2001 Annual Forum

at Misty Hills, Muldersdrift

Determinants and Impact of ICT use for African SMEs: Implications for Rural South Africa

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Paper prepared for TIPS Forum 2001
August 2001

This paper draws on collaborative work undertaken in East Africa by the Center for Development Research (ZEF Bonn) with financial support from the Alexander von Humboldt Foundation. The collaborating Universities from East Africa included, Dar es Salaam (Tanzania), Kenyatta and Maseno (Kenya). I would like Dr. Francis Matambalya for valuable input and Alan Hirsch, Joachim von Braun, Dietrich Müller-Falcke and participants of the DESG-IESG Annual conference 2001 for comments on earlier drafts of the paper. The remaining errors are mine.

Introduction

In most African countries small and medium enterprises (SME) account for a significant share of production and employment and are therefore directly connected to poverty alleviation. While in many respects the South African economy is different to that of other countries in the continent, for the poor population in the rural areas SMEs are also very relevant for employment and as an income source. Especially in developing countries SMEs are challenged by the globalisation of production and the shift in the importance of the various determinants of competitiveness. Through the rapid spread of information and communication technologies (ICT) and ever decreasing prices for communication, markets in different parts of the world become more integrated. Therefore, one basic question of this study is whether the use of ICT (as production technology, as information processing technology or as information communication technology) can help them to cope with these new challenges. The spread of ICT has led several commentators to argue that these technologies are creating a new economy – an information economy – in which information is the critical resource and basis for competition in all sectors – manufacturing and probably even more in services. Generally, from the performance perspective, the competitiveness effect of ICTs derives from the impact that ICTs have upon the productivity of the factor inputs. In this regard, ICTs can improve efficiency and increase productivity by different ways including, improving efficiency in resource allocation, reducing transaction costs, and technical improvement, leading to the outward shifting of the production function.

It is argued that in remote regions, the disadvantages that arise with isolation can be significantly lessened through access to rapid and inexpensive communication. However, there are also more pessimistic views that assume that the digital divide will increase and therefore producers in developing countries and especially in rural areas will face even greater disadvantages relative to their competitors in developed countries. Although South Africa is much more developed and its ICT infrastructure is far more advanced than in most Sub-Saharan African countries, in remote areas with a poor population similar difficulties as in other African countries exist with respect to education, unemployment, ICT infrastructure and role of the SME sector and therefore the above questions are also relevant.

So far there is little empirical evidence of how the diffusion and application of information and communication technologies (ICTs) can be a catalyst for economic competitiveness and growth in developing countries. After a review of the macroeconomics of ICT diffusion and growth effects in this study, we therefore particularly focus on how micro-level competitiveness is influenced by ICTs using enterprise survey data from two East African countries: Tanzania and Kenya. In so doing, we also account for other factors that obviously influence competitiveness. Hence, the analysis incorporates also the influence of the enterprise resources in terms of factor inputs, because the performance is partly a function of the resources that are invested in such basic factor inputs as labour, physical capital, and production materials. Besides, the saliencies of African SMEs (e.g., relatively small size and young age by international comparisons, and human capital stock) are drawn into the analysis. As the food processing, textiles and tourism sector, where we have conducted our empirical analysis of East African SMEs, are also of considerable importance for South Africa, we can draw some conclusions and develop policy recommendations, that are relevant especially for rural South African SMEs.

The East and South African Economies and their ICT infrastructure

Overview of East and South African economies

Although the South African Economy as a whole is far more advanced than the economies of the East African countries in some respects they face similar problems. During the eighties growth slowed down significantly in South Africa. At the same time labour productivity was falling because of skills shortages due to low education efforts for the majority of the population. This reduced the profitability of investment and a fall of private investment. As domestic savings are still declining from 19 % of GDP in 1990 to below 15 % now, the prospects

for future investment are also gloomy. These developments resulted in an increase in unemployment as private sector employment decreased in the mining and manufacturing sectors that have been important employers in South Africa. Only the services sectors showed a slight increase in employment. At the same time wages in the formal sector increased leading to an increase in inequality (Jenkins and Thomas 2000).

East Africa is a region that is rather marginalised in terms of economic production and world trade. However, there are not only big differences between the East African countries and South Africa but also between the two study countries Kenya and Tanzania (see Table 1). South Africa has on average a much higher GDP per capita a higher percentage of industry in value added and a much higher secondary school enrolment rate. Also Kenya is relatively more developed than Tanzania with more than double the GDP per capita, a higher percentage of industry value added of GDP and a higher school enrolment especially at the secondary level. In contrast both South Africa and Kenya have a lower performance in a dynamic respect, with Tanzania being the more dynamic country with 4.3 % annual GDP growth and even faster growth of industry value added and exports and a higher share of investment in GDP. Also labour productivity measured by average annual growth of real GDP per worker (1980-90) was with 2.3 % for Tanzania acceptable, whereas Kenya and South Africa had a negative rate.

Table 1: Some basic economic and social indicators for East African Countries, 1999

	Tanzania	*Kenya*	*RSA*
Population (million)	32.9	29.4	42.1
Population growth (annual %)	2.4	2.3	1.7
GDP per capita, PPP (US$)	480	1,001	8,908
GDP growth (annual %)	4.3	1.6	1.2
Gross domestic fixed investment (% of GDP)	17.86	15.0	14.9
Gross domestic fixed investment (annual % growth)	9.35	..	-6.9
Industry, value added (% of GDP)	14.34	16.8	32.4
Industry, value added (annual % growth)	7.60	1.4	-0.2
Exports of goods and services (% of GDP)	19.8	24.7	25.5
Exports of goods and services (annual % growth)	7.3	4.5	0.0
Export concentration index (1992)	0.248	0.305	0.378
Av. annual growth of real GDP per worker (% 1980-90)	2.3	-1.4	-0.9
Primary school enrolment (% gross, 1998)	66.8	84.9	132
Secondary school enrolment (% gross, 1998)	5.4	24.4	95
Tourism receipts (% of total exports) [a]	32.4	12.9	7.9
International Tourist Arrivals (1000) 1998	450	857	5,898
Growth rate of Tourism Receipts (%) 1998/97	45.4	-35.5	-1.1

Notes: Data are for 1999 if not otherwise stated. a- 1998 for South Africa
Source: World Bank 2001 a and b, WTO 2000.

The three sectors we have chosen for our empirical analysis are of different importance for the three countries. Tourism is an important sector for all three countries. But whereas South Africa has the highest number of tourist arrivals the relative importance is highest for Tanzania with 32 % of export revenues and also here Tanzania is much more successful in dynamic terms. In South Africa the travel and tourism sector is employing 7.3 % of the workforce and has a growing contribution to GDP in recent years.

In Kenya food products account for the highest share in manufacturing value added with 32 % in 1995. Textiles and wearing apparel play a minor role in South Africa as well. In Tanzania textiles is the largest manufacturing sector with 19 % of value added. Value added per worker was only 767 US$ in Tanzania compared to 4025 in Kenya and 20,303 US$ in South Africa. Employment in the manufacturing sector was lower in Tanzania than in Kenya despite the bigger population. In both East African countries it was much lower than in South Africa corresponding to the much lower share of industry in GDP. However the ratio between value added per worker and average wage leads to the impression that production of labour intensive goods is still cheaper in East Africa (see Table 2). Whereas in South Africa (1993-2000) the demand for textiles grew faster than average

consumption expenditure, for food products it grew slower indicating that income elasticity is smaller than one contrary to the situation in poorer countries (Reserve Bank of South Africa 2001).

Table 2: The manufacturing sector in East and South Africa, 1995

	Tanzania	Kenya	South Africa
Total value added (mio.$)	119	814	29,071
of which:			
Food products	11	32	10
Textiles and wearing apparels	19	7	6
Employment (ths.)	157	199	1,432
Value added p. worker	767	4,025	20,303
Average wage (including supplements)	238	1,251	10,093

Source: UN, 1997

SMEs in the East and South African Economies

East Africa's economic landscape conspicuously reflects the dominance of SMEs. Particularly, in terms of enterprise structure and dynamics[1], reminiscent to the overwhelming majority of developing economies, the SME sector is the vanguard of the country's private sector. SMEs provide employment to more than 50 percent of all employed labour force in the survey countries. In Kenya 49 % of employment in 1969 was in enterprises with one to nine workers and an additional 10 % in enterprises with 10 to 49 workers. For Tanzania the respective figures were 56 and 7% (Liedholm and Mead 1987). The SMEs are also accountable for above 50 percent of manufacturing gross domestic product. It is estimated that in Kenya small enterprises generate 12 % to 14 % of the national income (Daniels and Mead 1998).

Recent research (Biggs and Srivastava 1996) confirms the often made assumption that SMEs with less than 50 employees are an important source of employment growth as for example in Kenya employment growth for enterprises with 10-49 employees 41 %, for 50 –99 employees 24 % and for more than 100 employees only 12.5 %. However the share of total job creation for small enterprises (10-49) is only 23.0 % compared to 15.2 % for middle size enterprises (50-99) and 55.5 % for large enterprises (100+). As determinants of firm growth similar variables as in developed countries are found to be important, namely initial firm size, firm age, human capital, sector and in some cases form of ownership and ethnicity. It is worth noting that SMEs in developing countries usually show high rates of start-ups as well as high closing rates due to the difficulties they face in a highly risky environment.

In South Africa SMEs are also of great importance for example in the food processing sector where 183,000 people are employed. The enterprises are geographically dispersed over the whole country depending on the location of the production of main inputs. The SMEs face similar problems as in other African countries like limited access to credit facilities, poor management practices and limited access to technology. Especially the poor information and communication management is an obstacle to SME development. Many entrepreneurs rely mainly on personal contacts, newspaper and business magazines as main source of information and feel that especially sales and procurement information is lacking (CTA 2000).

The dominance of SME in developing economies is due to different effects. One is the fact that the bad state of the infrastructure leads to relatively isolated markets with limited demand that can best be served by small-scale localised production. Therefore the majority of the small-scale producers are located in rural areas, absorbing workers when seasonal effects reduce agricultural employment. As demand for manufactures is concentrated in

[1] In dynamic terms, the influence of SMEs is underscored by several facts as well. First, they utilise local resources and exert little pressure on limited foreign currency reserves. Second, they provide a flexible and skilled production base. Third, they facilitate the opening up of new markets. Finally, they are particularly crucial for the economic dynamics of rural areas (Mead and Liedholm 1998).

simple items these products can efficiently be produced using cottage technologies (Liedholm and Mead 1987, Tybout 2000).

However, there are also a number of distinctive features of the business environment as compared with developed countries that might hurt SMEs most. Among these the limited access to manufactured inputs (especially high quality imported goods), low quality of the infrastructure, poor legal systems and crime prevention and high volatility of macroeconomic conditions and prices are often mentioned. Low levels of human capital, especially low secondary education and scarcity of technicians limit the range of goods that can be produced and negatively affect the ability to absorb new technologies (Tybout 2000).

Access to ICT in East and South Africa

Before we investigate the effects of ICT use in SMEs we will give a brief overview of access to different types of ICT. The teledensity in all three countries is characterized by a strong country-urban bias. In Kenya the teledensity in the largest city lies at 7.11 and 0.47 phones per 1.000 inhabitants in 1999 in the rest of the country which indicates a huge disparity. Similarly for Tanzania the value is at 3.07 in the largest city and 0.26 in the rest of the country. For South Africa with a teledensity of 41.52 in the largest city and 8.18 in the rest of the country the gap is somewhat smaller but still very high. The SA Household survey from 1995 reveals that 41 % of Africans had no access to telecommunication at all and further 46 % had access only through a communal pay phone, telecenter or neighbor. Only 13 % had access to a fixed or cellular phone in their dwelling. For Whites only 9 % had no access but 85 % had access in their own dwelling. This diversity was reduced somewhat in the recent years but is still existing (Saitis 2000). While the advent and accelerated adoption in South Africa of cell-phone technology has permitted rapid access to telephone services in areas where fixed –line service is not available, the differential cost of using prepaid service (the only option for the poor) as opposed to long-term contract service means that the cost barrier is higher for the poor.

The monthly subscription rates are lower in the two East African countries (3.6 USD in Kenya and 4.1 USD in Tanzania) than in South Africa (11.9 USD) that lies more in the same range as industrial countries. For cellular phones monthly subscription fees in Tanzania and South Africa are very high with 26.8 USD and 27.8 USD respectively compared to 7.1 USD in Kenya and 22.2 for Africa on average (figures from ITU 2001).

Table 3 depicts the pattern of East and South Africa's ICTs physical infrastructure. The portrayed nation-wide diffusion of ICTs is rather low by international standards in East Africa, as it is underscored by a comparison with South Africa. For instance, in Tanzania the intensity of telephone main lines and mobile phones is less than 4 percent of the comparable intensity for South Africa and in Kenya the situation is only slightly better. Actually the waiting time for a fixed phone in Kenya is by far the longest in East Africa and has even increased from 5.6 years in 1997 to 9.6 years in 1999. The increase in mobile phones was most rapid in Tanzania where it increased from 0.1 phones per 1000 people in 1995 to 1.6 in 1999, but was also considerable in the other countries. For radio and TV, that are still important sources of information dissemination, the disparities are smaller and Tanzania has even a comparable ratio of radios per inhabitant as South Africa.

Table 3: Diffusion and Costs of selected ICTs in East Africa, 1997/99

Indicators	**Tanzania**	**Kenya**	**RSA˜**
Telephone main lines (per 1000 persons) '99	4.5	10.3	125
Waiting list (thousands) '99	29	121	116[a]
Waiting time (years) '99	1.6	9.6	0
Average cost of a 3 minute local call (US $) '99	0.1	0.1	0.1
Average cost of a 3 minute call to the US (US $) '97	3.7	11.2*	..
Mobile phones (per 1000 persons) '99	1.6	0.8	120
Fax machines (per 1000 persons) '97	0.1	0.1	3.6
Personal computers (per 1000 persons) '99	2.4	4.2	54

Internet hosts (total number '99)	158	560	140,470
Internet hosts (per 10 000 persons) '99	0.04	0.2	33
Dialup Internet costs (20 hrs/month in US $) '98	..	123	40
Radios (per 1000 persons) '97	279.3	104.1	332.5
TV Sets (per 1000 persons) '98	20.9	22.1	129

~ RSA stands for Republic of South Africa. * Data only available for 1996.
Source: World Bank: World Development Indicators, World Bank, Washington, 2001, and African Internet Connectivity web page.

In East Africa privatization of the ICT infrastructure is still limited. In Kenya competition is established in mobile phones and Internet but for fixed lines services the state owned operator Telkom Kenya still has a monopoly. There is the intention to sell 49 % to a private investor but until 2004 Telkom Kenya has a monopoly. In Tanzania the situation is very similar with a state monopoly of the Tanzania Telecommunications Company as the sole provider of basic fixed services in the mainland and some competition in mobile phones and Internet access.

In South Africa the ICT sector is relatively well developed and privatized. Apart from the national telecom Operator Telkom SA that was partly privatized, several private companies provide the local networks with the international bandwidth. 90 % of the dialup Internet access market is shared amongst two companies and in the mobile phone sector there is also competition. The relevant official force to regulate the ICT sector is the Independent Communications Authority of South Africa (ICASA), which is only responsible to the Minister for Posts, Telecommunications and Broadcasting.

To overcome the inequalities in ICT infrastructure the government is heavily engaged in developing the communications sector. Therefore, one of its main goals is to improve access to the telecommunications infrastructure throughout the whole country, including rural areas. The development aims should improve access to telecommunications across racial boundaries, which have drawn a border between access of white and indian parts of the population and the black and colored people. As a first step, the government established Internet Centers in former Township areas.

In March 1998 the South African Cabinet made public a proposal for a strategy to develop the national information and communications technology sector, which includes the use of so called smart cards and public access points. In order to enforce the ICT development the government spends about 1-2 billion US$ per year on information technology. As intended, all governmental networks shall be integrated into one network, that make it possible for the public to obtain identity documents or information about governmental services through the new system. Special committees and a Center for Information and Communications are introduced to provide advisory and engagement to ICT-development. For technological development and innovations the Commission for Information Technology (CITA) was formed with the aim, to provide enhancements in public-private partnerships.

In a survey of the African Internet status Jensen (2000) reports that the average usage of Internet is still very low due to high connection fees. Communications are mostly done with people outside the continent. Most users are NGOs, universities or private companies and users are mainly male and well educated. Email is used for correspondence, document exchange, technical advice, managing projects, arranging meetings, and exchanging research ideas, but it is still limited for accessing formal information resources. 25 % of e-mail is replacing faxes, 10 % e-mails replacing phone calls and 65 % of the e-mails standing for communication that would not have been made without an e-mail-system. Users report that Internet has increased efficiency and reduced information costs, although it is still an under-utilised resource.

Impact and determinants of ICT use on the macro level

In the information-theoretic approach to understanding development the causes and consequences of transaction costs, uncertainty, incomplete markets and incomplete information play an important role. Information

asymmetries are one of the major causes for high transaction costs, uncertainty and therefore market failure. A reduction of the information gap also reduces the ability of the better informed to extract rents from the less informed be it buyers or sellers of goods or factors. As the poor population and small firms usually have less access to information this effect might help to reduce disadvantages and inequality. A reduction of information asymmetry will also create new opportunities and therefore enhance the efficiency of resource allocation (Akerlof 1970). On a macro level this will then lead to faster growth and diversification of the economy.

ICTs can serve as information channels because they are able to support the decoupling of information from its physical repository, which can be argued to be the truly revolutionary aspect of these technologies (Evans and Wurster 1997; Pohjola 1999). This property allows the immediate transmission of large volumes of information and permits communication independent of the physical movement of individuals. This decoupling effect allows users access to a body of information and ideas which are non-rival in use and potentially generate large content-related externalities, that will improve the innovation capacity and diffusion.

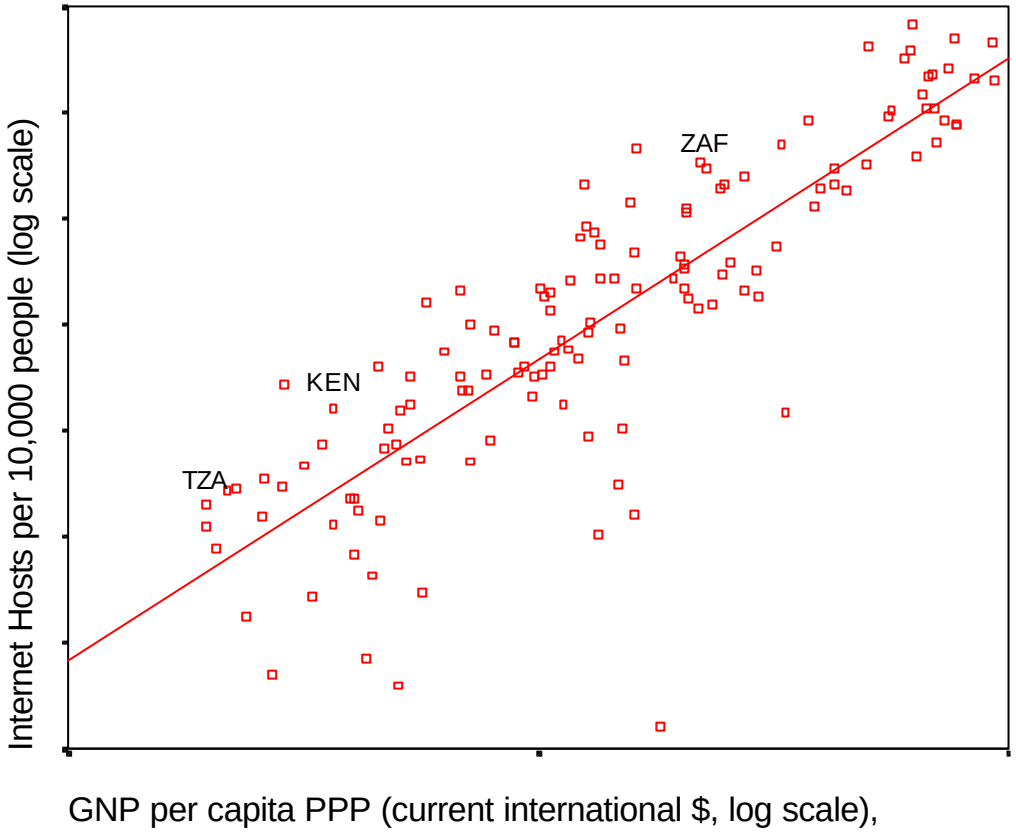
One effect of the diffusion of ICT is the disruption of established economic relations as new possibilities are in the reach. Changes in how the economy works will also have effects on employment. Creation of new jobs and a loss of jobs that become redundant, new contents and quality of work, relocation of firms and maybe most important the skills required are all affected by the spread of ICT (ILO 2001).

In general it is difficult to separate the factors that drive diffusion of ICT from the effects of ICT. For example education is a precondition to use advanced computer based ICTs but at the same time ICT might help to improve education through distant learning programs. To structure the discussion in the following this distinction is made nevertheless.

ICT diffusion

From cross-country data it is obvious that the spread of new ICT technologies is driven by GDP per capita. However, differences in access to Internet technology are even bigger than in national income across the world. In 1997, the fifth of the world's people living in the highest income countries had 86 per cent of world GDP but 93 per cent of Internet users, whereas the bottom fifth had 1% of GDP and 0.2 % of people 'online' (UNDP 1999). The relative number of Internet hosts in Tanzania, Kenya and South Africa is higher than on average for countries with similar GDP per capita levels. This reflects the fact that it is also true that countries with similar levels of per capita incomes exhibit wide variation in their ICT performances (see Figure 1).

Figure 1: Internet hosts and GDP per capita, 1997



Source: own calculations from WB 2001a.

The cost and availability of telecommunications determines the extent to which the new ICTs are used and these access costs are often higher in poorer countries. The price of telecommunication services has a negative impact on the spread of Internet technologies as the transmission of data depends on the use of this infrastructure which means that telephones and Internet are complementary (see Kiiski and Pohjola 2001).

There is also some evidence that the Internet is used more widely where political and civil freedom exists (ILO 2001). Robinson and Crenshaw (1999) furthermore show that other variables being equal, a 10 % rise in economic inequality results in a 8.9 % decrease in Internet hosts. They conclude that unequal economies, or those that have a strong disparity between their modern sector and the traditional subsistence sector, are much less able to make use of Internet development than are other nations. In a recent study on the cross country diffusion of the Internet it is shown that the number of Internet hosts per capita also depend on the level of education. For example Kenya with a much higher level of secondary education had almost 5 times as many Internet hosts per 10.000 inhabitants as Tanzania despite a relatively low quality of the telephone network (see Tables 1 and 3). Especially university education seems to matter for Internet access as universities are among the first institutions with Internet access in many countries.

There are also strong linkages between the other types of ICT. For example in a number of African countries the number of mobile phones already outweighs the number of fixed lines and in South Africa the number of mobile phones already matched the number of fixed lines in 1999 (see Table 3). This is mainly due to the bad quality of the fixed line service and long waiting lists. Therefore fixed and mobile phones are regarded as substitutes and mobile phones can to some extend leapfrog the extension of the fixed network.

Impact of ICT on economic growth

In cross country studies of growth that mostly include developed and developing countries the availability of telecommunications infrastructure is often found to contribute significantly to GDP growth besides other knowledge related indicators such as education. This implies that if investment is made in communications infrastructure and complementary factors at the same time considerably higher growth rates can be achieved. (World Bank 1998).

However, another study using an inter country Cobb-Douglas production function finds that returns on IT capital are positive and statistically significant only for industrial countries and not for developing countries. The authors conclude that a minimum requirement of infrastructure and other complementary factors is needed for ICT investment to be productive (Dewan and Kraemer 1998). As the study is based on 1985-93 data especially in the poorer countries the new generation of ICT was only very thinly spread and therefore it is not surprising that no overall effect on the economies could be found. These results are largely confirmed by Pohjola (1999) using an augmented Solow model where neither human capital nor information technology seems to have a significant impact on GDP growth.

As the relation between GDP per capita and ICT runs in both directions because ICT is not only a production input but also a consumption good it is difficult to separate the impact from the determinants of ICT investment. This is one possible explanation for the productivity paradox that firms especially in industrial countries but lately also in developing countries have invested heavily in ICT leading to the high growth rates in the ICT sector but overall productivity growth has slowed down at the same time compared to the 1970s where no Internet, mobile phones etc. existed. Other explanations are the time lag between purchasing and effectiveness of ICT due to learning and adjustment requirements. Furthermore the effects will be different for different sectors and enterprises in the economy. Maybe a more important explanation given by Avgerou (1998) is that ICT can only have a positive impact on performance when institutions are adapted through changing incentives and relative costs. This applies to market institutions in general with defined property rights etc. that have to be in place for ICTs to lower transaction cost. But also in the ICT sector itself the institutional background is crucial for the provision of adequate technologies.

Implications for regulation

When the so called information revolution started, communication infrastructure was largely state owned and communication was regarded as a partly public good and a natural monopoly because of network externalities and high sunk costs. This has changed tremendously in the recent years with privatisation of telecoms in nearly all countries in the world now at least discussed. Competition in cellular communications and Internet services is already widespread and they are to a large extent at least partially owned by foreign investors, but in basic telecommunication services 73 % of the markets still maintained a monopoly in 1999. Between 1990 and 2000 more than 150 countries have introduced new telecommunications legislation or modified existing ones (ITU 1999).

However, restrictions on entry of foreign firms or the participation of foreign capital are still common (Mattoo 2000). But new entry is crucial to decrease the costs of access and improve the quality of services. Recent research shows clearly that larger welfare gains arise from an increase in competition than from simply a change in ownership from public to private hands. This increase in competition is possible because of the erosion of the natural monopoly in telecommunication markets due to technological development, especially with respect to cellular phones.

In the GATS there are pro-competitive regulations for the ICT sector. However, these are only weak provisions with limited scope (Article VIII, Monopolies and Exclusive Service Providers) and limited bite (Article IX, Business Practices), but commitment to desirable principles in the Telecom Reference Paper should contribute to enhanced competition. These principles should be generalised to other network-based sectors (Mattoo 2000). One problem of the GATS is that those provisions dealing with domestic regulations (Article VI) are in general

among the weakest as they are considered to undermine national sovereignty but have an obviously powerful influence on international trade in services. It was proposed to complement the national treatment obligation with a 'necessity test'. This test leaves governments free to deal with economic and social concerns provided that any measures taken are not more trade restrictive than necessary to achieve the relevant objective. In principle universal service obligations are allowed under GATS provided they are administered in a transparent, non-discriminatory and not excessively burdensome manner.

A tricky issue in this respect is the universal service obligations. On the one hand this aims to meet the need for basic telecommunications also in regions with low population density that increases the cost of provision and with poor population where demand is expected to be low although even very poor people demand telephone services (Torero 2000). Therefore the universal service obligation should reduce the digital divide within countries. On the other hand such a regulation imposes market distortions and might therefore lower overall access to ICT. In the past universal services have been frequently supported by cross-subsidisation or direct transfers from the governments. Obligations can also be part of the license conditions for new entrants for example a certain number or percentage of public access points might be required as part of the licence. A further instrument is to fund the consumer rather than the provider so that those in need of the service who can't afford it are targeted directly and distortions are avoided. For the efficiency of the regulation in the ICT sector not only the formal provisions but also the functioning of governance plays an important role.

The determinants of ICT adoption and the role for ICT on firm performance in Africa

As SMEs are often disadvantaged due to remote location, economies of scale in production and marketing, lack of access to capital and inputs etc. it is especially interesting whether the use of ICT can help them to overcome some of these disadvantages. Therefore first the general effects of ICT on enterprise performance are discussed followed by specific SME circumstances.

ICT and enterprise performance

The increased use of ICT in enterprises, that can be observed in our sample (see Figure 4), leads to a substitution of ICT equipment for other forms of capital and labour and may generate substantial returns for enterprises that invest in ICT and restructure their organisation. However this does not necessarily imply that total factor productivity in the whole economy will increase. In fact in the industrial countries the growth of total factor productivity (TFP) that is associated with technical change has even declined in parallel to the increased use of ICT in the past 10 to 20 years (Jorgenson and Stiroh 1999).

Only in the 1990s empirical evidence was found that computers had a substantial effect on firms' productivity levels. In their studies of the effect of information technology on productivity, Brynjolfsson and Hitt (1995) observed that alongside firm effects, ICT capital contributes positively and significantly to output and productivity for large US firms. Similar results are also found when examining the effects the use of various ICTs has on productivity. These results were consolidated even further in a more recent study (Brynjolfsson and Hitt 2000), which underscores the importance of complementary factors such as restructuring the enterprise and improving the skills level of the personnel to get productivity growth as a result of investment in ICT. They also take into account the reverse causality that successful firms might spend their windfall on ICT equipment.

Information also has become in recent years an important feature in promoting and facilitating the conduction of trade. Contact or exchange of information between producers, exporters and consumers helps to improve trade performance by creating mutual awareness of products, quality and market conditions. Therefore, access to information is an important determinant to create competitiveness by effectively reducing transaction costs. The application of the new information and communication technologies, and especially the Internet, offer increased effectiveness, for they encourage and facilitate direct contacting between trade partners. However, usage of advanced ICTs presupposes as a necessary condition reliable technical equipment and infrastructure.

ICT and SME competitiveness

Flexibility is considered to be a major source of competitiveness for SMEs compared to larger enterprises. The use of ICT could now on the one hand increase the competitiveness of SMEs as they enable the creation of more flexible links with trading partners because of faster and more reliable communication channels. On the other hand ICTs could help bigger enterprises to increase their flexibility through a restructuring of the organisation which will enable them to adapt quicker to changing conditions. Therefore the competitive advantage of SMEs could also decline.

In general SMEs rely much more on informal information systems than larger enterprises. To get the relevant information that is needed for a rational decision is not costless especially as in SMEs usually there is only one decision maker – the owner/manager – who's personal resources (time, knowledge, capabilities) are restricted. However SMEs have the advantage of smaller internal coordination costs, as all decisions are made by one or few people (Blili and Raymond 1993, Müller-Falcke 2001).

External transaction costs are associated with the initiation, negotiation and enforcement of contracts. Especially the Internet helps to screen the enterprises' environment for relevant information and thereby get information about sellers and customers that were previously out of reach. However for the actual delivery of goods and the transmission of payments also other infrastructure like transport and a reliable banking system has to be in place.

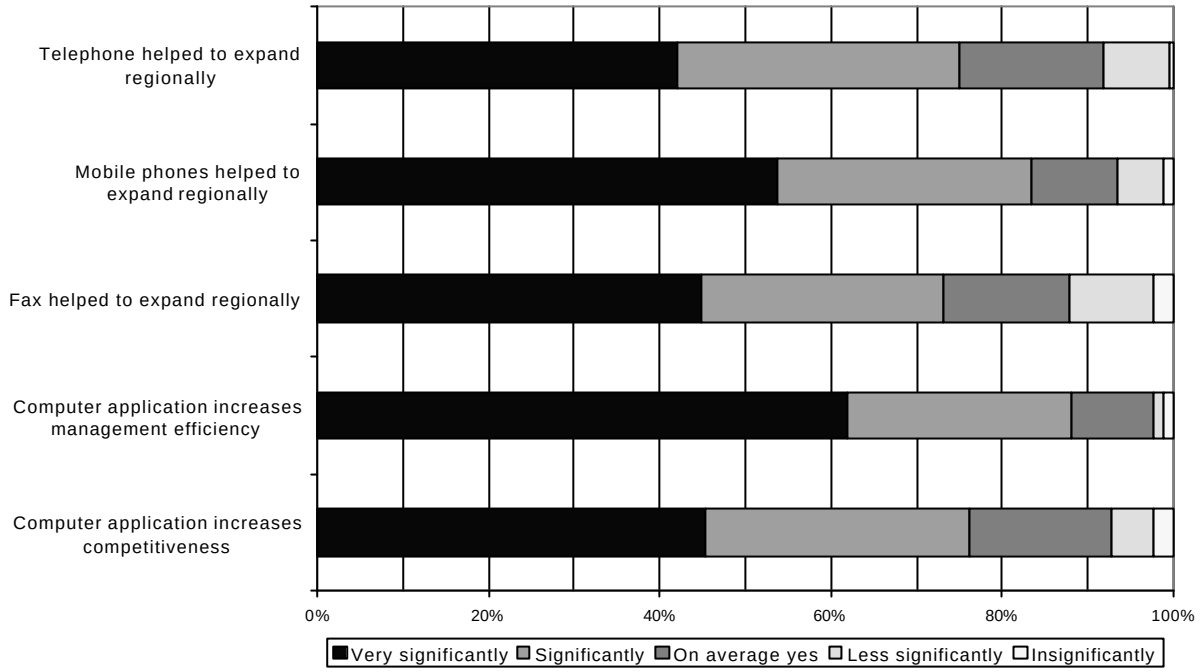
With the use of ICT transaction costs could be lowered and therefore the economies of scale in exporting can be reduced. This will enable SMEs not only to stick to local markets but to expand regionally and internationally. On the other hand many SMEs that are located in rural areas, serve the local niche market and are protected against competition from bigger enterprises because of high transport and communication costs. Therefore ICT might also increase competition for these enterprises, so they either have to become more productive or to close down.

There are hardly any studies that analyse the effect of ICTs on small enterprises in developing countries, partly due to data problems. Müller-Falke (2001) finds for Indian manufacturing SMEs that enterprises that use more advanced forms of ICT have on average a higher labour productivity and a higher growth rate. In a survey of 59 electric and electronic manufacturing Indian SMEs mainly employing less than 50 people, Lal (1996) observed higher profit margins, skill intensity and export and import intensities for firms using IT. There is also some evidence that export performance of SMEs is related to ICT adoption (Lal 1999, Nassimbeni 2001). However it is not the investment in the technology alone but the combination with other technologies and especially relevant skills that make ICT work.

A more qualitative study by Duncombe and Heeks (2001) stresses the different information and ICT needs for different types of SMEs. They conclude that smaller SMEs with little working capital (which they characterize as survivalists and trundlers) rely mainly on informal information from known sources where personal relations and trust plays a major role. For these enterprises ICTs are of minor relevance and only telephone can help to increase access to this kind of information. As phones can help to extend social and business networks and in some cases substitute for journeys and business intermediaries access to telephone services should be given priority.

However, for bigger SMEs that are growth oriented, belong to the formal sector, are export oriented etc. information becomes more important and therefore more advanced ICTs can be helpful for building business linkages. The survey SMEs in Botswana revealed the biggest information gap in market information pertaining to new customers and the need to expand into export markets. Information is also lacking about external finance and sources of skills and training. This lack of information was found to raise costs and reduce income. "ICTs can reduce time and money costs of business processes and can improve the certainty and quality of those processes." These benefits occur mainly in enterprises with bigger size (with annual turnover of a few tens of thousands of USD) and specific sector of operation such as manufacturing exporters and the tourist industry, where the Internet can be used as a marketing tool. However for 90 % of the survey enterprises lack of finance and skills are the main constraints and they cannot afford to buy a computer or make efficient use of it in the short or even medium term (Duncombe and Heeks 2001).

Figure 2: Percieved effects of ICT



Source: own calculations from East Africa SME survey

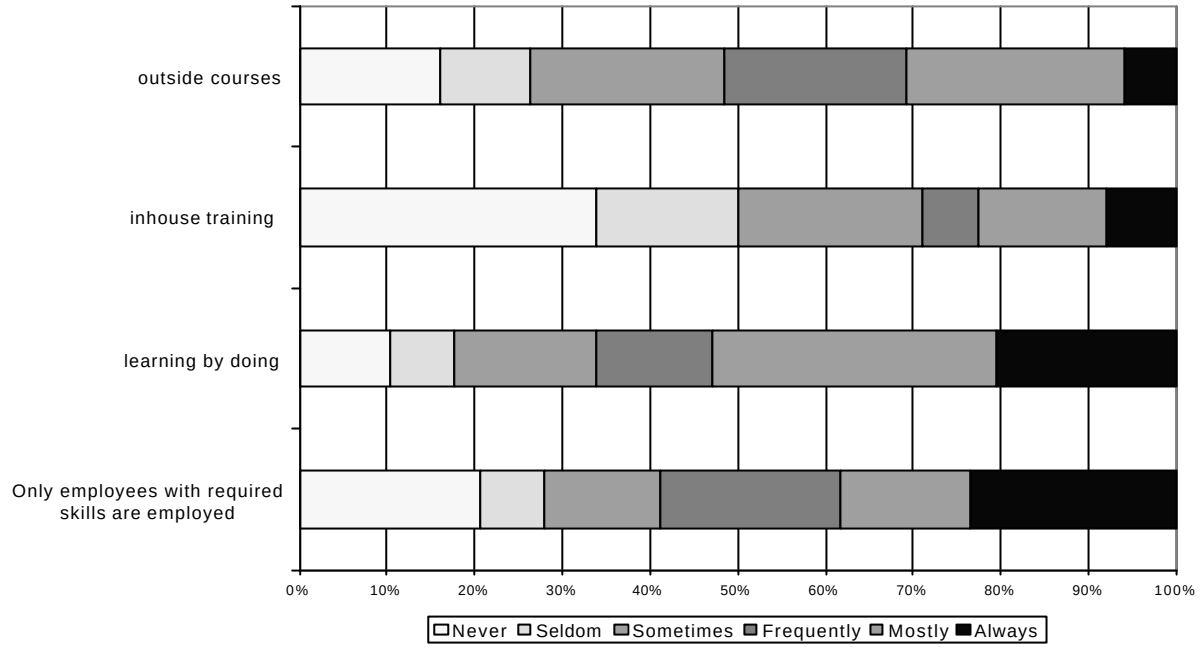
From the survey we conducted in Tanzania and Kenya[2] it can be seen that those enterprises using the different forms of ICT rate their effects mostly positive (see Figure 2). On top are computer applications that are assumed to increase management efficiency and competitiveness significantly by 88 % and 76 % respectively. Mobile phones are considered to contribute significantly to regional market expansion by most enterprises, followed by fixed phones and faxes.[3]

As advanced ICTs such as computers that are a prerequisite for email and Internet access are complementary to education the question how computer skills are acquired is of special importance. Many of the enterprises that use computers (24 % always + 20 % mostly and frequently) only employ staff that brings the required skills already with them. Others rely on learning by doing (53 % always and mostly) and only 31 % (22 %) offer mostly external courses (inhouse training). This might be explained by the fact that SMEs don't have the capacity to provide inhouse training and lack finance to send their employees to external courses. As the availability of employees with adequate computer skills is limited this leads to a relatively low rate of computer usage as can be seen below.

[2] A more detailed background information on the survey will be given in the empirical section.

[3] These figures only refer to enterprises that use the different technologies so they might be biased.

Figure 3: Computer skills aquired through different measures



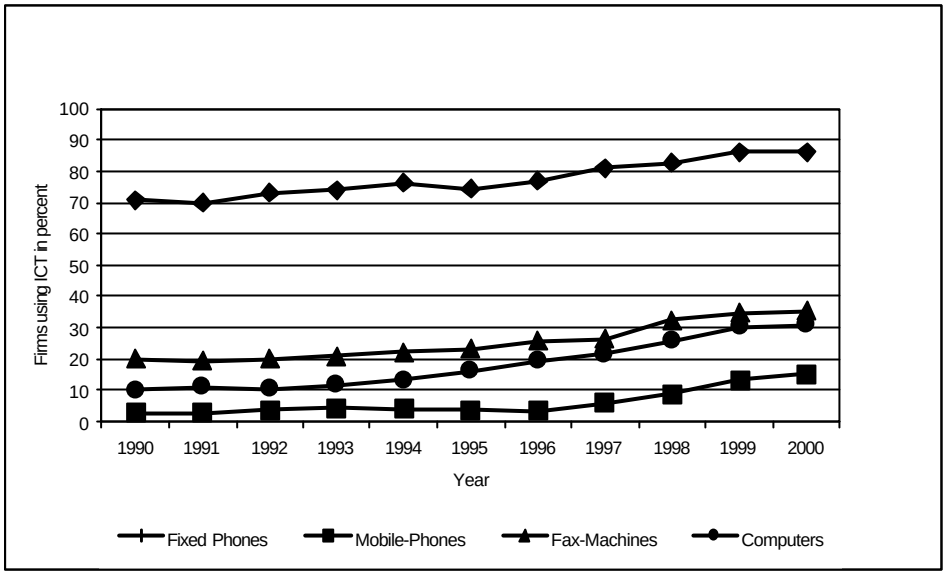
Source: own calculations from East Africa SME survey.

ICT adoption

SMEs usually face a comparatively uncertain environment and entrepreneurs often have a short-term time horizon. Therefore the decision to implement ICT depends on the intuition of the entrepreneur which is subject to his training and experience as well as to his optimism or pessimism with respect to policy changes and economic conditions in the future. Therefore the adoption decision is determined not only by enterprise characteristics but also by characteristics of the entrepreneur and the environment the enterprise operates in. This explains why not all potential users introduce the different ICT technologies at the same time despite its advantages.

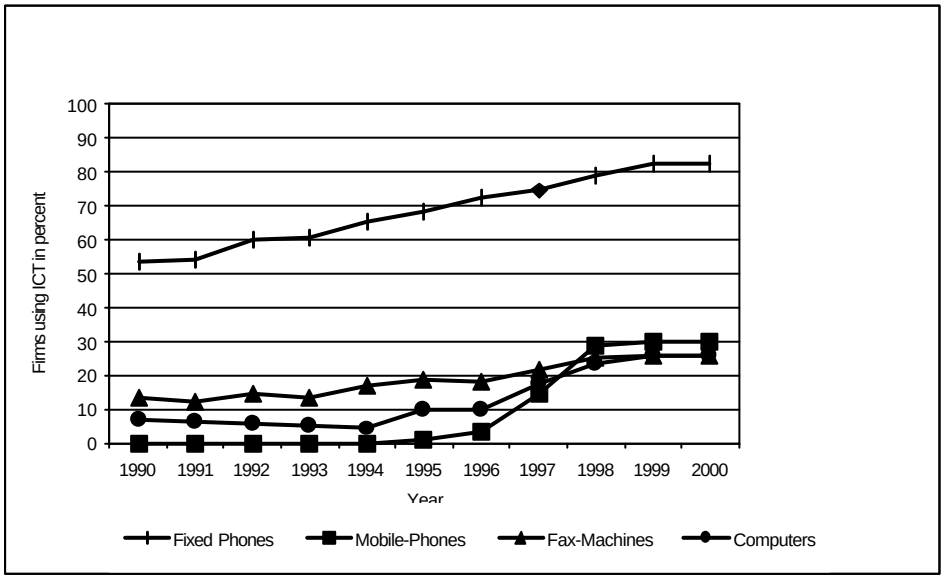
Technology adoption research shows in almost all cases, especially in network technologies such as ICT, that S-shaped adoption curves can be observed as in Figure 4. The diffusion of an innovation starts slowly with a few early adopters. As the benefits of the new technology can be observed by others the diffusion and the speed of penetration increases. When most potential adopters have the new technology the speed of diffusion decreases again until the saturation level is reached, where entrepreneurs might not see a benefit of the new technology but fear to have a disadvantage if they don't use it (Müller-Falcke 2001).

Figure 4a: Diffusion of ICT in Kenyan SMEs, % of firms using different ICTs



Source: own calculations from East Africa SME survey.

Figure 4b: Diffusion of ICT in Tanzanian SMEs, % of firms using different ICTs



Source: own calculations from East Africa SME survey.

Our sample shows that the use of ICT by SMEs in Kenya as well as in Tanzania is increasing over time (see Figure 4).[4] The usage of fixed phone lines nearly reaches the saturation point but is still lower in Tanzania than in Kenya. The percentage of firms that uses mobile phones is increasing much faster than the other technologies in all three countries. In Tanzania despite its late start only in 1995 it has already outgrown the usage of fax machines. This picture is in line with the expectations that within the next three to five years the number of mobile phones will be higher than the number of fixed lines in many African countries. This is an example how the use of advanced ICT can help to leapfrog some stages of technology adoption. As computers are still a relatively expensive investment for most SMEs their use, which is slightly higher in Kenya than in Tanzania,

[4] Müller Falcke (2001) observes a similar pattern in India.

increases only slowly but steadily. The question remains now how this improved access to ICT in Kenya and Tanzania will impact on enterprise performance and economic growth.

Table 4: Use of ICT by country and sector

Percentage of Enterprises that:	Tanzania			Kenya		
	Food	Textile	Tourism	Food	Textile	Tourism
Don't have any ICT	22.4	31.9	2.6	18.4	52.8	0.0
Have phone (fixed + mobile)	76.3	64.0	97.4	81.6	45.3	100.0
Have fax	13.6	2.0	74.4	30.6	11.5	66.0
Have computer	3.4	4.0	35.9	2.0	1.9	10.0

Source: own calculations from East Africa SME survey.

Table 4 shows that the different forms of ICT use are not only different by country, which to some extent might be due to difference in costs and availability of services, but also by sector. This might be the result of different cost benefit analyses of the entrepreneurs due to different production and marketing structures in the three sectors. In both countries in the tourism sector the most advanced ICT is used. In tourism, SMEs are mainly tour operators that organise safaris. Flexibility and rapid coordination are especially important in this sector. Mobile phones are used to stay in contact with the drivers. At the same time this is also the sector that is oriented mostly towards foreign customers. Some tour operators have even set up their own web pages and can attract customers directly. The food and textile sector don't differ that markedly with respect to exporting. However in the use of more advanced ICTs, the food sector outperforms the textiles sector.

Empirics of ICT and SME performance

Generally, from the performance perspective, the competitiveness effect of ICTs derives from the impact that ICTs have upon the productivity of the factor inputs. In interpreting productivity in the context of this study, the conception of inputs goes beyond the traditional dimensions, where inputs are typically restricted to labour, physical capital and materials consumed. Inputs can be understood to include human capital such as worker training and education, organisational capital (e.g., supplier relationships, investments in new business processes, etc.), etc. (Brynjolfsson and Hitt 2000). Productivity, as a proxy for competitiveness builds on the universal notion that sustainable success of an enterprise is a function of its ability to deliver (in absolute terms or relative to its competitors) more real value for its customers, without using more factor inputs (also, in absolute terms or relative to its competitors).

Though a necessary condition, high productivity is far from being a sufficient condition for competitiveness. Alongside efficiency in the use of economic resources, competitiveness depends on a host of other considerations related to the production and availing of the right product to the customer. These include among other things, product quality, flexibility in dealing with market differentiation and volatility, and responsiveness in terms of capabilities for innovation and absorption of new technologies as well as adapting to changing customer needs (Meyer-Stammer 1995).

The increased use of ICT in enterprises, that can be observed in our sample (see Figure 4), leads to a substitution of ICT equipment for other forms of capital and labour and may generate substantial returns for enterprises that invest in ICT and restructure their organisation, especially if ICTs are complemented by factors such as education and training.

To capture the effects of ICT use and other factors on productivity we construct a simple model. Following common practice we assume that the production function can be approximated by a Cobb-Douglas production

function (see Brynjolfsson and Hitt 2000; Söderling 2000; Söderbom and Teal 2001).[5] Then gross production output Y can be expressed as the following function of capital K, labour L and material inputs I: [6]

$$Y = A * K^{\alpha} * L^{\beta} * I^{\gamma} \qquad (1)$$

Taking log gives:

$$\ln Y = \ln A + \alpha \ln K + \beta \ln L + \gamma I \qquad (2)$$

The term A can be interpreted as total factor productivity as it captures differences in output across firms that are not accounted for by capital, labour or material inputs. As we are interested in the impact of ICT on productivity we divide investment into investment in ICT devices and other investment to be able to measure the impact of ICT directly. Likewise we divide material inputs into raw materials and intermediate inputs on the one hand and indirect costs (like energy, marketing costs, transport etc.) on the other hand.

Furthermore it is assumed that total factor productivity is affected by other variables such as skill intensity of labour (sil) and age of the enterprise (age) through a simple log linear function:[7]

$$\ln A = \delta sil + \eta age + \varphi age^2 \qquad (3)$$

Substitution then gives:

$$\ln Y = \alpha \ln K + \beta \ln L + \gamma \ln I + \delta sil + \eta\ age + \varphi\ age^2 \qquad (4)$$

By estimating this equation the determinants of TFP can be determined. Economies of scale can be directly identified from the coefficients of the production inputs.

The Data

The data used in this study was collected from 150 SMEs in Tanzania and Kenya each, distributed equally in the food processing, textile and tourism sectors. The data collection exercise lasted from November 1999 to May 2000 and collected data up to 1999 on general firm characteristics and performance indicators, special ICT usage information and opinions of the entrepreneur about factors that influence firm performance and business obstacles. The interviews were carried out by students who approached each enterprise directly and filled out the questionnaire together with the manager of the enterprise who was usually also the owner. To complete one questionnaire took approximately one hour. A number of managers were reluctant to give out financial data so the number of questionnaires that could be used for the statistical analysis was reduced. The sample enterprises were randomly selected from major commercial corridors in the countries. The two key considerations in the determination of the sample regions were their economic significance, and their ability to proxy fairly for the SME sector. The selected commercial corridors are the Lake Zone, the Coastal Zone, and the Arusha Region in Tanzania and the Coastal Zone and Lake Zone in Kenya.

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5 The Cobb-Douglas functional form has the advantage that it is the simplest form that enables calculation of the relevant quantities of interest without introducing so many terms that the estimates are imprecise.

6 Adopting a value added production function can lead to misspecification if there is imperfect competition or increasing returns to scale (Basu/Fernald 1995). As the proportion of material inputs in outputs varies considerably in our sample we choose to use output as the dependent variable in the production function following the approach used by Koski (1999) to estimate the effects of network technologies.

7 Söderbom and Teal (2001) argue that this specification of the skills effect is preferred because of experimental results to a logarithmic form as in the usual specification where skills are treated as a form of human capital and therefore modelled in analogy to physical capital. An inverted u-shaped form of the relationship between firm age and productivity is also often found empirically (Söderbom/Teal 2000).

In Tanzania of the 148 enterprises which had consistently plausible data, 34 did not use information and communication technologies at all. The remaining had invested at various levels in at least one of the ICTs. An additional 41 enterprises only use phones with fixed lines and only a minority uses more advanced ICTs as mobile phones or computers.

For Kenya the picture is a bit different as one would expect because of the better overall infrastructure and level of development. However,42 enterprises out of 150 do not use ICT at all and the majority also uses only phones with fixed lines for communication but a higher number than for Tanzania uses fax and computers. The high number of mobile phones in Tanzania might be due to the bad quality of the fixed lines (see Table A1).

In Tanzania 56.5 percent of all sample enterprises invest not more than US $ 200 in ICTs facilities like phones, computers, etc. This puts a high number of enterprises below the critical mass in terms of investments in ICTs. One should bear in mind that given the low level of investment capital already the purchasing of one mobile phone can lead to relatively high shares of ICT investment. This is one explanation why Tanzanian enterprises invest on average a higher percentage in ICT. The limited resources of the enterprises and the high costs of procuring and using ICTs seem to be the major factors that hinder the diffusion of ICTs. This explanation was given by 91 percent of the enterprises which do not use computer-dependent ICTs. Non-possession of computers is attributed to the high costs of hard- and software (80 percent) and high labour costs of computer-skilled employees (62 percent). Besides, close to 72 percent of the sample enterprises did not even see the use of computer-dependent ICTs. This could manifest limited business skills, or a product market situation where such lower order sources of competitiveness, as cheap labour, are still dominant. It is noteworthy that enterprises that don't use ICT or only telephone have a workforce with less years of schooling in both countries. They are generally less export oriented and also more labour intensive than the enterprises that use more advanced forms of communication (Matambalya 2000).

These differences can be partly explained by sector characteristics (see Table 5). For example average years of schooling are highest in the tourism sector in both countries and this corresponds with the use of more advanced ICTs and a higher export orientation. The biggest enterprises are in the food processing sector, whereas the tourism enterprises are on average older. This is due to a different production structure that requires a bigger minimum capacity to become productive in the food processing industry. The tourism sector is more succesful in the sense that enterprises seem to survive longer.

Table 5: Enterprise characteristics by country and sector (averages)

	Tanzania			*Kenya*		
	Food	*Textile*	*Tourism*	*Food*	*Textile*	*Tourism*
number of employees	14.2	8.9	12.2	24.3	10.0	19.8
average years of schooling of workforce	9.0	9.6	11.5	11.0	10.6	12.0
age of enterprise	6.2	7.8	8.2	10.0	10.7	11.3
rank of ICT use [a]	2.5	2.1	4.7	2.8	1.8	4.3
ICT Investment per employee (USD)	53.1	43.9	401.7	49.7	431.4	432.8
% of exporting firms	16.3	15.2	46.0	11.9	22.0	30.8

a this index is constructed on the basis of different ICT applications: 1-fixed phone, 2-mobile phone, 3-fax, 4-email, 5-Internet

Source: own calculations from East Africa SME survey

The sample data also reveal some linkages between size and performance. Value added per employee is lower for enterprises with less than 30 employees in Kenya. However, wage costs per employee are not lower for smaller countries which together with less years of schooling in the Tanzanian case makes smaller enterprises less competitive. Smaller enterprises are also more often non-exporting in both countries. They invest less in ICT relative to total investment. Hence, fixed costs of production and marketing may pose constraints for smaller enterprises. Also, size may be proxying other factors that influence performance, e.g., technological complexity, skill intensity of management, ability to process export markets, capacity to invest in labour force training, etc.

(Harding and Teal 1999). In terms of product markets, less than 1/3 of the enterprises are directly involved in export business. However, from Table A1 it can be assumed that the use of more advanced ICTs will help the SMEs to overcome some export obstacles as SMEs that use fax, email and Internet are more likely to export.

For the interpretation of the results of our study, skills are also relevant. For instance, education improves human resources, and the skills won through it are likely to impact on the ability of the enterprises to adopt advanced technologies including ICTs. Notably, schooling has allocative effects as it increases the ability to deal with disequilibria, e.g. changing factor and product prices (Weir 2000, Shultz 1975). Also, cognitive skills enhance the ability of entrepreneurs to access and use productivity-enhancing knowledge, and to adopt more positive attitudes towards modernisation and risk-taking (Weir 2000).

Results

The estimation of the modified production function (4) enables us to examine the determinants of TFP. The results of the regression analysis are displayed in Table 6. The results were obtained after excluding five outliers for the Tanzanian dataset. Besides the regressions by country, a regression on the pooled dataset was run also, to make use of the larger number of observations. However, the results indicate that the production technologies used are too different in the two countries and therefore the number of significant parameters drops. As productivity usually varies across sectors we have included sector dummies in the regression. The regional dummy is equal to one for enterprises located in the capitals Dar es Salaam and Nairobi. This dummy should capture some of the determinants of productivity outside the influence of the enterprise. As the correlation between the independent variables are relatively low (between –0.5 and 0.5 Pearson correlation coefficients, except for sector dummies) and auxiliary regressions among the independent variables have not too high R^2 multi-collinearity seems to be not problematic.

The coefficients for labour, capital (ICT plus other) and material inputs which can be directly interpreted as elasticities of output are all significant and add up to one for Kenya which implies that the assumption of a Cobb Douglas production function is plausible and no economies of scale exist.[8] For Tanzania not all input coefficients are significant (production material and ICT investment are not) and the sum of the significant coefficients equals 1.182 which indicates the presence of some scale economies. In Tanzania production is more labour intensive as would be expected from a relatively less developed country. The sum of the two investment coefficients is higher for Kenya than for Tanzania but the biggest difference can be observed between the coefficients for production material inputs. It can be concluded that the higher levels of labour productivity of larger firms are due to their higher capital intensity and do not reflect their greater use of skilled labour.

The investment in ICT has a significant positive influence on productivity only in Kenya. That might be due to lower transaction costs, e.g. for information for purchasing inputs as well as distributing output. Furthermore it could be partly attributed to a more efficient production process and a better resource allocation within the enterprise. This observation is in line with the findings of Brynjolfsson and Hitt (2000) and others for developed countries that suggest that ICT (use and investment) is positively linked with output and productivity. However, the mechanisms and direction of causality is not clearly established as firms with good performance are likely to spend their windfall on ICT equipment maybe also for prestige reasons. The elasticities for investment in ICT and other investment don't differ much for the Kenyan case which means that given the fact that the share of ICT in total investment is below 10 % on average, an additional investment in ICT in absolute terms will be more productive.

[8] This finding confirms the enterprise studies on Ghana by Söderbom and Teal (2001) where also no scale economies were found.

Table 6: Estimation of a production function

Dependent variable: ln (output)

	Kenya		Tanzania		Pooled sample	
Variable	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Constant	1.792*	[5.613]	1.901**	[2.242]	2.864*	[5.727]
Ln production material	0.471*	[10.279]	0.050	[1.281]	0.109*	[4.034]
Ln other inputs	0.226*	[5.080]	0.251*	[3.912]	0.256*	[5.617]
Ln number of employees	0.143**	[2.048]	0.815*	[3.993]	0.364*	[3.192]
Ln invested capital - ICT	0.090^{+}	[1.834]	0.116^{+}	[1.832]	0.150*	[3.086]
Ln ICT investment	0.069**	[2.586]	-0.015	[-0.308]	0.021	[0.645]
Average years of schooling	-2.372	[-0.995]	0.092	[1.484]	0.048	[1.340]
Age of the enterprise	-1.731	[-0.860]	-0.041	[-1.223]	-0.010	[-0.408]
Age squared	1.028^{+}	[1.662]	0.001	[0.984]	0.0002	[0.233]
Textiles sector (dummy)	0.142	[1.121]	-0.411^{+}	[-1.773]	-0.270^{+}	[-1.714]
Tourism sector (dummy)	-0.082	[-0.646]	-0.194	[-0.612]	0.094	[0.520]
Location in capital (dummy)	0.311**	[2.074]	-0.997*	[-4.883]	-0.653*	[-4.398]
Country = Kenya (dummy)					-0.595*	[-3.263]
No. of observations	84		114		198	
Adjusted R^2	0.923		0.582		0.645	

Note: Significance at the 1 per cent, 5 per cent and 10 per cent level is indicated by *,** and $^{+}$ respectively.
Source: authors' own calculations.

For both datasets the regional dummies are significant but with opposite signs. In Kenya SMEs in Nairobi seem to be more productive than in the Lake Zone. This is in line with the expectations as infrastructure in the capital tends to be better than in the rest of the country. In Tanzania however SMEs in Dar es Salaam are less productive than on average. This might be due to the fact that Arusha which even has its own airport has a better infrastructure than the capital. For example a higher share of enterprises uses mobile phones and computers in Arusha than in Dar es Salaam. Furthermore enterprises from the tourism sector are concentrated there and these tend to be more productive. For the pooled regression the country dummy was significant which means that Kenyan enterprises are less productive than Tanzanian ones. This is counterintuitive to the more advanced level of development of the country but could be due to the fact that given the same conditions in terms of inputs the less dynamic situation and the adverse political environment described above (see Figure 4) have a negative impact on productivity.

The results of the regressions are fairly robust with respect to the variables included. However a number of variables that were expected to impact on productivity were not significant for neither Kenya nor Tanzania. Among these were age (squared age is only significant at the 10 % level in the case of Kenya which indicates that older enterprises might be more productive) and skill intensity of the labour force (measured by average years of schooling). With respect to age there can be several reasons why this variable that usually has a relatively big impact on productivity as it is connected with more experience of the entrepreneur and therefore proxies human capital is not significant in our case (Biggs and Srivastava 1996, Söderbom and Teal 2000). As the use of ICT is associated with more human capital already this effect could be captured by the ICT variable.

On the other hand in accordance with the vintage capital theory older enterprises tend to use older technologies and therefore the two effects could compensate each other.

Conclusions

Our descriptive and regression analysis of the data on SMEs in Kenya and Tanzania show clearly that investment in ICT is one important determinant of total factor productivity once a certain threshold is passed. As the use of different levels of ICT - telephone, fax, mobile phone and computer - is linked to the level of education of the workforce we assume mutually enforcing effects.

One important feature of ITC is that it is a network technology and therefore positive externalities should occur. With our dataset we were not able to find such effects. Probably some of it is hidden in the location dummies as infrastructure tends to be more improved in the capital. Furthermore the enterprises in the sample are rather competitors and might have only little buyer-seller relationships where reduced information costs will play a big role. Furthermore it can be assumed that a certain threshold of ICT diffusion, that has not been reached in East Africa yet, is needed to observe these external effects.

A factor which limits the above analysis is that there may be a substantial time lag between ICT investments and their effects. Thus it is possible that lack of an ICT effect may simply reflect the time lag before investments in these technologies begin to payoff. Additionally, the approach with a sole focus on productivity may be too narrow. ICT technologies may exert their influence through product-quality improvements, through improved services and especially through improved networks. A further investigation with a second round survey could reveal further the links between ICT and SME competitiveness and may provide additional impetus for investments.

Most African countries have ICT development plans or even e-commerce programs in place or have the intention to develop them. Also the donor community is rather enthusiastic about the role of ICT for development as it can facilitate participation of the formerly excluded in all kinds of interaction, from democratic processes to markets. However, as our empirical results and other considerations show the use of ICTs is at best one factor amoung others that improves firm performance. Therefore ICTs should not be regarded in isolation as this as well as other research shows that access to credit, managerial and other skills, infrastructure, rule of law etc. are at least as important as information and ICT.

In South Africa a number of bigger enterprises and also a significant share of SMEs is alredy involved in e-commerce. Financial services are available in principle on-line and include for example Electronic Banking. Furthermore, e-Commerce (however defined) is now the leading new investment area in the Top 200 IT users in South Africa. As other institutions that are necessary for enterprise development such as banking, trade infrastructure, enforceability of contracts are relatively well developed, the potential benefits of using ICTs in rural SMEs will be higher for South Africa than for the survey countries.

One important aspect of access to ICT is the high cost of devices and services in many African countries. In this respect liberalisation and privatisation that ensures competition will be the most important step to increase the use of ICTs by all possible users. Special priority should be given to the telecommunications infrastructure as this can be easily used also by less successful SMEs and even poor households have a relatively high demand (Torero 2000). Therefore in addition to private supply some support for disadvantaged regions might be rectified. For an initial period also the attempt of the South African government to the use of special line rates for Internet using businesses in disadvantaged areas as a possible access step might be helpful.

When designing support programs for SMEs to increase the use of ICTs one has always to bear in mind that access to new information that can be used by the enterprise is the goal, not introduction of technology. This should also be mirrored in training courses where enterprise goals such as improved marketing or accounting should be in the center and use of Internet or computers should be introduced as one tool to reach that goal. The provision of high quality courses instead of self-taught skills development that is currently done will help to increase efficiency not only in ICT use (Duncombe and Heeks 2001).

To increase access to useful information ICT intermediaries could also play a key role, as they are able to add value to the information they provide. This role could be played by non for profit organisations such as business organisations, SME associations etc. as they are aware of the information needs of small enterprises and can at the same time help to form and increase networks that will increase access to information about best practices of operation, market prices at different locations, sources of supply of inputs etc.

Also of importance for small enterprises are government sites where regulations and support programs can be found. In this respect South Africa has already achieved a lot in contrast to most other African countries where content of government sites is still very little. In addition to the time saving of enterprises this publicly accessible information could increase transparency and therefore reduce also other business obstacles.

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Table A1: Sample characteristics by use of ICT

	Kenya					Tanzania				
ICT use	*no N=42*	*phone N=44*	*fax N=14*	*mobile N=8*	*computer N=45*	*no N=34*	*phone N=41*	*fax N=2*	*mobile N=32*	*computer N=39*
Number of employees	5.5	13.4	19.7	28.4	28.7	7.8	10.6	26.0	11.3	16.2
Years of schooling	10.6	11.0	12.2	11.6	11.5	8.6	9.4	9.9	9.5	11.9
Wage cost per employee	259.36	96.19	159.85	137.26	209.57	374.77	383.42	40.56	460.34	735.40
ICT-Share in total investment	0	5.69	5.54	5.71	10.25	0	10.38	10.04	12.87	26.47
Age of enterprise	9.6	10.4	10.1	15.0	11.4	6.2	8.1	1.5	7.4	7.4
Value added per employee	305.75	255.29	945.53	323.99	637.89	13391.72	2515.71	n.a.	40948.87	10143.24
Value added per total investment	4.66	2.70	1.73	0.75	2.50	97.84	67.13	78.89	263.13	6.50
Non-exporting in %	95	93	58	62	56	91.2	85.4	50.0	81.3	64.1
Total investment per employee	157.3	185.8	879.0	959.4	659.6	220.19	357.62	12567.61	1887.02	5247.66

Source: own calculations from East Africa SME survey.

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