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School of Development Studies
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INTRODUCTION

Despite the fact that South Africa ranks as an upper-middle income country with a per-capita GDP of some $3000, the majority of South Africans live in poverty. The legacy of apartheid has of course much to do with the poverty and the sharp dualism that characterise contemporary South Africa. Apartheid was a process of active dispossession that stripped assets such as land and livestock from the black majority. Apartheid simultaneously denied people the opportunity to develop new assets by restricting access to markets, infrastructure and education. Apartheid thus both produced poverty, and compressed social and economic class, especially in the rural locations where the majority of black South African continues to reside.[1] Nonetheless, this process of class compression does not imply that the black majority constitutes an economically homogenous population; nor does it imply that a single undifferentiated anti-poverty strategy will suffice to break the poverty dynamic introduced by apartheid.

As in many countries, the poor in South Africa are disproportionately found in rural areas. As McKinley and Alarcon (1995) suggest in their study of Mexico, anti-poverty policy must find a way to boost the level and, or the stability of income for the rural poor. Using data from a national living standards survey undertaken in late 1993, this paper disaggregates and explores the economics of livelihood generation and class in rural South Africa in an effort to contribute to the ongoing and vociferous debate in South Africa about poverty and its alleviation (e.g., see the papers in Lipton *et al.* 1996). Section 2 below begins the paper by presenting conventional quantitative poverty measures that reveal the extreme depth of poverty amongst rural black households. Yet, in contrast to these quantitative measures that focus on realised income or nutritional outcomes, the informants for a recent participatory poverty assessment describe poverty and vulnerability in terms of the specific bundles of livelihood tactics which the poor are able to exercise and assemble. As developed in section 3, this livelihoods-based description creates a connection to Sen's (1981) 'entitlements' approach that analytically characterises poverty and deprivation in terms of the livelihood or claiming systems that map social and economic endowments into real consumption possibilities. After exploring the range of claiming systems

and livelihood tactics available in rural South Africa, section 3 offers a first look at who the poor are from an entitlements perspective by disaggregating the rural population into discrete livelihood strategy classes. Eight livelihood classes are identified, ranging from the marginalised and transfer-dependent groups to a small entrepreneurial class.

In order to extend the analysis of poverty, livelihood and class, section 4 then briefly reviews microeconomic forces that distort and otherwise shape the nature of the livelihood mapping that links endowments to income and consumption possibilities. This review shows that in the presence of multiple market imperfections, the livelihood mapping will be characterised by non-linearities and flat spots that signal households' inability to effectively utilise some productive endowments. Section 5 goes on to employ non-parametric regression methods to flexibly estimate and graphically explore the nature of the livelihood mapping in rural South Africa. In addition to identifying those endowment combinations that map to consumption levels below the poverty line, the topography of the estimated livelihood maps helps identify the constraints that limit households' ability to effectively utilise their assets and endowments. The results suggest that poverty is a matter of not only having few assets, but also of facing capital and time constraints that limit the effectiveness with which those assets can be used. Section 6 closes the paper with implications for the design of poverty and livelihood policy.

QUANTITATIVE POVERTY MEASURES

The best method of measuring poverty remains the subject of debate amongst researchers (see Ravallion, 1996). A measure based on longitudinal data would perhaps be the most desirable as it could distinguish between households transitorily in poverty, and those whose current circumstance both render them poor and offer no potential for escaping to a better living standard in the future. Unfortunately, the available cross-sectional survey of South African households does not permit the construction of complex, multi-period measures that capture both current wellbeing and future potential and long term capabilities. Undertaken during the last quarter of 1993 by the Project for Statistics on Living Standards and Development (PLSLD) at the University of Cape

Town, the available data do provide South Africa's first-ever nationally and racially representative household data. With its focus on rural poverty, the analysis in this paper relies only on the data from the 4208 black households surveyed in non-urban areas.[2] Ardington and Lund (1996) describes some of the weaknesses of this data set.

Table 1 provides several alternatives measures of the incidence of poverty amongst South Africa's black rural African population. While each of the measures presented in Table 1 has its strengths and weaknesses, together they give a consistent portrayal of the risk and incidence of poverty. The income-based measure is calculated using a poverty line of 237 Rand (67 US dollars) per-adult equivalent per-month. This poverty line is based on scaling the Institute for Planning Research (1993) poverty line which is based on an estimate of minimum household consumption requirement.[3] Just over half (52.1 percent) of all African households in rural areas are poor in that their scaled per-capita expenditure [4] falls below this poverty line. Because these poorer households tend on average to be larger than wealthier households, this figure implies that almost 70 percentof all rural African individuals live in households with incomes below the poverty line.

Table 1 Alternative measures of absolute poverty in rural South Africa

Poverty Measures	% Rural African Households which are Poor
Income Poverty Line (237 Rand per Adult Equivalent)	52.1
Basic Needs Indicator (Lowest Rank on Composite Scale of Housing, Sanitation, Water and Energy*)	21.9
Nutritional Poverty Line (1815 Daily Calories per Adult Equivalent)	44.6
Nutritional Poverty Line (2100 Daily Calories per Adult Equivalent)	56.7

* Each component of the indicator was given equal weight and then summed.

The adequacy of 'money-metric' poverty measures such as the above can be critiqued from a number of perspectives, including one which notes that household income or expenditure only adequately reflect individual material well-being if the household has access to a market at which it can purchase all goods at given prices (see the discussion in Ravallion,

1996). However, goods like safe and available water and sanitation services have large indivisibility and public good components that make it impossible for a single household to marginally purchase more of such goods. More generally, some analysts would argue that access to safe water, adequate shelter, etc. are better indicator of poverty and human possibility then are income or expenditure-based measures.

Reflecting these various concerns, May *et al.* (1995) present a basic needs indicator based the type of shelter, water, sanitation and energy to which each household has access. As shown in Table 1, they find that 22 percentof the rural black population falls into the lowest rank of a four scale indicator (75 percent of these households also fall below the income poverty line). The bulk of the households in this group live in homesteads with rustic or temporary roofing, such as plastic sheeting or cardboard, and have high occupation densities. These households use unprotected sources of water, do not have a toilet facility of any kind, and collect and use wood as their main energy source. Another 51 percentof black rural households fall into the next highest basic needs category, meaning that they typically have access to a protected water source and an unimproved pit latrine, but have housing and energy sources similar to those of households in the lowest group. By way of contrast, only 3.1 percentof all households resident in major metropolitan areas respectively fall into either of these two lowest basic needs categories.

Another weakness of the household income-based poverty measures in Table 1 is that they are impervious to differences in intra-household inequality. Average food intake in a household arguably comes closer to a measure of individual well-being then does scaled per-capita household income.[5] While the PSLD data do not contain information on individual specific food intake, it is possible to calculate the calorie value of all food used by the household (over a 7 to 30 day recall period) relative to the caloric needs of the individuals who comprise the household.[6] Table 1 shows that approximately 57 percentof African rural households in the sample fall below a 2100 calories per-day (per-adult male equivalent) nutritional poverty line. The nutritional poverty head count under a lower standard of nutritional adequacy (1815 calories per day per-adult male equivalent) is 45 percent. These two nutritional poverty figures bracket the income-based poverty measures.[7]

Finally, relative deprivation as measured by income inequality provides another window into rural poverty and well-being. May *et al.* (1995) analyse income distribution using the full set of the PLSLD households (both rural and urban). They find that the poorest decile of the population, of whom 77 percent are Africans living in rural areas, controls just over 1 percent of household and adult equivalent expenditure. This can be contrasted to the wealthiest 10 percent of South African households which controls some 40 percent of expenditure. Only 4 percent of this latter group are Africans living in rural areas. These figures reflect an income distribution that the World Bank (1997) estimates to be the most unequal in the world after Brazil's.

POVERTY, LIVELIHOOD AND CLASS

The headcount and other quantitative poverty measures presented in the prior section permit the identification of an amorphous poverty risk or incidence for distinct demographic groupings. However, they tell us relatively little about how and why those identified as poor are poor. Interestingly, the voices and perceptions of the poor themselves point to a useful direction for a richer and more informative mode of analysis.

Voices of the poor

In a recent participatory poverty assessment, members of the South African community of Nhlangwini in the province of KwaZulu-Natal carried out a wealth ranking exercise, indicating on a social map the relative proportions of households belonging to different economic strata, in as well as some criteria for placing households in the different groups (Chambers, 1993 outlines the methodology used in the participatory study). As reported in Murphy (1995), the community members found that:

- Of the 76 houses drawn on the map 50 percent (38) were classified in the poor category. Criteria included: no-one working for cash, doing cheap labour, the household head living alone (especially women with no husbands), ill health, mental illness, pensioner, no parents and farmworkers.
- 30 percent (21) were place in the average category. Included in this category were households where members were wage workers (e.g.

teacher, policeman, nurse, work in Durban) or got an income from farming, owning a spaza (beer) shop or a taxi. In many cases, more than one member of the household had a regular job.

- 20 percent (17) were classified as rich. Some of these households ran more than one business (e.g. shops, taxis, tractors, traditional healer) while others had a number of members in salaried work.

The similarity between the subjective responses of the poor, and quantitative approaches based on expenditures and caloric intake is striking, as all three indicate that about half of rural South African households are poor. However, what is most striking about the perceptions of rural residents themselves is that they identify the poor in terms of shared characteristics, principally in terms of how the poor go about generating their income and the stability with which they are able to do it. This focus on what might be termed livelihood strategies identifies a way to move beyond poverty headcounts and profiles through a livelihood-based disaggregation and analysis of the rural population in a way that permits understanding of the structure of constraints that impinge upon the poor.

Similar to the approach put forward by Sen (1981), this livelihood focus suggests that the poor (and the vulnerable) can be identified as those who share common income-claiming strategies or 'entitlements'. Like the respondents to the participatory poverty assessment, Sen's work usefully directs our attention not just to the incomes people have realised, but also to the bundles of assets or endowments held by the poor; the nature of the claims attached to those assets; and, the nature and the vulnerability of particular claiming systems. This approach describes the *relationship* of people to the resources that they have and the commodities which they require to meet their basic sustenance requirements. In the terminology of Sen's entitlement approach, ownership endowments (including tangible assets like land and labour, as well as intangible assets like welfare rights and social and familial reciprocity) form the basis for gaining access to commodity bundles (food, services, facilities) through various claiming systems (including the labour and other markets, social and bureaucratic processes, etc.). The mapping which links endowments with attainable commodity bundles is what Sen calls the entitlement mapping, and will be referred to here as the *livelihood mapping*.[8]

The livelihood mapping thus defines the set of commodity bundles which can be claimed on the basis of a given set of tangible and intangible endowments, either through direct use of the endowments, or by using them to access other goods through market and other claiming systems. In the pure exchange economy of economic theory, when markets are perfect (price-rationed), the livelihood mapping is no more than the budget set defined by the endowments and the given set of relative prices at which exchanges are made. In his own work, Sen is interested in a more complex world in which sales- or quantity-constraints (e.g., unemployment), missing markets, and production and price shocks conspire to add complexity to the notion of a livelihood mapping. In particular, in a world without prefect insurance, a claiming system may fail to provide access to the expected bundle of commodities, creating what Sen calls an entitlements failure. *Ex ante*, the linkage or mapping between a set of endowments and the accessible bundles of consumable commodities thus becomes probabilistic.[9]

In addition, imperfect markets (e.g., credit markets in which access to capital is wealth-biased) also imply that some assets (e.g., land) can only be effectively utilised to generate claims when they are matched by holdings of ancillary ownership endowments (e.g., own-capital). Section 4 below will utilise the economic theory of the household in the face of imperfect markets to elaborate these considerations and their implications for the livelihood mapping. This theory also provides a choice-theoretic basis upon which to rest the analysis of livelihood mappings and class. However, before turning to that discussion, the remainder of this section empirically explores the multiple claiming systems operative in rural South Africa and the ways in which they are assembled into livelihood strategies.

The components and complexity of rural livelihood

In rural South Africa, as in many places, poor households exercise a multiplicity of claims passing through many distinctive claiming systems (Lipton 1993, and Maxwell and Smith 1992). The PSLSD survey data makes it possible to identify a number of activities from which rural households in South Africa are able to generate income. These include:

- **Agriculture,** for own consumption or sale
- **Small and micro enterprise** activities based on the extension of distribution networks such as hawking, petty commodity production

such as the making of clothes and handicrafts, and niche markets in the service sector such as child minding, money lending and contract agricultural services.

- **Wage labour,** including migrant labourers, farm workers and commuter labourers. Following Buraway (1975), the labour market in South Africa can be segmented into two main sectors: primary in which jobs are well paid and secure, and workers have prospects of career advancements and secondary in which jobs are low paid and offer little security and opportunities for upward mobility.
- **Claiming against the state** South Africa has a well functioning social pensions system which has a high coverage amongst the elderly in rural areas. Claiming these rights from the state in the form of pensions and disability grants has been shown to be of critical importance to household incomes (e.g., see Ardington and Lund 1996).
- **Claiming against household and community members** Migration for employment remains an important aspect of many rural people's lives, as does the reliance of the rural household upon a share of the migrant's income in the form of a remittance. As such, effective claiming of this remittance from migrants is an important livelihood tactic. Assistance is also rendered through kinship ties as well as through other forms of community reciprocity, including 'work parties' and outright charity. In addition, households assist one another by absorbing family members. May *et al.* (1995), for example, use the PSLSD data to show that resident household members suddenly increases when the declared head of household reaches pensionable age, reversing the demographic decline which sets in when the household head reaches middle age. Note that many of these family and social claims, like those which can be entered against the state, are contingent claims which can be pressed only when disaster strikes.

In addition to these activities which were measured by the PSLSD, at least three critical types of entitlement-generating activities are not adequately dealt with and can only be noted:

- **Unpaid domestic labour,** performed largely by women, which although not paid, contributes significantly to the household livelihood strategy.
- **Illegitimate activities**, many households survive by undertaking activities which are regarded as being illegitimate, either in the

narrow, legal sense, or in terms of the moral norms of a community. These include activities such as drug-trafficking, prostitution, and petty crime.

- **Non-monetised activities** engaged in order to either stretch household income, or to gain access to additional entitlements.

The relative importance of the different entitlements or income-generating activities for African rural households is reported in Table 2. The table shows that the three most frequently employed livelihood tactics in the month preceding the survey (or, year preceding the survey in the case of agriculture) are making claims against the incomes of non-resident (migrant) household members (39 percent of all households), employment in the secondary labour market (37 percent) and agricultural production (36 percent). Claims made against the state for pensions are the only other tactic employed by a large group (32 percent), [10] although it is noteworthy that 22 percent of households were able to enter into employment in the primary labour market. Involvement in small and micro enterprise activities is confined to some 10 percent of the sample, half of which are in the distribution and hawking sub-sector, confirming the paucity of rural manufacturing and endowments and opportunities to undertake it.

Table 2 Income generation and claiming systems

	% Rural African Households Engaging in Activity	Rand Earned per month (for those households engaged in activity)	
Activity		Mean	Median
Agricultural Production (Sold and Consumed)	36.4	91	31
Small and Micro-Enterprises	10.4	392	200
Wage Labour in the Primary Labour Market	22.1	1445	1132
Wage Labour in the Secondary Labour Market	37.4	582	500
Illegitimate Activities	n/a	n/a	n/a
Unpaid domestic labour	100% (?)	n/a	n/a
Claims against household members	39.0	267	200
Claims against the state	32.4	396	320
Non-monetised activity	n/a	n/a	n/a

Involvement in the primary labour market brings the highest return to rural households at an average of almost R1500.00 per month. Income

earned from participation in the primary labour market contrasts sharply with that available from secondary labour market work (at approximately R450 per month). Participation in niche service markets for both small and medium enterprises offers the second highest return of approximately R900 per month. Perhaps surprising is the finding that agriculture contributes on average little income, even among those households that engage in it. This result supports the findings from other studies where it has been noted that although households maximise what they can from the available land, agriculture is not the mainstay of rural households' existence (May *et al.*, 1994; May 1996).[11] The median values in Table 2 indicate that there is substantial variation and differentiation across households in the amounts earned the agricultural and self-employment sectors, suggesting that there may be quite distinctive types or classes of households participating in these activities.

Livelihood strategy classes

Following the lead of the participatory poverty assessment, it should be possible to identify strata of households which assemble similar bundles of the income earning tactics reviewed above, and in so doing share a common survival strategies and comprise distinct livelihood classes. While other researchers have made similar classifications of rural South African society, the analysis here tries to build on and improve these earlier efforts to create a typology of rural households (e.g., Nicholson and Bembridge, 1991 and Murray, 1978). Unlike these earlier efforts that primarily identify classes based on income levels, the livelihood classification scheme put forward here utilises information on extra-household claims derived from wage-earning activity in different labour markets, and on intra-household claims derived from the remitted incomes of people who live away from home. Table 3 presents detailed information on the following livelihood strategy classes for African rural households: [12]

1 *Marginalised households* have no access to wages or remittances from formal sector opportunities, and have no access to welfare transfers (largely pensions). Income from petty commodity production (i.e., small scale farming and microenterprise activity) is R92.00 per month or less;

2 *Welfare hependent households* have access to welfare transfers (pensions) , and receiving no wage or remittance payments. Income from petty commodity production is R92.00 per month or less;
3 *Remittance dependent households* have access to a remitted income, although no direct wage income is received. Transfers payments may be present. Income from petty commodity production is R92.00 per month or less;
4 *Secondary wage dependent households* have wage income earned by people living at home employed in the 'secondary' labour market. Income from petty commodity production is R92.00 per month or less;
5 *Primary wage dependent households* have access to wages earned by people living at home employed in the 'primary' labour market. Income from petty commodity production is R92.00 per month or less;
6 *Mixed income households with secondary wages* combine wages earned in the 'secondary' labour market with modest small business and other self-employment income;
7 *Mixed income households with primary wages* combine wages earned in the 'primary' labour market with small business and other self-employment income;
8 *Entrepreneurial households* earn incomes in excess of R1000 per month from agricultural activities, and/or business activities.

As can be seen in Table 3, the single largest category of households (20 percent of all rural households) are in class 4, those dependent on wages earned in the secondary labour market. Indeed, it is noteworthy that almost 33 percent of the rural sample is wholly reliant upon wage income earned in either the primary or the secondary labour market. Taken with those households that are dependent upon remittances, the extent of the general decline of agricultural production amongst the African rural population is evident. Another 11 percent of household are dependent on welfare payments such as social pensions and disability grants, and a marginalised 4 percent have no access to a formal cash income from any source.

Table 3 Characteristics of the different livelihood strategy classes

Livelihood Strategy Class	Percent Households	Dominant Tactic	Mean Adult Equivalent Income (Median)	Poverty Risk % House-holds	% in Worst-off Basic Needs Group	Mean Per-Adult Equivalent Capital (Median)	% Access to Land	% Access to Educated Labour
Marginalised	4.3%	Agriculture 81%	191 (131)	79	42	2492 (753)	36	27
Welfare Dependent	11.5%	Transfers 95%	195 (159)	74	30	1540 (524)	35	31
Remittance Dependent	25.1%	Remittances 64%	256 (xx)	57	27	1847 (751)	36	40
Secondary Wage Dependent	19.8%	Wages 96%	415 (274)	42	17	975 (30)	10.1	15.5
Primary Wage Dependent	13.6%	Wages 98%	507 (333)	29	9.1	2787 (861)	10.2	53
Mixed Income with Secondary Wages	15.8%	Even spread 20% - 30%	238 (177)	62	27.9	2017 (610)	31	35
Mixed Income with Primary Wages	8.1%	Wages 72%	376 (266)	38	8.3	4328 (1543)	30	74
Entrepreneurial	1.0%	Self-employ. 70%	631 (387)	24	9.4	10,206 (5133)	28	60

Within each strategy class, the proportion of income derived from the household's primary income source varies as the 'Dominant Tactic' column of Table 3 shows. Wage dependent groups, for example, receive 96 to 97 percent of their income from wages. Further analysis of these livelihood classes reveals a number of other significant features about the structure of household incomes in rural South Africa:

- Some households which are remittance dependent also combine this income with incomes derived from pensions and other welfare payments. These would appear to be older households who are able to press intermittent claims on their children. These pensions form a vital component of their income and serve to boost the average income earned by this group.
- Agriculture makes up 81 percent of the income of the poorest group, the marginalised, as well as 32 percent of the income of the wealthiest group, those deriving an income from entrepreneurial activities. Agriculture thus seems to play a dual role, as a safety net and as a way of deriving an entrepreneurial income.
- Finally, households that combine income in which the wage is earned in the secondary market spread their income earning activities across a wide range of survival strategies. Income is derived from claims pressed against household members, the state, as well as from entrepreneurial activities in small business and agriculture. In the absence of this range of activities, this group would receive a monthly income of less than an estimated poverty line income of R237.00 per month per adult equivalent.

Table 3 also shows indicators of the relative well-being of households in the different livelihood classes. Not surprisingly, the marginalised group is the least successful in generating a secure livelihood with almost 80 percent of households in this group falling below the 237 Rand poverty line. The majority of households in the marginalised group also fall into the most poorly serviced groups as measured by the human needs indicator introduced in section 2 above, with 41 percent of marginalised households in the most severely under-serviced group. Households dependent upon remittances that they receive from an unreliable source also generate an insecure livelihood, and earn R240 per adult equivalent per month. This group should be viewed as being extremely vulnerable as they could easily be pushed into the marginalised group if cut off from

their remittances. At the other extreme, households that are able to specialise in primary labour market employment, as well as those that recive an income from entrepreneurial activities, are by far the most successful at generating an adequate and secure livelihood. The earnings of these groups are R630.00 and R506.00 per adult equivalent per month, respectively.

Access to endowments

Consistent with the vision expressed by informants in the participatory poverty assessment cited above, analysis of the distinct livelihood strata found in rural South Africa shows that it those groups with the most precarious claims which experience the greatest incidence of poverty. Sen's entitlements approach suggests that the ability to make claims and assemble a secure livelihood strategy has its basis in the household's social and economic endowments and the claiming systems to which the endowments give access. While few studies have attempted to estimate the distribution of assets amongst African rural households, it is generally recognised that wealth is more unevenly distributed than income (May 1987). The PSLSD did gather information on a number of aspects of wealth including estimates of the value of fixed and movable property, and the ownership of livestock.

Analysis of this data reveals that just over a quarter of African rural households (26.1 percent) currently have access to a plot of land for the cultivation of crops. Average land size for these households is 2.2 hectares. A similar pattern is repeated with respect to the ownership of livestock, with some 24 percent of African households in rural South Africa owning livestock with an average holding for these households of 5.4 Mature Livestock Units [13] valued at approximately R4300.

Ownership of agricultural and other productive equipment that could be used in microenterprise activity is limited to 18 and 8 percent of rural African households respectively. This finding points to limited opportunities for the development of rural non-farm income generation. It is alarming to note that 20 percent of rural African household have no fungible assets of any kind that could be converted to cash in the case of need (meaning no cash savings, consumer durables, salable housing or land, nor livestock or other productive assets).[14] These households thus

have no safety net of their own, and are extremely vulnerable to any loss of income or entitlement failure, are unable to liquidate an asset to cover unexpected expenses or invest in new opportunities, and finally, lack any possible resource which could be used security against credit.

Access to human capital in the form of educated labour emerges as the most common endowment of rural households with 37 percent of households having an adult household member with at least ten years of education (Standard 8), while another 39 percent have an adult household member who could be considered functionally literate. Finally, 30 percent of household have a person of pensionable age, and 35 percent have a member of the household who is a migrant in another area.

Table 3 portrays the endowments held by households within the different livelihood strata. In terms of capital (defined as housing as well as productive assets), households that are dependent upon wages in the secondary labour market emerge as the least well off, with the mean value of assets worth less than R975 on a per-scaled-adult equivalent basis, with little access to land, and the lowest access to educated labour (the perhaps surprisingly larger capital endowments of the marginalised group results from their relatively large livestock holdings). Households that are dependent upon pensions and other transfers also have very little capital, although they have some access to land and to educated labour. These households are most likely in a late stage of their life cycle, and are liquidating their assets.

At the other extreme, Entrepreneurial Households are the wealthiest in terms of ownership of capital, with the mean value of assets worth just under R10,206 per-scaled-adult equivalent. Interestingly, this group is followed by those who combining incomes with wages received from the primary labour market. In terms of access to land, those households who are dependent upon wage labour tend not to have land, whereas land holdings are most common amongst households who fall into the more vulnerable livelihood tactic groups, that is, those reliant upon remittances and pensions. Finally, in terms of access to a person with more than a ten years of education (Standard 8), it is not surprising that this is most frequent amongst those households that engage in primary labour employment, in particular, those households that engage in activities in addition to wage labour.

MICROFOUNDATIONS OF LIVELIHOOD MAPPINGS AND CLASS

The shared endowment characteristics of the livelihood strata revealed by Table 3 suggest that these strata can be meaningful described as classes in the sense that households within them are characterised by broadly similar relationships to property and means of production. From the rational choice perspective of class analysts like Jon Elster (1985) (who compactly defines a class as a group of individuals who share a common 'endowment-necessitated behavior'), the assembly of endowment and claiming systems into livelihood strategies described in the preceding section, can be seen as an active or endogenous choice process in which people do the best they can given the often meager assets and opportunities available to them.

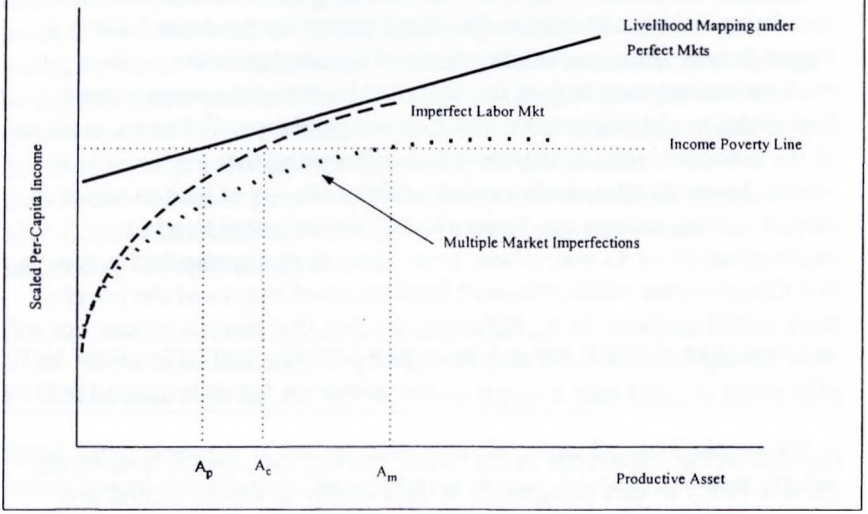
This process of livelihood assembly or endogenous class formation creates the livelihood or entitlement mapping defined in section 3 above. As detailed in note 9 above, we focus here on the mapping from assets into a one dimensional real income space, rather then the higher dimensional commodity space discussed by Sen (1981). Conceptualising this mapping as the outcome of active household choice is useful because it brings into focus the constraints that limit a household's ability to generate secure livelihood. The reality of risk and imperfect insurance markets creates the prospects for entitlement failure, implying that each asset position maps into a distribution of possible livelihood outcomes. The remainder of the analysis here will refer to the first moment or mean of that distribution—the *ex ante* expected income or livelihood outcome—as the livelihood map.[15]

The microeconomic theory of the household offers a series of insights useful for elaborating the choice theoretic basis of the livelihood map and for understanding the logic and constraints of low income rural households. From its roots in the 1924 work of A.V. Chayanov (1966), this theory has stressed how a household's resource allocation (e.g., the intensity with which it uses its fixed assets) systematically varies with the household's wealth and its endowments of land and labour. As this section explores, refocusing the theory upon the real income that the household generates through its allocative choices provides a choice

theoretic foundations for the livelihood map that links endowments to income.

As Singh, Squire and Strauss (1985) have most thoroughly explored, when the household has access to full and complete markets (meaning that it can purchase or sell any quantity it desires of both consumer goods and productive inputs like labour or capital), its production and (full) income generation decisions become independent of, or separable from its consumption decisions and its overall level of wealth and endowments. Under these assumptions, the topography of the livelihood map would be a boring, upward sloping plane, featuring constant slopes throughout the endowment space (indicating that marginal returns to endowments are constant everywhere, for rich and poor). The particular asset bundle owned by the household would not influence its marginal returns to any individual asset or endowment. The entitlement surface would simply be linear or additive in each asset or endowment.

Figure 1: Microfoundations of Livelihood Mapping and Asset Poverty



The solid line in Figure 1 illustrates a two-dimensional livelihood map for this perfect markets case. To keep matters simple, Figure 1 assumes that all households have the same demographic structure and hence livelihood requirements so that vertical axis can be equivalently expressed in total income and income per-adult equivalent units. The intersection of the poverty line with the livelihood map identifies the asset level, A_p, below which expected income or livelihood falls below the poverty level. In this perfect markets world, being poor would be a matter only of having insufficient assets. From a policy perspective, relieving the poverty of these households would be a matter of straightforward income (or asset) transfers. There would be no ancillary constraints which inhibit the effectiveness with which households use endowments to generate income, nor any constraints which might inhibit households' ability to effectively utilise assets which might be transferred to them.

In contrast to this perfect markets world, the topography of the livelihood map, and the nature of poverty become more complex when households are unable to buy or sell as much as they wish of certain goods or inputs. Chayanov's classic analysis of the peasant household presumed that the household could neither buy nor sell labour. Under this assumption, patterns of household resource allocation and use are inseparable from the household's overall wealth level, its demographic structure, etc. The livelihood map would take on the shape shown by the dashed curve in Figure 1, with the expected income level coming up to the perfect markets income map only at the asset level where the unconstrained household would desire to neither hire nor sell labour.[16] The steep slope of the livelihood map at low asset levels (meaning that the household would choose to intensively exploit additional units of land to which it gained access) reflects the desperation of the household and its undervaluation of its own labour time when its living standard is low. In this Chayanovian world, the asset level required to exceed the poverty level would increase, to A_c, reflecting the fact that poverty results not only from having little land, but also from being constrained in its ability to effectively use and gain a return on the labour resources it does have.

Beyond facing constraints in the labour market, low wealth households are also likely to face constraints in their ability to access capital and insurance in financial markets, as a now voluminous empirical and theoretical literature explores (see the review in Barham *et al.* 1996). The

behavior of the farm household in the presence of such multiple (labour and capital) market imperfections has been explored by Eswaran and Kotwal (1986) and Kevane (1996), among others. The dotted curve in Figure 1 captures the general implications of their analysis for the livelihood mapping. As can be seen, this additional market imperfection flattens the entitlement surface of low wealth borrowers who are unable to access working capital needed to finance cash costs of production (including perhaps their own immediate consumption needs). Despite their advantageous access to relatively cheap efficiency labour, these households are unable to effectively utilise more than a minimal land endowment because of their inability to capitalise production. Note that income (and marginal returns to productive assets) could rise steeply beyond a wealth level where the household is able to gain access to formal financial markets (see Kevane 1996 for a complete discussion of the impact of various financial and labour market constraints on asset use and productivity).

In this multiple market imperfection world, the projection of the poverty line into asset space now shifts out to a point like A_m. Households can be poor both because they are close to the origin (i.e., they have a meager asset bundle) and, or because they are trapped in a flat portion of the endowment space indicating constraints limiting the ability to generate income from that bundle.[17] From a policy perspective, such a world would be one in which the usual range of income and asset transfers can be supplemented with ancillary financial market policies that correct constraints that limit poor households ability to utilise those assets they do have. Equally important, in this world, simple asset transfers (or market-assisted asset transfer schemes) may not work in the absence of what Carter and Barham (1996) call a 'proper microeconomic sequencing' of reform policies.

NON-PARAMETRIC ESTIMATES OF LIVELIHOOD MAPPINGS FOR RURAL SOUTH AFRICA

Rural South Africa is of course more complex than the multiple market failure model described in the preceding section. Nonetheless that simple model suggests an interpretation of flat spots or other twists in the topography of the empirical livelihood map to be estimated in this

section. In addition to missing and imperfect markets analysed in section 4, the logic of the survival strategies outlined section 3 reflects the reality of decades of apartheid and its restrictions on opportunity and mobility for the rural African population. Moreover, unlike the abstract discussion in the prior section, households both save and exercise social claims, implying that observable livelihood generation in any period depends on more then contemporaneously generated income. Note that the real income transfers of a well functioning system of reciprocity or of social safety nets will flatten out the livelihood map compared to the individualistic theoretical representation in Figure 1 above.[18] A similar effect obtains when individuals transfer household members to better-off households (e.g., children may be sent to live with pensioner grandparents--see May *et. al* 1995). Against the backdrop of these theoretical and other considerations, this section goes on to employ a flexible econometric approach to the estimation and exploration of the topography of the mapping between assets and livelihood or entitlements for rural South Africa.

Table 4 presents basic information on the variables to be used for the estimation of the livelihood map. For the estimation and analysis of the entitlement mappings in rural South Africa, the PSLSD data covering rural black households were split into three geographically defined groups, the arid former homelands, the subsistence former homelands, and white farming regions. The three regions can be distinguished from one another in terms of the environmental and economic structures of income earning opportunities. The analysis presented here is for the subsistence former homeland region, comprised primarily by KwaZulu/Natal, Mpumulanga and Eastern Cape. Results for the arid former homeland areas are similar to those presented here in the sense that they identify a similar set of overlapping constraints, although the income levels and returns to factors are quite different in the arid areas. The livelihood map for rural black households in white farming regions is rather distinctive, but is not reported here in the interest of saving space and because of the relatively small number of African rural households in that region.

Table 4 Income and endowment variables for non-parametric regression analysis*

	Full Sample (4208 observations)			*Subsistence Former Homelands (1549 observations)*		
	% with Asset	Mean	Median	% with Asset	Mean	Median
LIVELIHOOD	-	292	199		230	185
Household Size (Scaled Adult Equivalents)	--	4.0	3.9	--	4.7	4.3
Earned Income	--	561	230	--	522	161
UNEDUCATED LABOUR (fte's)	98	3.0	2.8	98	3.5	3.3
EDUCATED LABOUR (fte's)	28	0.42	0	30	0.45	0
HH REPRO. TIME (fte's)	--	0.49	0.03	--	0.58	0.1
LAND (hectares)	26	0.41	0	41	0.6	0
LIVESTOCK	24	1038	0	36	1776	0
TRANSFER INCOME	59	246	140	67	272	187
Migrant Remittances	39	105	0	57	144	33
Pensions and Transfers	32	141	0	30	128	0
PRODUCTIVE CAPITAL	24	217	0	38	383	0
SME Equip.		139	0		215	0
Agricultural Equipment	18	78	0	30	168	0

- Bold-faced variables are those actually used in regression analysis. Unless otherwise indicated, all variables measured in Rand/month for flows and total Rand for stocks.

As Table 4 shows, livelihood or income per-scaled-adult equivalent averages only R230 in the subsistence region, with a median value of R183.[19] The endowments available to households to produce income are divided into uneducated labour, educated labour, land; other productive assets (farming tools as well as equipment and installations used to generate non-farm self-employment income); livestock; and monthly transfer income (defined as the sum of pension payments and remittances received by resident household members). Both the labour and human

capital endowments are measure as weighted sums of the individuals resident in each household, with young children given a weight of zeros, older children and the elderly a weight of 0.5, and all others given a weight of 1.0. Uneducated individuals are people with less then 5 years of schooling. Educated individuals are those with more then that amount. Also reported with the labour variables is a measure of household reproduction time, defined as the full-time labour equivalents devoted to the fetching of fuelwood and water.

As can be seen, this variable averages nearly 60 percent of a full time worker in the sample, though the median is lower. As documented in May *et al.* (1995), these tasks are primarily undertaken by women and girls. This household reproduction burden suggests that the net endowment of labour time is significantly less than the gross figures for labour availability suggest. How this and other constraints impinge on the ability of rural African households to generate a livelihood is explored in the remainder of this section.

Non-parametric estimation procedure for livelihood maps

In order to explore the topography of the mapping between assets and livelihood, this section utilises the non-parametric smoothing technique of locally weighted regression (or LOESS, see Cleveland *et al.* 1989, and Hastie and Tibshirani 1990).[20] For each data point, LOESS calculates a set of local regression weights (as detailed below) for all other observations in the sample. These observation-specific regression weights are then used to approximate a unique local regression fit for each observation, as described by Cleveland *et al.* (1989). While no single set of numerical parameters can describe the LOESS fit, the results can be displayed and interpreted graphically using higher order conditioning plots, as will be explained momentarily.

The advantages of the non-parametric LOESS procedure over conventional parametric regression analysis are several fold in the current context. First, LOESS flexibly allows the shape of the regression function to change over the data space. Such flexibility is particularly appropriate for the exploration of livelihood or entitlement maps given that theory predicts that these mapping can take on complex and variable shapes over the endowment space, depending on the interacting, and theoretically

indeterminate effects, of multiple market imperfections. In addition, the 'localness' of the regression fit should help partially mitigate that the fact that particularly livelihood strategies are the endogenous result of a not yet well understood household decision-making process.

Thus, households which choose to cultivate the land to which they have access may in fact be those who have experienced an entitlement failure along other dimensions (e.g., the household may have lost or failed to find formal sector wage employment for its labour power). A conventional, single-equation parametric analysis might show that land has a low or even negative impact on livelihood if land rights are only exercised by households which have experienced relatively unfavorable circumstances in the labour market. In contrast, a local regression fit will estimate the impact of land on livelihood using information on structurally similar, statistically proximate, observations.[21] LOESS results are thus less likely to be biased by the endogeneity of the decisions to pursue a particular livelihood strategy.[22]

Endowment necessitated choice and poverty

To explore the nature of rural livelihood mapping, LOESS techniques were used to explore the relationship between livelihood (measured as income per-scaled adult equivalent) and the following assets shown in Table 4: Land access (measured in hectares); Livestock; Productive capital (measured as the Rand value of agricultural implements and equipment used in small and medium enterprises); Uneducated labour (measured in full time adult equivalents); Educated labour (in full time equivalents); financial capital or liquidity (measured as transfer income form either migrant remittances or government social welfare transfers); and, the 'negative asset' of required household reproduction time (measured as the full time labour equivalents spent in the collection of water and fuel).

This latter variable is included on the ground that while household reproduction time is probably partially endogenous to realised income levels (e g., a wealthier household can substitute a paraffin stove for firewood), the huge amounts of time spent by many rural households on these tasks primarily reflects poor social infrastructure.[23]

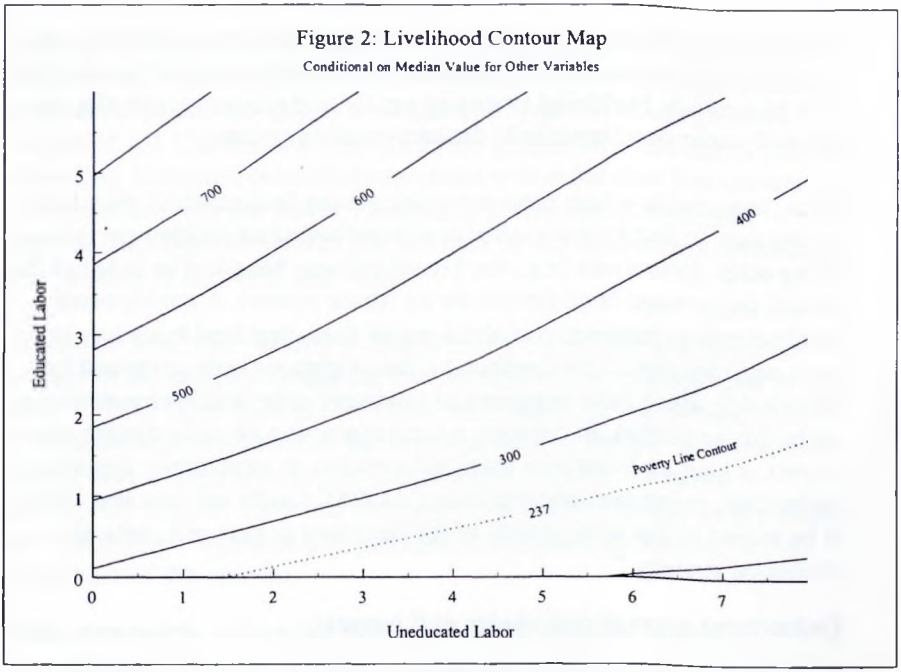


Figure 2 gives a first look at the nature of the estimated livelihood mapping. Drawn holding land, transfer income and household reproduction time at their sample medians, the contours in Figure 2 show those combinations of uneducated and uneducated labour which map into the indicated levels of livelihood. Note that the contour marking an income of 237 Rand (per-scaled adult equivalent per-month) is the projection of the conventional income-based poverty line into asset space. In simpler terms, Figure 2 maps out those asset combinations that are estimated to yield a livelihood at or below a subsistence living standard.

Apparent in Figure 2 are the extremely low returns to uneducated labour as increments of uneducated labour actually reduce scaled per-capita income, indicating that expected incremental returns to uneducated labour are below a poverty subsistence level (i.e., marginal returns to uneducated labour are positive but below the scaled poverty line of R237). It should be stressed that Figure 2 is drawn conditional on holding other endowment variables at their median levels (including social claims). It is thus apparent from Figure 2 that only those households with either education or other assets above median levels are likely to be found

above a poverty standard of living. In simplest terms, Figure 2 shows that poverty in rural South Africa is in part simply a measure of having few assets to which the extant economy pays significant returns.

As discussed in section 4, in the actually existing world of imperfect markets, poverty is also potentially the result of interacting constraints that prevent households from effectively deploying and earning returns to the meager assets they do possess. Figures 3 and 4 use the LOESS estimates to explore aspects of these interacting constraints. Figure 3 explores the impact of household reproduction time on income generation capacity. Subject to the endogeneity caveat described above, these estimates suggest that for a given work capacity, household reproduction time sharply diminishes income generation capacity. Indeed, the time demands of securing drinking water and fuelwood diminish the median household's available uneducated labour power by some 20 percent. While returns to this labour are low, it is clear that poverty in part reflects the state of rural infrastructure that creates what might be termed Time Poverty.

Finally, Figure 4 explores the interactions between transfer income (as a potential source of self-finance for agricultural production) and land. The surface is drawn for median levels of labour, education and household reproduction time. The ability of transfer income to apparently relax a binding capital constraint is visible in the steepening slope of the entitlement surface (with respect to land) as transfer income increases. When transfer income is low, marginal returns to land are actually estimated to be slightly negative (holding labour fixed). By contrast, returns to land rise to about R50/hectare/per-month when transfer income is high. These twists in the topography of the livelihood surface are similar to what the simple multiple market failure model above shows to be the impact of binding capital or liquidity constraints on the returns to land. While there are undoubtedly other important constraints that limit rural households' ability to effectively use land resources, the flat part of the entitlement surface when transfer income is low, matches the theoretical expectation discussed in section 4 above.

To summarise, understood as the result of optimising, endowment necessitated choice, the topography of the entitlement mapping that links endowments and real incomes helps identify the nature of the constraints

Figure 4: Capital Constraits and Land Productivity

Conditional on Median Values for Other Variables

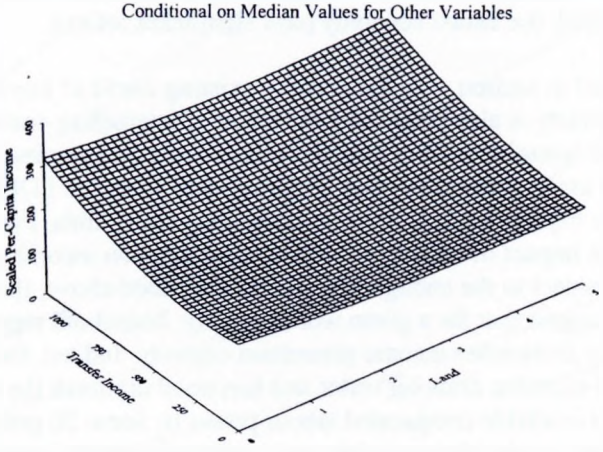
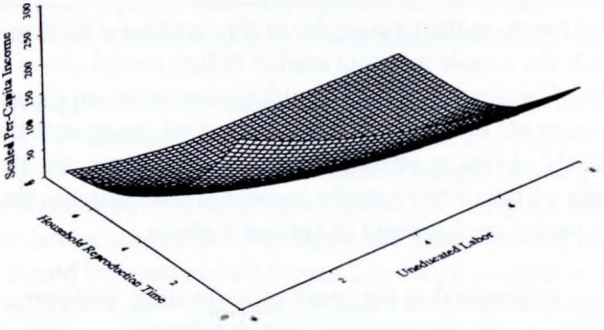


Figure 3: Time Poverty and Livelihoods

Conditional on Median Values for Other Variables



that shape livelihood choices by the rural poor. The empirical estimates presented here identify significant departures from the smooth asset additivity that would characterise the mapping in a world of full and complete markets. The poor are poor not only because they have few assets, but also because they are constrained in their ability to effectively utilise the assets they do have. Under the existing structure of opportunity, which surely remains an artifact of the legal restrictions of apartheid, a land endowment appears necessary to garner a return to uneducated labour, and an endowment of capital (measured as an inflow of transfer income) appears necessary to effectively utilise land. The picture that emerges is one in which wage opportunities are weak and ancillary factor markets do not working very well.

CONCLUSION

This paper has explored the economics of livelihood generation and class in rural South Africa in an effort to understand not just who is poor, and along what dimensions, but why they are poor. In general, the picture that emerges is one of poor households with alarmingly limited access to endowments, highly constrained options for the use of these endowments, and in most cases, poor returns being generated for those activities in which they are able to engage. Stratification of the rural population into livelihood classes based on shared livelihood strategies reveals that economic well-being differs systematically across livelihood class. This suggests that the poor and the non-poor gain their livelihoods from rather distinctive portfolios of activities and enjoy rather different sets of economic endowments and social claims. Merging Sen's entitlement approach with the economic theory of the household in imperfect market environments, non-parametric estimates of the mapping between household endowments and poverty is presented. Analysis of the estimated mapping permits identification of those endowment bundles that map into livelihoods above the poverty line and reveals three dimensions of the rural poverty problem:

1 Most simply, and matching the conventional concept of poverty, returns to uneducated labour are so low that claims on other economic or social assets are necessary to lift a family above the poverty line;

2 The topography of the livelihood map identifies financial constraints that limit the poor's ability to effectively utilise productive assets and endowments (e.g., land) which they do have. Poverty is thus not only a matter of few assets, but also of constraints to effective use of those assets.
3 The burden of water and fuelwood fetching in rural South Africa creates a 'time poverty' that further constrains households ability to effectively employ those resources to which they do have access in the generation of livelihood.

These findings about the nature of rural poverty have implications for policy designed to promote rural livelihoods and relieve poverty. In a world in which markets were perfect, a policy that transferred assets such as land to the poor would indeed improve their position as they would simply be able to use factor markets to access any complementary resources that they might need. However, in a country where policies have systematically distorted almost every economic market and social institution, it is not possible to be sanguine about the functioning of factor markets. In addition, a wealth of international experience suggest that factor markets—especially financial markets—tend not to work well for the poor, irrespective of policy distortions (e.g., see Barham *et al.* 1996).

These results thus suggest that policy prioritise actions that lift the constraints that limit the effectiveness with which the rural poor are able to use the limited assets and endowments they possess should be especially beneficial. An example of such policy would be the promotion of local financial institutions that would help release the financial constraints discussed above. These micro-lending institutions would need to have the capacity to extend credit, take deposits and foster investment while dealing with the costs of numerous small transactions. The delivery of essential services, especially water and energy would be a complementary measure to release time constraints for rural households, thereby allowing them to engage in productive activities (the income impacts of this newly released time will of course be modest given the estimated low returns to unskilled labour). While not all constraints need be lifted prior to, or simultaneous with, asset transfer schemes, it is important to note that when productive assets are transferred at market prices (as they are under the market-assisted land reform policies being

utilised in South Africa), the failure to lift constraints to asset use effectively causes a decapitalisation of the poor.

Successfully implementing these policies will require flexibility at a local level so as to permit appropriate sequencing. Support would be required to strengthen or establish institutions which can facilitate implementation of this nature. A final concern to be taken into account is the strong evidence that rural communities are fundamentally heterogeneous in nature. If overlooked, this characteristic can undermine development initiatives in rural areas through the influence of patronage and factionalism. It also suggests that there is the potential for conflict between integrative development strategies and the differentiated nature of the intended beneficiaries. Despite this, shared economic or social need may offer a more powerful basis for collective action than that of an organisation based on locality, such as the village development committee, and if recognised, be contribute towards the alleviation of poverty.

NOTES

1 While there is income inequality both within rural areas and between urban and rural areas, apartheid prevented social and economic mobility, and compacted socio-political interests. As a result, inequality in rural areas did not translate into differing class interests such as that of a middle peasantry, proletarian or petite bourgeois.

2 'Black' is here defined to include people previously classified as African, but excludes the 'colored' and Asian populations. 'Households' are defined using the admittedly problematic PLSLD survey definition. According to that definition, *resident* household members are defined as those individuals who had (a) lived in the surveyed dwelling for at least 15 out of the preceding 30 days, (b) shared food from a common source; and, (c) contributed to or shared from a common resource pool. Individuals not meeting condition (a) were classified as *non-resident* members if they had lived in the household at least 15 days out of the preceding year and filled conditions (b) and (c) during their period of residence. Complete employment and earning data were collected on all resident household members. Earnings by non-resident members were

recorded only to the extent that they were reported as remittances on the survey. All calculations of household size utilise only resident members.

3 Here and throughout this study, all monetary measures of well-being are standardised or scaled in order to account for the fact that large households need more income than do small households to reach a similar level of well-being, that adults need more food and other commodities then do children, and that there are some economies of scale in household production. A simple scaling was defined such that the number of adult equivalents (ADEQs) in each household is defined as: $ADEQ = (A + 0.5*C)^{0.9}$
where A is the number of resident adult (older then 16 years of age) household members, C the number of children, and 0.9 is the scaling parameter which captures modest increasing returns in the creation of a living standard. Dividing household income or expenditure by ADEQ yields scaled per-capita measures. The 237 Rand poverty line results from applying this scaling to the IPR's (1993) reference household of 4 adults and 2 children requiring a minimum expenditure of 723 Rand per-month to achieve a subsistence living standard. May *et al.* (1995) detail the weaknesses of the IPR-based poverty line.

4 Throughout this paper, total monthly expenditures rather than measured income are used as the preferred measure of household material well-being. Assuming that households are more or less successfully able to smooth their consumption over time, expenditures is theoretically a better measure of permanent income (and well-being) then is current income. In addition, because certain real income flows are difficult to measure, as are changes in stocks of savings, expenditures may be empirically more reliable than measured income.

5 For example, a finding of caloric inadequacy in households with incomes above the poverty line would signal a sort of intra-household inequality that would lead us to question the adequacy of household income-based measures as indicators of individual well-being.

6 Nutritional needs were calculated for each individual using standard WHO requirements for each individual based on their age, sex and pregnancy and lactation status. Clearly, however, such calculations are imperfect as food energy requirements vary across individuals and over-time. Likewise, the way in which food is prepared and combined also affects the energy which can be realised from it. Despite these reservations, nutrition has formed one of the ways in which economists have attempted to analyse poverty. Kakwani (1989) provides a useful discussion of measuring under-nutrition and poverty.

7 Of those households that are nutritionally poor under the 2100 (1815) calorie standard, 81percent (84percent) are also poor by the income poverty line. Of the households that fall into the lowest basic needs category, 62 percent are nutritionally poor in that their average daily calorie use falls below the 2100 calorie standard.

8 The term 'livelihood' is used in preference to 'entitlement' because the latter term carries negative connotations from debates in the US and South Africa over a 'culture of entitlement' which discourages work effort.

9 While Sen casts his entitlement approach in the general terms of *multi-dimensional* commodity bundles which an endowment can command , much of the dynamism and insight of his approach can be retained by thinking more simply about the one dimensional real income which an endowment bundle can command, and the distinctive patterns of vulnerability that characterise the real income claiming mechanisms utilised by different classes of agents. For example, a semi-subsistence peasant farmer (endowed with unskilled labour and land) and a semi-skilled artesian (endowed with labour, human capital and tools) may on average be able to command the same commodity bundles (i.e., they may have the same real income and budget sets on average). However, they are subject to very distinctive forms of vulnerability and poverty risk. The peasant farmer is exposed to production shocks (direct entitlement failures), while the artesian is subject to the risk of sales constraints and changes in the price of the commodity he sells relative to the price of subsistence goods (what Sen calls trade entitlement failure). Sen's

(1981) analysis of Bengal famine shows that precisely these two groups, peasants and artisans, had distinctive histories, with the latter suffering trade entitlement failures and bearing the brunt of the famine-related deaths. Note however, that changes in the prices of consumption necessities relative to each other is not critical to this story, which can be told in terms of the different vulnerability of the agents' real income claims. The empirical analysis later in this paper will in fact concentrate on the mapping between assets and real income.

10 This figure of 32 percent exceeds the proportion of households with a person of pensionable age. As there other possible forms of state assistance beyond pensions, this is entirely possible, and suggests that pension coverage in the rural areas of South Africa is virtually complete. Data problems cannot however be ruled out as May *et al.* (1995) discuss.

11 It should be noted that the survey was undertaken in a drought year, and that as a result of apartheid urbanisation policies, many rural areas in South Africa display the characteristics of displaced urban communities.

12 The development of this livelihoods categorisation has also been reported in May (1997).

13 A mature livestock unit is a simple cattle-equivalent scale in which 5 sheep or goats are equivalent to one head of cattle.

14 Unfortunately information on stores of food were not collected in the survey and are not therefore included into the calculation of savings and wealth.

15 While we focus here on income generation, we might also have looked explicitly at livelihood classes as an outcome of active household choice. In a theoretical analysis of class formation in an imperfect market economy, Carter and Zimmerman (1998) explicitly explore the creation of a 'class map' that relates economic class to underlying endowment characteristics.

16 Figure 1 is constructed on the assumption that all commodities, including leisure, are normal goods.

17 The dynamic question is of course why households would get trapped in such unbalanced portions of the asset space. Poverty is reproduced if the household remains stuck in that unremunerative portion of the asset space over time. While issues of poverty reproduction are beyond the scope of this work and its cross-sectional data base, dynamic analysis of accumulation suggests two fundamental reasons why a household may reproduce a weak endowment position over time. First, its income could be so low, and its current needs and discount rate so high, that little savings are generated. Second, missing insurance and contingency markets may lead the rational household into autarchic self-insurance strategies which lead to reliance on safe savings instruments which generate low rates of return (e.g., large grain stores generating a -7 percent rate of return in the prototypical peasant economy). Zimmerman and Carter (1997) discuss these issues of 'distorted' accumulation in greater detail.

18 Sen (1981) colourfully denotes an economy that lacks the social reciprocity of traditional, embedded economies and the social safety nets of the welfare state as a PEST for pure exchange system in transition. Sen of course was writing at a time when the welfare state enjoyed greater political legitimacy then it does now, though this comment only heightens the importance of his observation about the importance of safety nets in market economies.

19 As in the earlier sections, we use total household expenditures as the measure of permanent income.

20 An advantage of non-parametric techniques is that they allow flexible exploration of a regression surface. Unfortunately, many non-parametric techniques break-down over either dimensionality (i.e., if they are more than a single explanatory variable) or over interactions among explanatory variables. LOESS techniques offer a nice compromise of flexibility with less sacrifice in the nature of the interactions being modeled.

21 The standard ordinary least squares parametric regression results reported in May *et al.* (1995) in fact estimate that land has a negative impact on livelihood generation. It should, however, be noted that the non-parametric local regression approach utilised here will still tend to confound the impact of latent characteristics which uniquely enhance the household's return to certain activities (e.g., farming skill) with the expected average return to, say, land use.

22 Computationally, LOESS estimates are calculated as follows. For a given observation x, let $\Delta_i(x)$ be the Euclidean distance from x to the explanatory variables of the i^{th} observation. Let $\Delta_{(i)}(x)$ be the value of those distances ordered from smallest to largest. For the α observations closest to x, the local regression weight for observation i is defined by the following tricube weight function based on the distance between it and observation i. The other N-α observations (i.e., those further away from point x than the cutoff observation α) are given a zero weight. Note that the parameter α thus determines the bandwidth, or span, of the LOESS non-parametric estimation (see Hastie and Tibshirani 1990). The results reported below use a default span parameter of 75 percent. All computations were carried out using the SPLUS software. Because of programming restrictions, all LOESS fits were specified to locally linear in the explanatory variables.

23 Shelembe (1997) models household reproduction time and income generation as a simultaneous equation system, and obtains results qualitatively similar to the non-parametric results reported here.

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