

The SME boom in rural South Africa – links to electricity and telephony

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In this study we investigate into determinants of households' small- and micro enterprise (SME) activities in rural South Africa, with a special focus on electricity and telephone access. The micro data we analyse suggest a doubled number of SME's in the country's deep rural areas between 1997 and 2004. A growing literature suggests considerable links between rural development and improved access to modern energy. The results in our study corroborate the high, recent policy priority given to the electrification of the historically disadvantaged "deep rural" areas. In parallel to a doubled electricity access, we find a 14-fold increase in households' access to telephones. Through descriptive analyses we observe that SME uptake is considerably higher both among households with grid access and with telephones. We apply multivariate logit regression analyses to each of seven years of household survey data as well as to three pooled samples, with a binary dependent variable indicating SME operation status,. The estimated, reduced form specification encompasses electricity and telephone as explanatory variables juxtaposed to household demographic variables and a contextual control variable. We estimate positive, statistically significant associations to SME operation from telephone access in all years and in the pooled sample. Electricity is associated with significant impacts of lesser magnitude in four out of the seven years and in the pooled samples. The analyses yield minor negative significant impacts from the context variable which represents higher extents of development. We conclude that both electricity and telephone access variables appear to be positively associated with enterprise operation.

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1 Introduction

In this study we apply quantitative methods to identify household level characteristics that determine the operation of small and micro enterprises (SMEs) in rural South Africa. In the context of the country's high and persistent unemployment rates, considerable effort has been put into policies aimed to facilitate self-employment (Berry, Blottznitz, Cassim, Kesper, Rajaratnam and Seventer (2002), South African Government (1998)). Previous studies suggest that the provision of modern energy has beneficial impacts both on the uptake and productivity of SME activities in developing countries (Barnes and Sen (2004), Meadows and Riley (2003)). South Africa's National Electrification Programme has increased the domestic electrification coverage from 36% to over 70% in the last 12 years. Electricity to the country's "deep rural" areas has been highly prioritized, as a measure to combat poverty and counteract the historical neglect of service provision to those areas (South African Government, 2001, 2003). Hence, households' access to the national electricity grid as a determinant of SME uptake is of particular interest here.

A lack of access to modern energy has been characterized as a micro-level barrier to development. However, whether the removal of this barrier alone necessarily results in socio-economic development has become a topic of debate with policy implications. Many studies of mainly qualitative data attribute considerable influence to energy as a catalyst of development. However, it is often emphasized that the impact of energy is amplified when provided *in concert* with other interventions (Cabraal, Barnes, and Agarwal, 2005).¹ Certain authors argue that electrification can enhance rural development only under the right circumstances, among which a development-driven demand for energy is paramount (Foley (1990), Barnes (1988)). In contrast, others argue that electricity can be a driver of development in its own right, with both indirect and direct effects (World Bank, 1975).

The course of events covered by the data available to this study provides an opportunity to feed quantitative evidence into the above debate. For each year, we are able to compare the characteristics of households which are involved in SME activities to those that are not and investigate into the impacts of the doubling of connection rates and manifold increase in telephony

¹ For example, a study from Peru has shown that the provision of education without electricity did not have as much impact as providing education with electricity. Similarly, providing electricity by itself without schools or other educational facilities will not have as much impact as having both of them present in a community. The same study showed that, in otherwise identical households, those with joint access to basic services such as electricity and water "had a significantly higher growth rate of per capita consumption than households that did not have such access".

access. In our attempt to explain the variation in activity status among households we hypothesize, firstly, that as an outcome of the “free basic” electricity policy, the vast majority of households in an area connect when the grid reaches them. A household’s decision to operate an SME is furthermore affected by (a) its grid connection status and telephony access; (b) other household-specific characteristics such as its demographic and education-wise composition; and (c) contextual factors in its specific area of residence.

We utilize seven sets of annual cross-section data from national household surveys to assess these hypotheses in two stages. The first stage involves analyses of descriptive statistics through which we derive impressions of: (i) the nature and increase of SME activities; (ii) the development of households’ access to electricity and telephony; (iii) the location of households with SME’s in the income distribution of the deep rural areas; as well as (iv) the relationship between area-level densities of traditional dwellings and various informal development indicators. In the second stage we apply logit regression analyses. The binary dependent variable in our reduced form model indicates whether a household runs an SME or not. The independent variables encompass the household’s demographic and educational composition, its access to electricity and telephony, and a proxy variable for the area-level development.

The remainder of the paper is organized as follows. The next section reviews findings from previous investigations into the benefits to enterprises from electrification programs in developed countries. Sections 3 and 4 respectively present the South African electrification program and the role of SMEs in the economy. The fifth section introduces the data and definitions. Section 6 is designated to descriptive statistics. The seventh section discusses theory that can guide the modelling of the relationship under investigation. Section 8 explains the empirical approach and specification. The multivariate analysis is found in Section 10 and conclusions are drawn in the final Section 11.

2 The importance of energy provision for developing country enterprises

A distinct and highly unusual feature of economic activities, in a sub-Saharan African context, is the virtual absence of commercial or peasant agricultural activities in South Africa’s deep rural areas (Bundy (1998), Dieden (2004)). Consequently, households in these areas historically often

depended on transfers from migrant members but their situation has improved by the scaling up of the country's social security system (Budlender (2000), Jensen (2001)).

The absence of agricultural activities in these areas implies that the most interesting experiences here are impacts from modern energy provision on non-agricultural SME activities in other developing countries. However, as an example of contextual influences on energy impacts, the performance of agricultural sector serves well. In developing countries, agriculture plays important roles, both as an income generator and as a source of backward and forward linkages, with opportunities for small scale entrepreneurs.

In a study of Kenyan SME activities, impacts from energy in two settlements are compared (Kirubi, 2007). One is served by a small-scale diesel driven mini-grid, while the other village is located closer to markets, has superior infrastructure and access to cheaper, more secure energy from the national grid. In the former settlement however, are found evidence of increases in per-worker productivity, daily sales volumes, and gross revenues in carpentry and tailoring enterprises², as well as benefits to agricultural activities and small scale agro-processing businesses. None of these developments were observed in the other location. The author identifies the prime limiting factor as the low levels of agricultural activity and diversity, originating in the second settlement's location in a semi-arid region. Hence, neither the better roads nor the cheaper electricity could outweigh the contextual disadvantage.

Other researchers have arrived at results similar to the above and suggest that access to electricity encourages the modernization of existing rural enterprises, but only exerts modest stimulus for the growth of new enterprises (Rogerson, 1997a). These findings thus suggest that necessary, contextual pre-conditions exist for energy provision to contribute to the development of micro-enterprises.

Meadows and Riley (2003) have reviewed evidence from a variety of countries and do, however, attest to a development-enhancing potential of energy. Causal relationships are often not presented

² An illustrative example from a tailor shop is provided: To iron a man's coat takes 30 minutes with an electrical iron, while with a charcoal heated iron it takes three times as long. In 1.5 hours a pair of men's trousers can be produced. Hence, at a unit price of KSh500 per pair of trousers, the tailor's gross alternative cost is KSh1000 for every three coats ironed with the charcoal iron.

in detail, but examples encompass micro-hydropower contributing to small businesses development in Nepal, security lighting enabling small enterprises to run also in the evening in poor urban areas of South Africa, and reports of power-theft for business purposes by non-metered users in India (Rana-Deuba (2001), Dube (2001), Xavier Institute of Management (1997), Habtetsion and Tsighe (2002)). The Grameen Phone initiative has promoted business activities through the installation of solar systems in rural villages in Bangladesh. These installations have not only created thousands of small mobile phone charging enterprises and enables workshops that repair radios and TVs, operators of solar powered computers, lamp rental agencies, and retail businesses (Bayes, von Braun and Akhter (1999), Barua, 1998). By enabling the use of modern communication devices, energy access also allows rural dwellers access to accurate and current (urban) market prices, the absence of information about which would complicate decision making and have negative impacts on revenue (World Bank (2003), Bhatnagar, Dewan , Torres and Kanungo (2003).

A survey of 2000 households, designed to specifically assess the impact of rural electrification has been undertaken in the Philippines (UNDP/World Bank (2002)). It was discovered that one-quarter of the households with electricity access ran home businesses, compared to roughly fifteen percent among those without. Households with access also operated a larger variety of businesses and spent more time involved in business activities. As a point of interest, agricultural performance was presumably low at the time of the survey, which was conducted during a two year spell of little rain, attributed to the El Niño effect. In summary, from the multitude of results above, it does appear as if electrification has the capacity to stimulate enterprise formation. However, results could be more easily interpreted if detail is provided on the context of studies.

3 South African energy policy

The Republic of South Africa is well-endowed with energy resources. Yet, in many parts of the country, especially in rural areas, energy access is a constraint to the improvement of living standards in the population. Historically, households belonging to the minority white population relied almost exclusively on electricity for their domestic energy needs. The black majority, to a larger extent confined to destitute rural areas, relied on inferior and inconvenient fuels such as fuelwood, candles, batteries and paraffin.³ Not least for environmental considerations, but also due

³ Household survey data collected in 1993 estimated the total number of households in South Africa to approximately 9 million. Individuals from the white population constituted roughly 12 percent of the total population and 30 percent of

to its potential as a as a catalyst for rural development, electrification of the historically disadvantaged sector, both urban and rural, became the preferred policy option (Mandhlazi, 2001).

Already in 1991 the last government of the apartheid era initiated the “Electricity for all” program”. By 1993 approximately only 3.7 million households were electrified, mostly in cities and towns close to the established electricity grid. A further boost to the electrification came from the new, democratic government’s endorsement of the National Electrification Program. These initiatives increased the number of electrified households to 6.4 million in 2002 approximating, a good 70 percent of the population. Yet, many households, especially in rural areas, remained unconnected (South African Government, 1998, 2001, 2003)).

Through the national government’s White Paper on poverty alleviation, the government is committed to free basic services for poor households. Free basic electricity was launched in 2003, providing poor households the first 50 kWh of electricity consumed per month for free. The allocation was deemed sufficient to provide poor households with the basic levels of lighting, TV, radio, ironing and cooking. (South African Government, (2003))

In the area of economic growth and improved productivity, it was initially thought that the provision of electricity would enhance these factors. With respect to the NEP’s impact on economic development, the government recognizes that electrification is simply one promoting factor. Factors such as business skills development, financing availability and access to markets are more fundamental to business development. Yet certain businesses depend crucially on electrification, and many others benefit.⁴

In order to achieve greater impact on economic development a need has been recognized to coordinate efforts between organisations responsible for, for instance, electrification, capacity building, and finance provision (South African Government, (2001)). One ambition to the latter end is the incorporation of energy plans in all rural municipalities compulsory Integrated Sustainable

the urban. Out of the rural population more than 95 percent belonged to the African population group (Southern Africa Labour and Development Research Unit, 1994).

⁴ Examples of benefits provided by Foley (1990) and Borchers and Hofmeyr (1997) are that workshops are able to use electric tools, hair salons can use electric clippers, shops can install effective electric refrigeration and supply an increased range of goods. Electric lighting enables businesses to stay open longer and bars can obtain video or TV entertainment as well as offer refrigerated drinks.

Rural Development Strategies. Hence, energy policy has been and still is assigned high priority at all levels of government in South Africa.

4 SMEs in South Africa

South Africa's Small, medium, and micro- enterprise (SMME) economy has been promoted by policy since 1995. While considerable research has been undertaken, this sector's impacts on poverty alleviation, economic growth, or international competitiveness have not been established. One obvious impediment to the assessment of the informal sector is that it, by definition, largely encompasses activities that are not recorded statistically. Complications in the area of recording may also arise from the apartheid legacy, since members of the black population would be prosecuted if involved in such activities.

The apartheid legacies impede also the scaling up of informal activities, since the modern and informal sectors are distinguished not only by differing productivity levels, but also divided along racial lines, with few cross-linkages between the sectors. The historically poor schooling facilities available to the previously disadvantaged population groups, in conjunction with the prior suppression of entrepreneurial activities, have also yielded low levels of education, training, and experience in the informal sector.⁵ Among investigators, consensus seems to be that in comparison with many other developing countries, the contribution of South Africa's SMMEs to employment and economic growth is low (Berry *et al* (2002)).

Official standards classify South African enterprises as of "micro" size if the numbers of paid employees including the owner are less than six. "Very small" businesses employ six to ten individuals, "small" businesses eleven to fifty, and in "medium" sized business employ from fifty-one up to one or two hundred people, depending on economic sector. The small-, micro- and medium-sized enterprises (SMMEs) are furthermore classified into three other categories depending on their extent of formality: (i) the survivalist enterprises, (ii) micro-enterprises, and (iii) the formal SMME economy (South African Government, 1995).

⁵ These features have given rise to the distinction in South Africa between "established formal SMMEs" and the "emerging SMME economy". Enterprises in the first category are largely in white or Asian ownership and located in the urban, primarily metropolitan areas. In the second category, the enterprises are mostly owned by individuals in the African or coloured population groups and found in urban townships, informal settlements and rural areas (Berry *et al* (2002), Rogerson (1997b)).

The largest component in the South African SMME economy is the “survivalist sector”, at an estimated 2.5 million enterprises, comprising roughly 75 percent of all small, micro- and medium enterprise enterprises. Activities in this sector are typically undertaken by unemployed people unable to find regular employment. Incomes usually fall below minimum standards, capital investments are small, skill training is minimal, and opportunities for enterprise expansion are scant. Micro enterprises are “very small”, often involving the owner and some family members. In the absence of licenses and formal premises, and often run with only rudimentary business skills, these firms are considered informal. The third category encompasses “small” and “medium” enterprises. These types of are mostly licensed, owner-managed, and operate from fixed premises. ((South African Government (1995), Rogerson (1997b))

The National White Paper on Small Business sets forth a primary policy objective to create an enabling environment for SMME development. Two specific policy objectives are of particular interest to this study. Firstly is the reduction of inequality in income, wealth and economic opportunities, through “a strengthening of the labour-absorptive process in the micro-enterprise and survivalist segments, the redressing of discrimination with respect to blacks as well as women's access to economic opportunities and power, and the facilitation of growth in black and small enterprises *in rural areas*”. Secondly, in order to create long-term jobs policy interventions are prescribed to upgrade skill levels of SMME operators and to strengthen the use of appropriate *modern technologies* (South African Government, 1995). Thus, this study should be perceived in relation to the facilitation of growth of black and small enterprises in rural areas and to the strengthened use of appropriate modern technologies.

According to Berry *et al* (2002), statistical analysis of South Africa’s SMME sector is rendered very difficult for several reasons. Accurate information regarding the number and size of enterprises is difficult to obtain, especially with respect to the informal activities which dominate the sector.⁶ Comparing different sources, the authors cautiously conclude that “it can probably be said that there are between 650 000 and 2.3 million” SMME firms in South Africa. We attempt to avoid any

⁶ Although the annual review the *State of Small Business in South Africa*, published by the Ntsika Enterprise Promotion Agency (Ntsika), represent an official source of data, the information is not easily usable. Until the year 2000 the reviews contained very comprehensive statistics which were compiled through (often discretionary) extrapolation from a multitude of fragmentary, inconsistent, and sometimes outdated sources. The more cautious line followed since the turn of the millennium has resulted in more general and less comprehensive information. Analyses mostly make reference only to formal enterprises, and no absolute numbers about establishments and employees are published ((Berry *et al*, 2002).

contribution to this confusion by giving a detailed account of the nature of the firms analyzed here. Our definition of an SME is accounted for in the next section, whereas the sizes and revenues of the firms are the first topics of the following section.

5 Data and definitions

The analyses here are based on data from the following seven national surveys undertaken by Statistics South Africa:

- the 1997-1999 October Household Surveys (OHS series)
- the year 2000 combined Income and Expenditure Survey and September Labour Force Survey (IES/LFS), and
- the 2002-2004 General Household Surveys (GHS series).

All surveys were designed to be nationally representative and collected through two-stage sampling procedures. Samples were stratified by population group (race), province, and urban or rural location. In the first stage “enumerator areas” were drawn as Primary Sampling Units (PSUs). In the second, ten households were drawn from each selected PSU. Once the information had been collected, individual elements (households and individuals) in the surveys were attached with a weight, so as to yield nationally representative samples along the three dimensions of stratification. All figures in this study are computed using weights.⁷

Three further features of the sample design are important. Firstly, the sampling procedure does not ensure that households are representative of their enumerator areas. Secondly, the benchmarks for national representation were the three population censuses undertaken 1991, 1996 and 2001. The 1997 sampling frame was designed from the 1991 census, a considerable shortfall of which was that not all non-white areas were visited. Thus, population census figures for many such areas were estimates. In an attempt to improve the 1997 survey data set, the data were at a later stage assigned weights based on the 1996 census. The analogous procedure applies to the 2002 data with respect to the 1996 and 2001 census. Finally, both the latter censuses were also subject to shortcomings information, the details of which are provided in Statistics South Africa post-enumeration reports. As a consequence, trends in the data that span across the whole period should be interpreted with a

⁷ The usage of the (probability) weights maintains households’ relative representativity, even though the weights were designed to yield a representative sample for the whole republic and not for the deep rural areas.

great deal of caution, while those discernible within 1998-2000 and 2003-2004 periods would be more reliable.

All surveys used here collected information on a variety of living standards related subjects, including education, health, employment, and access to services and facilities. However, differing questionnaires and sometimes different definitions were applied across years. The analysis of descriptive statistics is therefore obstructed by the lack of information about some variables in certain years. The multivariate analysis is constrained to definitions that apply across years and will be conducted separately for the years.

Three concepts at the core of this study are the “deep rural areas”, “electricity access” and “involvement in SME activities”. The “deep rural areas” refer to rural, magisterial districts that would formerly have fallen within the boundaries of the apartheid era “self-governing territories” or “independent states”.⁸ Only the General Household Surveys 2002-2004 asked specifically whether households had a connection to the grid. Therefore, a household is considered as having “electricity access” (or “connected”) if it uses grid electricity as its primary energy source for light.⁹

A household is considered involved in an SME activity (or “home business”) if at least one person is recorded as “self-employed”. For a person to be considered self-employed, three criteria were applied. Firstly, the person must meet have met the official self-employment status. Secondly, we deviate from the official definition in that we do not consider domestic workers employed by households self-employed. Thirdly, we required that the self-employment activity was recorded with a three-digit sector classification. The questions from the questionnaires used in each of the years were:

For self-employment status:

1997-1999: “Who does work for? (Someone else/him/herself/someone else and him/herself)”

⁸ In consequence of the 1913 Natives Land Act, the bulk of South African land was reserved for white ownership exclusively. By the same act, Africans were denied rights of residence except during work contracts outside designated “reserves”. When the apartheid program was instituted in 1948, “influx control” into the urban areas of “white” South Africa became even tighter. From the 1960s, Africans were officially considered citizens of the “reserves”, by that time relabeled “tribal areas”, “homelands” or “Bantustans”. Six of those areas were considered “self-governing territories” and four “independent states”. The migration regulations were abolished in 1986.

⁹ Data from detailed South African energy surveys reveal that when households get connected to electricity, even those who cannot afford to use electricity for any other purposes use it for lighting.

2000, 2002-2004: “In the last seven days, did, even for only one hour run or do any kind of business, big or small for himself/herself?”

For international three digit economic sector classification (derived by Statistics SA) from:

1997 -1999: Describe the work.....does/did for him/herself

2000: What is the name of’s place of work?

2002- 2004 What are the main goods and services produced at’s place of work?
What

are its main functions?

The broader employment status definition applied from the millennium shift is unfortunate. As we shall see however, the most dramatic increase in SME activities were in the preceding year 2000. From year 2000 the activity declines. The risk remains that the last four surveys overstate self-employment figures as compared to the first three. On the other hand, many sporadic activities may be precluded by a reasonable notion of ‘running or doing *business*’ in the respondent alongside the requirement to specify “goods or services” produced at a “place of work”.

6 SMEs in the context of electricity and telephone access in the deep rural areas

In this section we shall first study the characteristics of the firms under investigation. Thereafter we acquire an impression of the association between increased electrification, telephony access and SMME uptake. With reference to the discussion in Section 3, we continue by exploring whether contextual factors could differ between connected and non-connected households. In the third subsection we therefore analyze the process by which electrification takes place. If electrification takes place sequentially at an area level and if electrified areas share other characteristics that affect SME performance, one would wish to control for such characteristics in a multivariate setting. The fourth subsection therefore studies a broader set of living standards characteristics among connected and unconnected households. Finally, it could be argued that SME operators are more prevalent among electrified households by virtue of a higher income, in which case causality runs *from* SME operation *to* the acquisition of an electricity connection. The analogous line of reasoning applies to telephone ownership. Based on the only data set that allows such analysis, we study the place of SME operators in the household the per-capita income distribution of the deep rural areas in 2000.

Characteristics of SMEs in the deep rural areas

The number of employees in an SME determines the official SMME category into which it falls. Table 1 contains the figures from the surveys that enquired into the number of employees in home

businesses. As opposed to the IES/LFS 2000, the OHS series distinguished between paid and unpaid employees. With the exception of year 2000 less than five percent of the firms engage five persons or more, and less so for paid employees. Hence, the vast majority of firms appear to fall into the *micro firm* category. A share of at least 10-15 percent enroll one to three unpaid employees, which if family members would further support the application of the same official firm definition.

Table 1) Distribution of enterprises by number of employees

Number of employees including owner	Paid employees			All employees			
	1997	1998	1999	1997	1998	1999	2000
1	80.7	87.5	86.7	73.4	78.5	68.2	67.1
2	8.5	5.5	7.3	11.1	8.2	14.9	n.a.
3	6.3	2.6	3.8	8.0	5.5	6.7	n.a.
4	0.5	1.5	0.4	2.6	2.6	4.5	20.8*
5 or more	4.1	2.9	1.8	4.9	5.2	5.7	12.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n	588	463	865	588	463	865	937

* The fraction represents the share of firms with 2-4 employees. IES/LFS 2000 only provided categorical information.

The figures in Table 2 show the types of activities pursued for each year. The vast majority of firms are engaged in Retail and Wholesale trade. Taking the figures at face value, the fraction of such firms has increased from roughly one-half at the beginning of the period, to approximately two-thirds towards the end. The second largest category, at around one-tenth in five out of the seven surveys is Manufacturing. Further, the share of SMMEs involved in Construction appears to have shrunk from one-tenth to roughly half the size, while the share of Transport, storage and communication firms remain steady around five percent. Also Other services appears stable, in the neighbourhood of seven to nine percent. The last three surveys capture very small fractions of primary sector activities, while with the exception of 1999 its share was on average eight percent in the other surveys.

Data for “income or turnover before [the owner’s] expenditures” is only readily available in the OHS 1997 and the GHS data. As can be seen in Table 3, less than five percent in any of the samples are in the category above R 11 000 that turnover-wise would reach the defining limit for “very small” businesses at R150.000/year. It is worthwhile to notice that between 1997 to each of the other survey years in Table 3, the South African “Consumer Price Index for Metropolitan and Other urban areas – FOOD index” had risen by respectively 47, 59 and 62 percent (Statistics South Africa,

2007). From the figures in Tables 1-3 we proceed with the notions that (i) the overwhelming majority of the businesses under analysis are micro-firms – possibly to a large extent survivalist activities – which (ii) mostly employ one person, with (iii) a majority of enterprises in Retail and Wholesale activities.

Table 2) Distribution of firms by broad economic sector

Sector of self-employment	1997	1998	1999	2000	2002	2003	2004
Primary sectors	7.8	9.6	21.4	8.0	2.6	1.8	2.2
Manufacturing	10.7	6.7	7.5	13.5	12.2	11.0	13.3
Construction	12.6	10.0	9.6	5.2	5.4	7.4	6.1
Wholesale & retail trade	53.9	61.9	51.4	59.1	66.3	65.7	66.4
Transp. storage & comunctn	6.1	4.4	4.2	5.1	5.0	6.0	5.0
Other services	8.6	7.1	6.0	8.8	8.4	7.8	6.9
Other	0.4	0.2	0.0	0.3	0.2	0.2	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n	588	463	865	937	763	633	733

Table 3) Distribution of 1997 firms by monthly turnover

Turnover categories in running Rand	Fraction			
	1997	2002	2003	2004
0	0.9	1.4	2.7	2.2
1 - 200	13.2	27.1	23.8	19.2
201 - 500	22.7	30.8	29.4	31.6
501 - 1000	21.5	17.9	21.0	20.5
1001 - 1500	11.7	7.1	8.2	8.1
1501 - 2500	12.9	7.1	7.7	7.8
2501 - 11000	14.9	4.9	4.7	6.1
11001 - 16000	2.2	3.9	2.6	4.5
Total	100.0	100.0	100.0	100.0
n	544	530	443	542

The association between electricity access and SMME uptake

The increased access to modern technologies at the core of this study is illustrated in Table 4. For the period under analysis the figures suggest that:

- The estimated number of households increased by one quarter. The cross-section survey nature of the data is typified by lower figures than the preceding year in 1998 and 2000.
- Electrification rates have practically doubled from 30 to 60 percent.
- Access to telephones has increased from less than three percent to more than forty, largely due to the spread of cellular telephones. Indications of increasing upsurges in access rates are found in the 12 percentage points increase between the two years of 2000 and 2002 and the one-year interval 2003 to 2004.
- The fraction of households with access to both electricity and a telephone has increased from less than two percent to more than a quarter.
- The rate of telephone access is approximately twice as high among electrified households as among non-electrified throughout the period.

Table 4) Electrification and telephone access rates 1997 - 2004

Year	1997	1998	1999	2000	2002	2003	2004
No of households (thousands)	2 416.3	2 249.5	2 635.7	2 508.0	2 907.5	2 986.0	3 004.3
Service access							
Electricity	30.6	31.6	39.6	42.0	54.4	57.6	60.7
Telephone	2.7	4.4	7.2	15.2	27.1	30.1	42.0
<i>out of which cellular (%)</i>	36.2	64.3	<i>n.a.</i>	63.4	91.6	95.4	97.8
Electricity and telephone	1.9	2.6	4.3	9.7	18.6	20.4	28.3
Phone connection							
Electrified	6.1	8.3	10.8	23.0	34.2	35.4	46.7
Non-electrified	0.9	2.7	3.7	7.3	12.8	16.3	25.1

In Table 5 we turn to the parallel increase in SME activities in various categories of households. With respect to the general scenario, the estimated number of enterprises more than doubled between 1997 and 1999. The number peaked at some 370 000 firms in 1999 after which it dropped by roughly 15 percent, and only returned to the 1999 level in 2004. The fraction out of all households that operate SMEs – the uptake rate - increased from just below seven percent in 1997 to a good 12 percent in 2004. With a peaked at 14.4 percent in year 2000 the uptake rate otherwise follows the trend of the absolute number of SMEs.

Table 5) SME activities and uptake rate according to access to electricity telephony, 1997-2004

Year	1997	1998	1999	2000	2002	2003	2004
SMEs number (thousands)	159.7	205.3	372.0	363.8	344.8	304.9	369.5
SME uptake rate among households							
All	6.6	9.1	14.1	14.4	11.9	10.2	12.3
Electrified	8.3	10.3	15.6	17.5	13.8	11.1	13.9
Non-electrified	5.8	8.6	13.1	12.3	9.6	9.0	9.8
<i>With:</i>							
Telephone access	14.6	16.3	18.7	24.9	20.0	15.4	17.4
No telephone access	6.4	8.8	13.8	12.8	9.2	8.2	9.2
n	8 690	4 763	6 100	6 405	6 285	6 331	6 212

Turning now to the impact of access to electricity and telephony, in Table 5, the SME uptake rate is consistently higher among electrified households than among non-electrified. The same holds true to an even greater extent among households with a telephone compared to those without. With the exception of households with a telephone, the uptake rates in all categories follow a trend similar to that of the allover rate. The absence of a corresponding a trend in the two access rates (in Table 4) suggests that the fluctuation in SME activity reflects the global business cycle, rather than an altered survey design due to the new census 2001 reference point. Among households with a telephone, the largest increase in SME uptake took place between 1999 and 2000. The consecutive relative downturn of SME activity in this category is greater than in any other group. At the end of the period its uptake rate is also furthest from a recovery to its 1999 level. This category's deviations from the general trend are consistent with a greater sensitivity among its types of activities to the world business cycle and/or with reduced comparative advantages due to the rapid expansion of telephony access.

Electrification as an area level phenomenon

In South Africa the first 50 kW/h of electricity consumption per month is free and no charge is associated with a connection to the grid. Hence, it is reasonable to assume that most households choose to connect when the national grid has been extended to their area of residence. If this assumption holds true, electrification is not only as a household level decision, but also affected by the order of prioritization of different areas. Further, if areas that have been highly prioritized share *other* characteristics, which are beneficial to SME activities, the latter may contribute to the greater SME activity among electrified households. Examples of the latter type of characteristics could be better infrastructure or greater access to other public services in the more swiftly connectable areas.

In the applied sampling procedure, a cluster of ten households were drawn from each PSU (“magisterial district”) regardless of its true population size. In Table 6 we have categorized all clusters according to the electrification rate among its households. Since inference cannot be from the households in a cluster to population-level PSU characteristics, the figures in the table are not adequate reflections of true electrification levels. However, it is clear that the doubled general electrification rate, during the period under analysis, is associated with a trebled sampling of fully electrified clusters. Furthermore, an increase by two thirds can be observed for clusters with less than 100 percent of households but more than two-thirds connected. These observations are consistent with the notion that households do connect en masse, area-wise and precaution is warranted with respect to area level characteristics.

Table 6) Distribution of sampled PSU-clusters by connection rate and year

Cluster connection rate	1997	1998	1999	2000	2002	2003	2004
0	40.1	45.5	41.0	36.2	29.4	27.2	24.9
1 - 33%	17.3	11.6	9.5	9.5	6.1	5.8	4.6
33 - 66%	15.7	9.2	13.1	14.4	10.7	9.0	9.0
67 - 99%	16.8	20.8	21.4	25.5	26.7	28.2	28.8
100%	10.1	12.9	15.1	14.5	27.1	29.8	32.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n	695	481	697	697	701	702	698

Table 7 displays households’ access to various appliances, to a private water tap, and to types of housing according to electrification status. The observed higher prevalence radios and television sets among connected households may be explained by their more convenient operation with grid electricity. Also, the utilization of electrical pumps for water distribution could explain the more frequent access to private water taps among electrified households. However, no obvious electrification related reasons exist for the more common ownership of motor vehicles or brick houses among the connected. Vice versa applies for a higher prevalence of traditional dwellings among the unconnected. Hence, it appears as if living standards differ in several ways between connected and unconnected households. Based on the analysis of Table 6, those differences could apply also on a location level.

In the 2002-2004 surveys, households were asked about their preferred means of transport and their travel time to the nearest medical clinic and post offices. Answers for each type of transport were coded into various time intervals. Based on those questions, Table 8 provides further substantiation

of contextual variations among connected and unconnected households. The table is divided into separate sections for access to clinics and to postal offices. For each facility, the table contains the modal time-interval (with the highest fraction of observations), for those preferring to walking and for those traveling by minibus. Alongside the travel time is displayed the share of the unconnected or connected households associated with each modal interval. (The figures summarize Table A3 in the Appendix.)

Table 7) Asset ownership among connected and unconnected households

Asset	Connection status	Year						
		1997	1998	1999	2000	2002	2003	2004
Radio	Connected			82.4	80.7	77.2	78.4	80.2
	Not connected			70.5	63.7	65.8	62.5	65.0
TV	Connected			54.8	53.3	51.4	51.3	52.7
	Not connected			20.2	14.9	13.4	13.6	12.9
Motor vehicle	Connected			14.0	8.9	11.4	10.9	9.7
	Not connected			6.0	3.9	3.7	3.3	2.7
Own water tap	Connected	37.8	33.0	34.9	36.0	34.4	30.4	30.2
	Not connected	10.8	9.8	12.1	11.1	10.6	11.6	12.8
Brick house	Connected	72.7	73.9	72.5	69.7	68.7	71.4	68.1
	Not connected	48.8	47.3	42.3	40.3	37.7	41.4	33.7
Traditional dwelling	Connected	20.2	16.2	14.6	17.0	19.3	19.4	23.6
	Not connected	45.3	43.0	44.0	43.6	49.9	48.3	59.3
n		8 690	4 763	6 100	6 405	6 285	6 331	6 212

Table 8) Modal traveling times to public facilities by foot or minibus taxi, by households connection status 2002–2004.

Year	Means and time of transport to clinic								Sample size	
	Walking				Minibus taxi				Not connected	Connected
	Not connected		Connected		Not connected		Connected			
Modal travel time (min.'s)	Modal sample fraction	Modal travel time (min.'s)	Modal sample fraction	Modal travel time (min.'s)	Modal sample fraction	Modal travel time (min.'s)	Modal sample fraction			
2002	> 44	15.9	15-29	21.6	> 45	14.0	15-29	12.6	2598	3745
2003	> 44	16.8	15-29	23.5	> 45	14.1	15-29	12.4	2605	3746
2004	> 44	20.4	15-29	22.6	> 45	10.9	15-43	19.7	2334	3921
	Means and time of transport to post office								Sample size	
	Walking				Minibus taxi				Not connected	Connected
	Not connected		Connected		Not connected		Connected			
Modal travel time (min.'s)	Modal sample fraction	Modal travel time (min.'s)	Modal sample fraction	Modal travel time (min.'s)	Modal sample fraction	Modal travel time (min.'s)	Modal sample fraction			
2002	< ¼	11.2	<½	14.1	> ¾	30.0	¼ – ¾	36.6	2513	3860
2003	< ½	15.1	¼ – ½	16.1	> ¾	27.9	½ – ¾	16.5	2597	3766
2004	¼ – ½	7.6	¼ – ½	16.1	> ¾	21.3	¼ – ¾	32.3	2418	3916

Accordingly, among the unconnected households that preferred to walk to the clinic – in the upper left half of the table – 15.9 percent of the sample in 2002 used more than three-quarters of an hour. In the very bottom right half of the table can be seen that, in 2004, 32.3 percent of the connected households used between one-quarter and three-quarters to reach their *post office* by *minibus taxi*. With respect to clinic access, the table can be summarized by roughly 30 percent of the unconnected sample using more than three quarters of an hour, when adding the two categories of transport. A similar fraction of connected households used fifteen minutes to half an hour. Access to post offices is not as swiftly summarized. However, among minibuses users modal transport times appear shorter and associated with larger sample fractions among the connected. In summary, the generally longer modal travel times for unconnected households are consistent with some greater extent of remoteness of unconnected areas. Taken together thus, the findings in Tables 6-8 suggest that higher cluster-level electrification rates may be associated with higher material living standards and easier access to public facilities. Taken together the findings thus serve as our justification to use cluster electrification rate as a proxy for location specific circumstances in multivariate analyses.

Relative income levels, SMEs and access to electricity or telephony

Implicitly this study assumes that causality runs from access to electricity or telephony to SME operation status. However, the greater uptake rates among households with such access could also be explained by a greater wealth among SME-operators which permits their acquisition of electricity (beyond the free basic) and telephones. The only survey which provides information of income in continuous format is the IES/LFS 2000 survey. In Table 9 we have devised the deep rural households' per-capita income quintiles. By the quintile cut-off points we thereafter define 5 brackets by which we derive an impression of where different categories of households fall in the income distribution.

Figures based on the full deep rural sample are found in the upper half of table 9 and the lower half displays SME-operators. The first points of interest are found in the first two columns of figures. If the 14.4 percent of households that run home business were income-wise distributed as the whole sample, one-fifth of the group would be found in each income bracket. This is however not entirely the case. Households with home business are slightly over-represented in the highest brackets (4 and 5). In the second column are found the running Rand median incomes in each income bracket and for the two respective samples. As can be seen, the median incomes of SME operators follow

that of the all-over sample closely. Hence, the small extent of over-representation in the higher income brackets would not readily warrant a categorization of SME operators in 2000 as generally in a relatively better position to afford electricity or telephony.

Table 9) Per-capita income distribution in the deep rural areas, in the full sample and among SME operators, with categories according to electricity and telephone access.

All households	Percentage frequency	Median monthly income	Access		
Income bracket			Electricity	Telephone	Neither
1	20.0	62	13.3	6.8	26.1
2	20.0	117	16.9	13.2	22.7
3	20.0	180	20.1	14.6	20.0
4	20.0	285	23.7	22.1	17.7
5	20.0	640	26.0	43.3	13.4
All	100.0	180	100.0	100.0	100.0
Total sample fraction	100.0		13.9	42.0	53.8
SMEs	Percentage frequency	Median monthly income	Access		
Income bracket			Electricity	Telephone	Neither
1	18.4	61	14.0	8.2	25.7
2	16.3	118	12.1	7.8	21.3
3	20.6	183	19.7	18.3	20.8
4	21.6	290	24.0	24.1	19.3
5	23.1	620	30.2	41.6	12.9
	100.0	200	100.0	100.0	100.0
Total sample fraction	14.4		7.3	3.4	7.3

In the three rightmost columns in the upper half of Table 9 are found the distribution of households according to their access status. Households with access to electricity are over-represented in the higher brackets to an extent that exceeds the SME operators. The same is true for owners of telephones in year 2000. In the latter category more than 40 percent are found in the top bracket. The distribution of households with access to neither telephony nor electricity is more or less the inverse of those with electricity access. All though containing very similar trends, the shaded figures in the corresponding access-categories for SME operators are based on very small sample fractions. We therefore refrain from their interpretation. In conclusion, the figures in Table 8 are not inconsistent with a flow of causality from service access to SME operator status.

7 Theoretical considerations

The empirical objective of this study is to assess whether access to grid electricity or telephony can explain households' involvement in SME activities. The objective can be obtained through the application of multiple regression analysis which allows us to account for the (linear) influence of

other relevant household level characteristics. The value of the information attained by such a investigation depends on how well the household's firm-operation decision is modeled. In reality a household's enterprise operation status may be affected by several (more or less interlinked) relationships. From a methodological viewpoint, the estimation of a structural model, which specifies all conceivable links between a household and home business activity, would be the most preferable approach. A structural specification would involve equations for e.g. labor force participation, fertility, earnings and saving functions, and household production functions. Theoretical guidance exists for the formulation of models that represent such relationships *individually*. However, existing theory does not prescribe how such linkages may be *combined* into an adequate system for our purposes. We are therefore confined to a reduced form estimation. The ambition of such an approach is to regress our dependent variable on presumably exogenous, explanatory variables which as much as possible capture the structural relationships.

Some guidance as to which variables to include, may be found in studies conducted on in a developing country context on labour force participation, employment, and earnings. A healthy working-age adult's *non-participation* in the labour force is usually assumed to be an outcome of premeditated choice. As pointed out by Sahn and Alderman (1988), an estimated probability of labour force participation is often interpreted as the probability that labor income (or expected net income from self-employment) exceeds an individual's reservation wage. That reservation wage may be subject to influence from *inter alia* household composition variables, such as the age and number of children in the household. Presumably the relationship between the number of children in the household and the amount of non-employed household labor available to assume e.g. child care responsibilities, would also affect the participation decision. Hence, household size and fractions of children will enter as explanatory variables, juxtaposed to the fractions of unemployed and inactive, adults not employed in the home business.

Studies of employment and earnings in South Africa identify determinants of employment among age, experience, gender, education, marital status, and race (Mwabu and Shultz (2000), Naudé and Serumaga-Zake (2001)). The access to financial resources could be invested and instigate home business activities. Several sources of financial capital for small scale business may originate in the South African social security system, with support programs to cover e.g. old age (pension), disability (grant), child support, care dependency, foster care, and social relief. Households' access

to these grants will be included in the empirical specification since they may affect both reservation wages and investment decisions.

Finally, a reduced form model for Philippine households' home business operation was estimated by UNDP/World Bank (2002). In that investigation it was shown that, in addition to electricity access, the age, gender and education characteristics of the household head was associated with home business activities. Also, the number of school age children increased the likelihood of starting a home business. As justified by the descriptive investigation, we account for the influence of contextual factors by including the cluster level electrification rate as a proxy for such influences.

8 Empirical approach

In this study we will apply a logit regression method to the survey data from each year and to pooled data sets for the whole time period, for the years 1998–2000, and for 2003-04. We conceive of SME operation as a dichotomous phenomenon. Our dependent variable therefore takes on the value 1 for households that operate SMEs and 0 for those that do not. With several continuous and categorical (dummy) explanatory variables, the generalized form of the regression model we wish to estimate becomes:

$$\log\left(\frac{P_i}{1-p_i}\right) = \beta_0 + \sum_j \beta_j X_i + \sum_k \beta_k D_k + \varepsilon_i$$

Where P_i is the probability of that given household (i) operates an SME, X_j is a continuous variable reflecting some characteristic of the household. D_k is a categorical (dummy) variable taking on unity value if household i belongs to category k , and ε_i the error term. The dependent variable is the logarithm value of the odds ratio in favor of a household operating an SME. For continuous variables, an estimate reported (in Table 11 below) is for the elasticity of the odds ratios with respect to the variable. For categorical variables the reported value represents the *ceteris paribus* ratio of the predicted value of the dependent variable for observations with $D_k = 1$ as compared to that of $D_k = 0$. Hence, a reported coefficient of 2 implies that the *ceteris paribus* odds ratio is twice as high for observations with $D_k = 1$ compared to those for which $D_k = 0$.¹⁰

¹⁰ It is important to be aware that a given change in the odds ratio translates into differing absolute changes in probabilities depending in the absolute size of the odds. The output in the format used here provides no information on absolute odds.

The explanatory variables in our specification are listed with their mean values for each year in Table 10. The variables encompass dummy variables for female working-age and elderly household heads. Working age is 15-59 years for women and 15-64 for men, above which the definition of “elderly” applies. The household head’s education is captured by dummy variables for primary education, incomplete secondary, and complete secondary education or more. The left-out category is “no education”. Household demography is represented with the discrete household size and continuous variables for the shares of for children in age-categories 0-7 and 8-14 years old out of total household size. Similar shares are computed for non-head working-age adults by gender categories for and by educational categories corresponding to those applied to the head. Shares of elderly household members constitute the base category. Adults not employed in a home businesses are captured by their fractions in employment status categories, with unemployed left-out. Access to electricity and telephony are represented by dummy variables and contextual influences proxied by bundle’s electrification rates. Finally, three dummy variables respectively indicate whether anyone in the household receives old age pension, a disability grant or a child maintenance grant.¹¹

9 Multivariate analysis

Parts of the output from the regression analyses are found in Table 11, which contain estimates that were statistically significant at the 10 percent level or higher. (More detailed regression outputs are found in Tables A1 and A2 in the Appendix). From left to right the output is derived from the analyses undertaken on the pooled samples and each of the years in chronological order. All specifications explain in the vicinity of 25 percent of the variation in their samples. Five variables have significant estimates in all regressions; those for elderly household head, household size, the fractions out of household size of non-head adults with secondary education, the shares of adults not involved in SME activities by both variables for labour market status and the dummy variable for telephone access. In addition to these, significant estimates are returned in all regressions except one for four variables; working age female heads, the share of male and of primary educated non-head adults, and reception of old age pensions.

¹¹ As a point of interest, in addition to the two access variables, the mean values of the two disability and child maintenance grants display the most distinct changes over time.

Table 10) Mean values of explanatory variables

Mean values of explanatory variables								
Years		1997	1998	1999	2000	2002	2003	2004
Number of observations		8 690	4 763	6 100	6 405	6 285	6 331	6 212
Explanatory variable		Mean value	Mean value	Mean value	Mean value	Mean value	Mean value	Mean value
Head	Working age female (dum)	0.375	0.361	0.350	0.343	0.332	0.352	0.347
	Elderly (dum)	0.313	0.303	0.285	0.306	0.275	0.282	0.282
	Primary schooling (dum)	0.422	0.432	0.460	0.457	0.446	0.426	0.433
	Some 2:ndary school (dum)	0.126	0.128	0.128	0.129	0.191	0.213	0.222
	Compl 2:ndary /more (dum)	0.072	0.063	0.050	0.086	0.047	0.050	0.045
Demography	Household size (discr)	5.44	5.30	5.11	4.81	4.629	4.582	4.74
	Sh. 0 – 7 yrs old (%)	19.25	18.43	14.97	15.78	15.01	14.79	16.52
	Sh. 8 – 14 yrs old (%)	18.97	19.72	18.17	17.68	16.20	16.66	16.27
Adults other than head	Sh. female adults (%)	19.60	19.18	19.69	17.90	17.84	18.20	17.53
	Sh. male adults (%)	13.90	12.84	14.44	13.38	13.24	13.36	13.84
	Sh. Primary school (%)	36.96	38.55	52.62	53.40	32.80	29.79	29.64
	Sh. incompl. 2:ndary (%)	27.75	25.74	29.73	28.46	24.74	27.72	28.74
	Compl 2:ndary /more (%)	9.53	8.24	10.24	13.31	10.68	12.11	12.09
Non-SME labour force	Sh. employed (%)	13.20	12.75	16.21	26.15	21.79	18.90	19.05
	Sh. non-participants (%)	71.07	65.68	59.45	50.85	54.11	57.74	57.07
Access	Electricity (dum)	0.306	0.316	0.396	0.420	0.544	0.575	0.606
	Telephone (dum)	0.025	0.045	0.065	0.139	0.244	0.273	0.382
Context	Cluster electricf rate (%)	33.24	31.62	39.64	42.12	54.47	57.59	60.66
Social welfare	OAP (dum)	0.366	0.305	0.284	0.310	0.299	0.304	0.300
	Disability grant (dum)	0.037	0.035	0.032	0.047	0.050	0.075	0.106
	Child maintnce grant (dum)	0.006	0.009	0.008	0.048	0.139	0.269	0.404

Table 11) Significant parameters from logit regressions on all samples

Logit regressions applied to all samples – estimates significant at 10% level or higher											
Dependent variable SME activity											
Years	Pooled	Pooled	Pooled	-97	-98	-99	-00	-02	-03	-04	
	97-04	98-00	03-04								
Number of observations	44 786	17 268	12 542	8 690	4 763	6 100	6 405	6 285	6 331	6 212	
Pseudo R ² +	0.2584	0.2662	0.2362	0.2888	0.2410	0.2713	0.2992	0.2582	0.2321	0.2418	
Log likelihood	-11805.03	-4830.48	-3370.56	-1504.34	-1104.32	-1809.13	-1858.6	-1697.54	-1602.25	-1756.17	
Explanatory variable	Signf est	Signf est	Signf est	Signf est	Signf est	Signf est	Signf est	Signf est	Signf est	Signf est	
Head	Working age female (dum)	0.713***	0.743***	0.697***	0.469***	0.736 **	0.526***		0.778**	0.699**	0.689***
	Elderly (dum)	0.252***	0.231***	0.278***	0.191***	0.316***	0.268***	0.141***	0.249***	0.305***	0.258***
	Primary schooling (dum)	0.884 *	0.822**						0.723***		
	Some 2:ndary school (dum)	0.751***	0.737**					0.601***	0.643***		
	Compl 2:ndary or more (dum)		0.738*					0.689*			
Demography	Household size (discr)	1.143***	1.148***	1.136***	1.143***	1.140***	1.089***	1.201***	1.115***	1.119***	1.149***
	Sh 0 – 7 yrs old (%)				1.017***						
	Sh 8 – 14 yrs old (%)						1.008**		1.006*		
Adults other than head	Sh female adults (%)	1.017***	1.019***	1.018***	1.031***		1.024***	1.022***		1.018***	1.019***
	Sh male adults (%)	1.014***	1.017***	1.013***	1.031***	1.010*	1.021***	1.018***		1.016***	1.011**
	Sh Primary school (%)	1.006***	1.006***	1.004**	1.006***	1.012***	1.003**	1.004***	1.010***	1.005**	
	Sh incompl 2:ndary sch (%)	1.006***	1.004***	1.005**	1.008***	1.008***	1.004***	1.003 **	1.010***	1.005**	1.005*
Non-SME labour force	Compl 2:ndary or more (%)	1.004***				1.007 **			1.011***		
	Sh employed (%)	0.955***	0.952***	0.960***	0.945***	0.958***	0.941***	0.953***	0.955***	0.962***	0.958***
Access	Sh non-participants (%)	0.964***	0.961***	0.967***	0.957***	0.962***	0.961***	0.960***	0.966***	0.968***	0.967***
	Électricity (dum)	1.458***	1.552***	1.479***		1.535*	1.565**	1.570***			1.624**
Context	Telephone (dum)	1.981***	2.148***	1.830***	1.941***	2.472***	1.410*	2.223***	2.299***	1.843***	1.821***
	Cluster electrif. rate (%)	0.997***	0.996***			0.996***	0.996*				
Social welfare	Old Age Pension (dum)	0.581***	0.643***	0.525***	0.428***	0.391***	0.615**		0.719*	0.465***	0.570**
	Disability grant (dum)	0.733***	0.915***	0.571***	0.345 **		0.940**			0.468***	0.631*
	Child maintnce grant (dum)	1.166 **	1.412 **	1.231**				1.357**	1.398***	1.299*	
Trend	(discr)	0.981***	1.277***	1.170**				n a.			

Significance levels are based on standard errors that take the clustered and stratified nature of the sample into account.
 Symbols: ***/ ** / * Estimate significant at the 1% /5% / 10% level. Estimates in **bold** are significant everywhere. Estimates in *italics* significant all but one year. + Pseudo R2 derived through an ordinary logit estimator applying probability weights.

Taking the estimates at face value and in coarse summary across specifications, the estimated impacts are that the odds ratio is reduced if the head is female or above working-age, by respectively some 25-30 (up to 50) and 70-85 percent. For each additional household member the odds ratio increases in the neighbourhood of 10-15 (up to 20) percent. Each additional percentage fraction of non-head males in the household (accumulatively) increases the odds ratio by roughly one to two (up to three) percent. One-percent increases in fractions of non-head adults with primary or secondary education similarly increase the odds ratio by 0.3-1.0 (up to 1.2) percent. Considerably stronger impacts are found from similar increases of the shares of adults not employed in a home-business, who are in the unemployed or in the not-participating labour force categories. The incremental presence of such adults reduces the odds ratio by 3.5-4.0 percent (up to 5.9 in the case of unemployed), for each percentage point they constitute out of the total. Finally, the remaining demography related impact is the negative estimates from reception of old age pensions, which are typically 30 to 50 (up to 61) percent.

Of particular interest to this study, the estimated increase of the odds ratio from phone access is usually in the range of 80 – 130 percent (down to 41 percent and up to 147 in individual regressions). In the pooled regressions the corresponding range is 83-115 percent. The pooled regressions also all return positive, significant estimates for electricity access in the range of 45-55 percent. The latter are supported by significant estimates at the upper end of the same range, for four out of the seven regressions on data for individual years. In two of the pooled regressions increasing electrification rates (representing influences from a more developed context) are associated with miniscule negative impacts in on the odds ratios. Returning to the demographic impacts, in the pooled regressions increasing shares of adult females are associated with factors that increase the odds-ratio by at least as much as do increasing shares of adult males. Further, the reception of a disability grant reduces the odds-ratio, possibly due to its increasing uptake and impact towards the end of the period at which it was made legible to HIV/Aids infected individuals. The reception of a child maintenance grant however, increases the ratio by 17 to 40 percent in the pooled regressions.

10 Conclusions

Through the analysis of seven years of household survey data, we have studied rural South African households' involvement SME activities. The enterprises appear to be small, often in the retail sector, and yielding incomes that render the per-capita income distribution of home business operators similar to the overall distribution in the deep rural areas. We have observed doubling numbers both of households that run home business and of households with electricity access as well as a 14-fold increase of households with a telephone, very much due to the spread of cellular phones.

Descriptive analysis has shown that home businesses are considerably more prevalent among households that own a telephone and among households with electricity access. In South Africa, the first 50 kWh of electricity consumption per month is free of charge for poor households. As an outcome of the two-stage sampling procedure, we observed that the doubled electrification rate during the period is associated with a trebled first-stage sampling of fully electrified clusters of ten households. While not representative of actual area-level electrification rates, the latter finding justifies our consideration of electrification also as an area level phenomenon, especially in light of the “free basic” electricity policy.

Further descriptive analyses suggest that electricity access is associated with income levels that in general are not much higher than other households'. However, grid access is associated with contextual advantages such as more frequent access to private water taps, residence in brick houses, and shorter travelling times to public facilities. Based on these we proceed to control for contextual factors in the consecutive multivariate analysis, applying cluster electrification rate as a proxy variable.

Conceive of households SME operator status as a binary phenomenon and we have applied a multivariate logit regression specification to three pooled data sets and to each of the seven annual data sets. In addition to variables which capture access to electricity, access to telephony and the context proxy variable, we include several demographic variables that would be associated with households' decision to operate SMEs. According to the regression estimates in all analyses, access to telephone is positively associated a household's home business activity, also when accounting for linear influences from other variables. In the pooled samples as well as in four of the single-year

samples, access to electricity is associated in the same manner, although of distinctly lesser magnitude.

To summarize, out of the multivariate analyses, a picture emerges of SMEs as typically operated by male headed households, that are larger than average size with greater numbers of adults, possibly of young working age due to an association with higher levels of education in non-head adults. Home business households are however less likely to host large fractions adults who are not employed in the SME and either unemployed or non-participating. Negative associations with old age pensions and disability grants in SME operating households suggest that such grants may not be a common source of financial capital. The opposite may however be the case of child maintenance grants. The access to telephony appears to be associated with a considerable advantage in running home businesses, as does electricity, although to a lesser extent and with somewhat lesser certainty. Contextual influences are small and, somewhat surprisingly, negative. These may suggest that the comparative advantages of being e.g. electrified or owning a telephone may be lesser in more developed areas.

Many energy services that are useful for home retail businesses can be derived from other sources than grid electricity, which admittedly may be more expensive or less convenient. (Even the charging of cell phones may take place at many bending points for airtime or through for instance diesel driven generators.) However, substitutes to communicating by telephony would be telegrams, letters, travelling for face-to-face interaction, or accessing relevant information through public sources. In comparison, the advantages associated with especially cellular telephones in terms of speed, convenience, financial and exclusivity of communication for business operators are thus obvious. Hence, one would expect greater impacts from telephony access than from grid electricity for retail businesses. The results in this paper are consistent with these intuitions.

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Appendix

Table A1) Detailed output from logit regressions applied to pooled samples

Logit regressions: Out put from applications to pooled samples				
Dependent variable: Household SME activity				
Years		1997-2004	1998-2000	2003-2004
Number of observations		44 786	17 268	12 542
Pseudo R ² +		0.2584	0.2662	0.2362
Log likelihood		-11805.03	-4830.48	-3370.56
Explanatory variable		Est. (std.err.)	Est. (std.err.)	Est. (std.err.)
Head	Working age female (dum)	0.713*** (0.036)	0.743*** (0.054)	0.697*** (0.070)
	Elderly (dum)	0.252*** (0.025)	0.231*** (0.032)	0.278*** (0.057)
	Primary schooling (dum)	0.884* (0.048)	0.822** (0.063)	1.059 (0.114)
	Some 2:ndary school (dum)	0.751*** (0.064)	0.737** (0.084)	0.889 (0.141)
	Compl. 2:ndary or more dum)	0.867 (0.085)	0.738* (0.109)	0.985 (0.188)
Demography	Household size (discr)	1.143*** (0.011)	1.148*** (0.017)	1.136*** (0.023)
	Sh. 0 – 7 yrs old (%)	0.999 (0.002)	0.998 (0.002)	0.997 (0.004)
Adults other than head	Sh. 8 – 14 yrs old (%)	1.003 (0.002)	1.001 (0.002)	1.004 (0.003)
	Sh. female adults (%)	1.017*** (0.002)	1.019*** (0.003)	1.018*** (0.004)
	Sh. male adults (%)	1.014*** (0.002)	1.017*** (0.003)	1.013*** (0.004)
	Sh. Primary school (%)	1.006*** (0.001)	1.006*** (0.001)	1.004** (0.002)
	Sh. incompl. 2:ndary sch.(%)	1.006*** (0.001)	1.004*** (0.001)	1.005** (0.002)
	Compl. 2:ndary or more (%)	1.004*** (0.001)	1.003 (0.001)	1.003 (0.002)
	Non-SME labour force	Sh. employed (%)	0.955*** (0.001)	0.952*** (0.002)
Sh. non-participants (%)		0.964*** (0.001)	0.961*** (0.001)	0.967*** (0.001)
Access	Électricity (dum)	1.458*** (0.105)	1.552*** (0.160)	1.479*** (0.223)
	Telephone (dum)	1.981*** (0.120)	2.148*** (0.206)	1.830*** (0.165)
Context	Cluster electr. rate (%)	0.997*** (0.001)	0.996*** (0.001)	0.997 (0.002)
Social welfare	OAP (dum)	0.581*** (0.051)	0.643*** (0.076)	0.525*** (0.095)
	Disability grant (dum)	0.733*** (0.085)	0.915*** (0.121)	0.571*** (0.114)
	Child maintnce grant (dum)	1.166** (0.086)	1.412** (0.189)	1.231** (0.123)
Trend	(discr)	0.981 (0.016)	1.277*** (0.062)	1.170** (0.062)

Significance levels are based on standard errors that take the clustered and stratified nature of the sample into account. Estimates in bold are significant. Symbols: ***/ ** / * Estimate significant at 1% / 5%/ 10% level.
+ Pseudo R2 derived through an ordinary logit estimator applying probability weights.

Table A2) Detailed output from logit regressions applied to annual samples

Logit regressions: Output from applications to annual samples								
Dependent variable SME activity								
Years	1997	1998	1999	2000	2002	2003	2004	
Number of observations	8 690	4 763	6 100	6 405	6 285	6 331	6 212	
Pseudo R ² +	0.2888	0.2410	0.2713	0.2992	0.2582	0.2321	0.2418	
Log likelihood	-1504.34	-1104.32	-1809.13	-1858.6	-1697.54	-1602.25	-1756.17	
Explanatory variable	Est. (std.err.)	Est. (std.err.)	Est. (std.err.)	Est. (std.err.)	Est. (std.err.)	Est. (std.err.)	Est. (std.err.)	
Head	Working age female (dum)	0.469*** (0.059)	0.736** (0.107)	0.526*** (0.060)	0.956 (0.108)	0.778** (0.087)	0.699** (0.100)	0.689*** (0.092)
	Elderly (dum)	0.191*** (0.048)	0.316*** (0.087)	0.268*** (0.066)	0.141*** (0.030)	0.249*** (0.056)	0.305*** (0.078)	0.258*** (0.075)
	Primary schooling (dum)	1.002 (0.126)	0.850 (0.131)	0.850 (0.102)	0.854 (0.107)	0.723*** (0.090)	0.909 (0.125)	1.212 (0.168)
	Some 2:ndary school (dum)	0.816 (0.162)	0.895 (0.193)	0.762 (0.136)	0.601*** (0.113)	0.643*** (0.105)	0.824 (0.158)	0.957 (0.178)
	Compl 2:ndary /more (dum)	0.916 (0.197)	0.858 (0.231)	0.723 (0.229)	0.689* (0.143)	1.098 (0.261)	0.825 (0.202)	1.121 (0.297)
Demography	Household size (discr)	1.143*** (0.028)	1.140*** (0.032)	1.089*** (0.026)	1.201*** (0.031)	1.115*** (0.026)	1.119*** (0.031)	1.149*** (0.032)
	Sh. 0 – 7 yrs old (%)	1.017*** (0.005)	1.000 (0.005)	1.000 (0.004)	0.998 (0.004)	0.998 (0.004)	0.995 (0.005)	0.998 (0.006)
	Sh. 8 – 14 yrs old (%)	1.004 (0.005)	0.999 (0.005)	1.008** (0.003)	1.000 (0.004)	1.006* (0.004)	1.003 (0.004)	1.004 (0.004)
Adults other than head	Sh. female adults (%)	1.031*** (0.006)	1.008 (0.006)	1.024*** (0.004)	1.022*** (0.005)	1.008 (0.005)	1.018*** (0.005)	1.019*** (0.005)
	Sh. male adults (%)	1.031*** (0.006)	1.010* (0.006)	1.021*** (0.004)	1.018*** (0.005)	1.002 (0.005)	1.016*** (0.005)	1.011** (0.005)
	Sh. Primary school (%)	1.006*** (0.002)	1.012*** (0.003)	1.003** (0.001)	1.004*** (0.001)	1.01*** (0.002)	1.005** (0.002)	1.003 (0.002)
	Sh. incompl. 2:ndary (%)	1.008*** (0.002)	1.008*** (0.003)	1.004*** (0.001)	1.003** (0.001)	1.01*** (0.002)	1.005** (0.002)	1.005* (0.002)
Non-SME labour force	Compl 2:ndary /more (%)	1.000 (0.003)	1.007** (0.003)	1.002 (0.003)	1.001 (0.002)	1.011*** (0.003)	1.003 (0.003)	1.003 (0.003)
	Sh. employed (%)	0.945*** (0.004)	0.958*** (0.003)	0.941*** (0.004)	0.953*** (0.003)	0.955*** (0.003)	0.962*** (0.003)	0.958*** (0.003)
Access	Sh. non-participants (%)	0.957*** (0.002)	0.962*** (0.002)	0.961*** (0.002)	0.960*** (0.002)	0.966*** (0.001)	0.968*** (0.002)	0.967*** (0.002)
	Électricity (dum)	1.268 (0.207)	1.535* (0.397)	1.565** (0.273)	1.570*** (0.234)	1.266 (0.232)	1.332 (0.246)	1.624** (0.325)
	Telephone (dum)	1.941*** (0.420)	2.472*** (0.550)	1.410* (0.286)	2.223*** (0.272)	2.299*** (0.256)	1.843*** (0.231)	1.821*** (0.215)
Context	Cluster electr. rate (%)	1.002 (0.002)	0.996*** (0.003)	0.996* (0.002)	0.997 (0.002)	0.999 (0.002)	0.997 (0.002)	0.997 (0.003)
Social welfare	OAP (dum)	0.428*** (0.082)	0.391*** (0.118)	0.615** (0.139)	0.805 (0.119)	0.719* (0.137)	0.465*** (0.108)	0.570** (0.150)
	Disability grant (dum)	0.345** (0.156)	1.170 (0.469)	0.940** (0.294)	0.808 (0.137)	1.097 (0.231)	0.468*** (0.111)	0.631* (0.171)
	Child maintnce grant (dum)	1.317 (0.838)	0.747 (0.493)	1.173 (0.546)	1.357** (0.203)	1.398*** (0.182)	1.299* (0.175)	1.187 (0.160)

Significance levels are based on standard errors that take the clustered and stratified nature of the sample into account.
 Estimates in bold are significant. Symbols: ***/ ** / * Estimate significant at 1% / 5%/ 10% level.
 + Pseudo R2 derived through an ordinary logit estimator applying probability weights.

Table A3) Distribution of households across categories for time taken to reach public facilities, by walking or using mini-bus taxi, by connection status, 2002 - 2004

Year	Min's taken	Medical clinic						Post office						
		Walking			By mini-bus taxi			Walking			By mini-bus taxi			
		Unconctd	Connected	All	Unconctd	Connctd	All	Unconctd	Connected	All	Unconctd	Connctd	All	
2002	User frac.	57.0	59.2	57.2	34.5	30.5	34.0	29.4	33.2	29.8	56.5	52.0	56.0	
	< 14	19.1	29.0	24.9	2.3	3.7	3.0	38.3	42.5	40.9	1.2	2.0	1.7	
	15 -29	28.0	36.5	33.0	25.3	41.3	34.0	35.0	34.6	34.8	18.5	35.1	28.1	
	30 -44	24.7	22.5	23.4	31.9	36.4	34.3	14.0	16.3	15.4	29.0	35.3	32.6	
	>44	28.1	12.0	18.6	40.6	18.7	28.7	12.6	6.7	8.9	51.3	27.5	37.6	
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	n	1463	2226	3689	914	1133	2047	723.0	1271.0	1994.0	1436.0	2018.0	3454.0	
2003	User frac.	50.9	62.9	57.8	34.1	30.7	57.8	23.2	40.2	33.0	53.0	48.8	50.6	
	< 14 min	16.1	21.4	19.4	2.4	9.2	6.1	32.7	32.9	32.8	1.4	4.9	3.3	
	15 -29	26.3	37.4	33.2	22.5	40.5	32.4	32.4	40.2	37.9	15.2	32.9	25.0	
	30 -44	24.5	26.7	25.9	33.6	30.2	31.7	18.9	18.6	18.7	30.7	33.8	32.4	
	>44	33.1	14.5	21.5	41.5	20.2	29.8	16.0	8.3	10.6	52.6	28.4	39.2	
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	n	1333	2439	3772	881	1067	1948	648	1586	2234	1332	1766	3098	
2004	User frac.	52.1	62.4	58.3	25.8	27.9	27.0	23.4	39.2	33.0	40.9	48.5	0.0	
	< 14 min	12.1	18.8	16.4	3.4	7.8	6.2	24.5	28.9	27.7	1.8	4.4	3.5	
	15 -29	20.9	36.2	30.8	23.0	35.0	30.5	32.5	41.0	38.7	15.7	33.2	27.0	
	30 -44	27.8	27.7	27.8	31.2	35.7	34.0	22.5	19.1	20.0	30.3	33.5	32.4	
	>44	39.2	17.4	25.0	42.4	21.5	29.3	20.5	11.0	13.7	52.2	28.9	37.1	
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	n	1218	2535	3753	600	1006	1606	594	1611	2205	961	1823	2784	