



Total factor productivity growth in Uganda's telecommunications industry

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ABSTRACT

The telecommunication sector is usually thought to be characterized by high productivity growth rates arising from increasing returns to scale. The actual productivity patterns in the sector, however, need to be empirically determined. A panel data set was assembled and a common set of input and output indicators was constructed to support the estimation of the Malmquist Total Factor Productivity index via input-oriented Data Envelopment Analysis. A general specification encompassing all available input and output data was employed to obtain the average total factor productivity changes for the sector. Over the study period, there was total factor productivity growth in Uganda's telecommunications industry, which was mainly due to technical or technological progress as opposed to technical efficiency. These results indicate the existence of a potential for tariff reduction via the X-factor in the price cap formula.

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1. Introduction

The pattern of total factor productivity in the telecommunications industry has attracted considerable attention in the literature following the practice of liberalisation and privatisation in many parts of the world. Productivity patterns provide a critical input in computation of the X-factor, which can be used to correct market failures in the industry. Market failures in the telecommunications sector largely arise from increasing returns. The ensuing productivity increases should ideally, at least in part, be passed on to the consumers. However, due to imperfections in the market, firms will not have sufficient incentives on their own to pass on the gains in productivity to final consumers. It is the need to curb these incentives that brings telecommunication regulation into the picture.

There is now almost universal consensus that price-based incentive regulation is more suited to mimic the efficient market outcomes as compared to other approaches. The basic regulatory apparatus employed in almost all incentive regulatory practices is the price caps approach. Price caps are set by regulators and permit telecommunication operators to adjust their prices upwards within certain predetermined ranges reflecting increases in inflation and other exogenous factors such as increased taxes. At the same time price caps allow possibilities for improvement in consumers' welfare over time to reflect growth in total factor productivity. The welfare improvement resulting from total factor productivity growth is commonly referred to as the X-factor or the productivity offset. These components of the price cap formula need to be empirically determined both for regulatory and other general policy purposes.

Whereas information pertaining to inflation expectations and other components of the price cap formula such as exogenous variations in tax rates can easily be predicted at the aggregate macroeconomic level from the overall monetary and

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fiscal policy stance, total factor productivity for regulatory purposes on the other hand, needs to be measured. Presently however, the patterns of the telecommunications industry productivity in Uganda are not known.¹

There are reasons why undertaking a study of total factor productivity patterns in Uganda's telecommunications industry is important. The country has in the recent past moved fast to implement reforms and create an enabling environment to hasten the spread and adoption of telecommunication services. The single most important reform has been the dismantling of a state monopoly that previously dominated the provision of telecommunication services so as to encourage competition and expand the variety and coverage of telecommunication services. As a result, 70% of the land area is now covered by fixed and or mobile telephones. The telephone penetration levels have increased from a dismal 0.26 per 100 inhabitants in 2001 to 10.34 per 100 inhabitants in 2006.

Telecommunication services expansion is usually associated with increasing returns to scale due to the rapid rate of technological innovations in the sector, and lower input price inflation due to decreasing unit costs of processing, switching and transmission. From a regulatory (or policy) perspective, therefore, it is important to provide insights into how efficiently the major players in Uganda's telecommunication industry have used the various inputs during the expansion process as well as the drivers of the productivity patterns.

After the introduction, the rest of this paper is organised as follows: Section 2 presents the major reforms that have taken place in the sector during the liberalisation era and draws out implications for total factor productivity growth and regulation. This is followed by a discussion of the total factor productivity growth measurement in Section 3. The methodology of the study is presented in Section 4 followed by the empirical results in Section 5. The paper ends with concluding remarks and policy implications in Section 6.

2. Telecommunications industry reform and regulation in Uganda

This section presents the major reforms and presents the structure of the telecommunication industry in Uganda. It then draws out implications for productivity growth and regulation. The main policy thrust with respect to the telecommunication sector over the past decade has been to promote its rapid growth and expansion to cover most parts of the country. This reflects the government's recognition of the synergies and positive feedback effects that exist between a well-developed telecommunications sector and economy wide productivity growth.

In the early years that followed attainment of political independence, Uganda pursued a system with a proactive state. Indeed, until the early 1990s the telecommunications sector was comprised basically of the incumbent state monopoly, the Uganda Posts and Telecommunications Corporation (UPTC). The reform process kicked off in the early 1990s and has been largely focused on attracting private investment into the sector. The first private telecommunication company in the Ugandan market, Celtel (Uganda)—now Zain (Uganda) was licensed in 1993 to provide mobile telephone services.

The period after 1996 witnessed implementation of additional measures that sought to reduce state dominance in the sector. The incumbent state monopoly was dismantled and subdivided into three smaller and more specialised units, namely Uganda Post Limited, Uganda Telecommunications Limited and Post Bank Uganda Limited. Other private companies have also been licensed in order to promote competition. At present there are two national telecommunication operators working on a license that allows provision of all telecommunication services. There are three cellular operators and a couple of public pay communication providers reselling the services of locally licensed operators, and three licensed third party network providers that provide private data and voice services.

The reforms have resulted in increased competition among the service providers and have seen the rolling out of telecommunication services to most parts of the country. All districts and 80% of sub-counties in the country have a point of presence of telecommunication services reflecting increased network coverage.

The process of expansion in the telecommunication industry is usually expected to be associated with much higher productivity rates relative to other sectors of the economy due to the higher than usual rate of technological innovations in the sector and lower input price inflation due to decreasing unit costs of processing, switching and transmission. The efficiency with which service providers have influenced the resource inputs (such as the cost of investments, non-wage operational costs and staff costs) in their expansion operations in Uganda's case is not clear. In the event that there has been total factor productivity growth, it would also be important to understand its drivers as this can originate from different sources (Fare, Grosskopf, Norris, & Zang, 1994; Giuffrida, 1999). First, the technical efficiency of an individual organization may change, at a given scale of operation. Second, the efficiency of the organization may change in response to a change in the scale of operation. Finally, the underlying technology may change, thereby inducing a shift in the production frontier, which will affect the efficiency of all organizations. Empirical evidence on total factor productivity patterns as well as its underlying drivers is provided in Section 4.

The ever increasing level of competition that has followed liberalisation in the sector is theoretically expected to induce firms to become highly innovative and to set prices that are competitive. This in turn, is expected to be reflected in increased consumers' welfare² as they share in the ensuing productivity gains. However, due to market imperfections firms will not

¹ Indeed, with the exception of *Bollou and Ngwenyama (2008)*, there is no other African study which has addressed the issue of total factor productivity growth in the telecommunications industry.

² This can take the form of lower prices and better quality services.

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