

## Summary

The thesis explores the importance of the strategic application of Information and Communication Technologies (ICTs) to Sub Saharan African (SSA) economies to enhance growth opportunities in the region. It explores the properties of satellites as an easily expandable connectivity infrastructure to build a satellite based endogenous growth model that demonstrates theoretically the growth potential that mass connectivity holds for infrastructure-poor SSA. The thesis then empirically investigates these effects by first looking at communication costs and their impact on trade in SSA, and then studying the effects of access to telecommunications infrastructure in South African municipalities vis-à-vis the amount of wealth created per municipality. Aggregate household income is used in this study as a proxy for wealth created in a municipality.

One of the main questions posed by the study is whether the strategic and accelerated diffusion of ICTs in Africa will lead to accelerated growth in key economic sectors leading to general economic growth and development in the region. In trying to answer this more generic question some specific questions are asked pertaining to the role and effect of satellite technology on economic growth on the continent, as the backbone of international communications in sub-Saharan Africa. The employment of satellite technology as an overarching infrastructure backbone for strategic ICT applications in Africa may have the potential to accelerate the diffusion of ICTs and contribute immensely to the economic growth and development of African economies. But satellite communications are expensive technologies and African countries are currently dependent on international satellite systems that charge very high premiums for their services leading to relatively high cost of ICT services on the continent. As alternatives to satellite continue to roll out on the continent, it is important to note how the cost of access will change compared to current levels. This leads to the question of whether high communication costs actually affect trade outcomes in sub-Saharan Africa and how much access to communication infrastructure actually affects income generating activities in geographically defined communities. The following is a chapter by chapter summary of how the research is organized:

After a brief overview of the problem and the origin of the idea of the thesis in Chapter One, an introduction of the basic ideas of satellite technology is given in Chapter Two. The chapter also provides an overview of the state of satellite technology in Africa and the competition playing between satellites and other technologies, especially undersea fibre optic cables.

In Chapter Three we build a satellite based endogenous growth model on the premises that

1. regional connectivity matters for growth and that
2. satellite technology easily achieves widespread instantaneous connectivity between regions over very large geographical areas.

We review the literature on connectivity and growth and then build an endogenous growth model based on the provision of connectivity and transport infrastructure. Communities become connected through communications and transportation infrastructure and get the possibility to trade in specialized goods and services. This trade leads to overall growth in the economy. In the model, provision of communication infrastructure is a necessary condition for growth to occur. This growth stems mainly from the assumption of boundless imitation capabilities in the connected communities

and an increase in the number of varieties that members of a connected community can consume. We find that reduction of transportation and communication costs lead to a higher growth rate of connected communities. The largest growth effect was observed for the case of reductions in the cost of making new connections. This result points to the importance of the size of the network of connected communities. The size of the communities themselves was also found to be important for growth

Chapter Four discusses the pros and cons of competing technologies on the continent and shows the practical advantages of connectivity by satellite that are assumed in Chapter Three. An evolutionary approach is taken starting with a brief history of international communications in Africa. Different ICT services are discussed, in each case emphasizing how these are affected by satellite connectivity in Africa. In addition a detailed comparison between satellite and fibre optic technology is carried out laying out the pros and cons of each and why one or other of the two technologies may not be the solution to connectivity problems facing SSA.

Chapter Five follows through with an empirical investigation of economic growth through trade in sub-Saharan Africa using an enhanced gravity model approach. Data on exports, international telephone charges, monthly subscriptions for internet and the number of outgoing calls from a country in 2007 are analyzed in the gravity setup. The results suggest that communication costs are important to trade and that these costs are negatively affected by satellite connectivity in Africa.

Chapter Six investigates the relationship of telecommunications access in general to household income in municipalities in South Africa. Here we question the importance of access to ICT infrastructure through radios, computers, television sets and telephones (both fixed and mobile) to per capita household income in municipalities in South Africa. We find that higher access to telecommunications infrastructure has a positive effect on per capita household incomes in South African Municipalities.

Chapter Seven shows how particular efforts to provide services in Africa using satellite connectivity have fared. We discuss the case of Worldspace Incorporated, a satellite digital radio service company; the case of Multichoice, a satellite TV provider and also have a look at various tele-medicine projects on the continent, particularly the Virtual Doctor project in Zambia.

Chapter Eight summarizes our findings and proposes policy recommendations and avenues for future research.

The importance of this research lies in the realization that in order for ICTs to make a meaningful contribution to economic growth in Africa, there is a need to contain and reinvest resources in the sector on the continent. African service providers need to curb the drain of meager resources to foreign satellite and fibre optic providers, so that they can compete favorably with international telephony pricing and extend their services to hard-to-reach rural areas as well, where services like tele-medicine have failed to take root and contribute positively partly because of high connectivity charges.