

Chapter 7

Analyzing Africa's Total Factor Productivity Trends: Evidence from the DEA Malmquist Approach

Chali Nondo

Massachusetts College of Liberal Arts, Adams, USA

Juan R Jaramillo

Adelphi University, Garden City, USA

ABSTRACT

Using data envelopment analysis (DEA), the authors investigate the productivity changes of 42 African countries by computing the Malmquist productivity indices. Subsequently, the measured Malmquist productivity indices become the dependent variables of a pooled truncated regression. The point estimates of the Malmquist indices indicate that TFP improved at an annual rate of 1.97% over the period 1992-2007. The decomposition of TFP shows that the major contribution of TFP growth is technological progress. Nevertheless, technical efficiency also appears to be trending upwards. Therefore, these results suggest that contrary to the dominant view in previous studies, Africa's TFP since the early 1990s has been accompanied by positive technological change rather than stagnation. The second stage results suggest that improving the quality of human capital and FDI not only augments the quality of labor, but also indirectly improves TFP. Regression results also show that an increase in openness positively affects TFP growth as this facilitates adoption of more efficient techniques of production.

INTRODUCTION

Recent data from the World Bank indicates that since the mid-1990s, several African countries have experienced robust economic growth. Accordingly, between 1995 and 2007, African economies grew at an average of 4.3 percent compared to the world average of 3.17 percent. To that end, the importance of improving and sustaining economic growth cannot be over emphasized given that African countries

DOI: 10.4018/978-1-7998-3019-1.ch007

have committed to implementing the 2030 Agenda for Sustainable Development (SDGs), which, among other things, aims at reducing poverty and promoting efficient utilization of factors of production.¹ Both cross-country analyses and country case studies provide overwhelming evidence that rapid and sustained growth is a powerful strategy for reducing poverty (Agarwal, 2008; Sachs and Warner, 1997).

Endogenous growth models emphasize how human capital, research and development, education, government policies, physical capital, spillover effects, and institutional factors affect a country's productive process and future income growth (Grossman and Helpman, 1991; Lucas, 1992; Romer, 1987 and 1990). A plethora of studies has suggested that low TFP has impeded the growth potential of many African countries (Ndulu and O'Connell, 2008; Block, 2001). Undoubtedly, increasing investment and boosting total factor productivity are the core issues that African countries must address.²

Albeit the vast research on productivity changes in Africa, there appears to be no consensus within the empirical literature on the pattern of TFP and determinants of Africa's TFP growth. The analysis by Fuglie and Rada (2013), Block (2010), Alene (2010), and the IMF (2008), among others, present some evidence of improved TFP on the African continent. On the other hand, some researchers do not find any systematic evidence of productivity improvement across the African continent (Bosworth and Collins, 2003; Collier and Gunning, 1999; Ndulu and O'Connell, 2009). Further, Devarajan, Easterly, and Pack (2003) contend that it is the low TFP rather than the level of investment that has constrained African growth. Similarly, there also appears to be some ongoing debate on the sources of Africa's productivity growth. Some studies suggest that technical change is the main source of productivity growth while others indicate that improved efficiency changes or the catch-up effect explains major changes in Africa's TFP (Fulginiti, Perrin and Yu, 2007; Nkamleu, 2004; Alene, 2010).

To this end, previous studies have inarguably provided a good understanding of the productivity trends in Africa. Nonetheless, the focus of previous studies has been largely on agricultural productivity, and the majority of these studies have grouped African countries together with non-African countries (Kumar and Russell, 2002; Krüger, 2003; Alene, 2010). However, owing to the differences in economic conditions and production technology between African countries and non-African countries, these studies may offer erroneous policy recommendations.

To close the gaps in the existing literature, the aim of this study is to analyze the cross-country TFP changes on a panel of 42 African countries by using the Data Envelopment Analysis (DEA) Malmquist productivity index approach. As such, we adopt Färe et al.'s (1994) application of the DEA-Malmquist technique on panel data to calculate the cross-country TFP change. Overall, the contribution of this study is threefold. First, we estimate the TFP of 42 African countries and determine the sources of productivity change by decomposing TFP in technological change and technical efficiency.³ The second contribution of this study is that we classify African countries according to their income level (level of development), based on the World Bank, World Development Indicators (World Bank, 2007). In practice, we present stylized differences in TFP growth among different income groups for African countries.

Third, to mitigate the potential bias in DEA estimates and hence make a meaningful statistical inference, we construct confidence intervals for TFP indices using Simar and Wilson's (2007) bootstrapping and truncated regression procedure. To our knowledge, this is the first study that takes a cross-country approach for a group of African countries and applies the two-step estimation approach. By taking this approach, we effectively assess the significance of capital accumulation (physical and human), foreign direct investment (FDI), information and communication technology, macroeconomic stability, and institutional quality in stimulating TFP. In an attempt to account for reverse causality and multicollinearity,

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/analyzing-africas-total-factor-productivity-trends/253141

Related Content

Ethical Appraisal of the Role of Civil Society in Nigeria: Pathway for Social Inclusion and Sustainable Development

Essien D. Essien (2016). *International Journal of Civic Engagement and Social Change* (pp. 23-38).
www.irma-international.org/article/ethical-appraisal-of-the-role-of-civil-society-in-nigeria/161599

The Black Academy: A Renaissance Seen Through a Paradigmatic Prism

Mark Rose (2020). *Indigenous Studies: Breakthroughs in Research and Practice* (pp. 389-406).
www.irma-international.org/chapter/the-black-academy/239770

Bollywood Sporting Spectacles: Indian Premier League Cricket as a Bollywoodized Media Event

Sony Jalarajan Rajand Rohini Sreekumar (2016). *Global Perspectives on Media Events in Contemporary Society* (pp. 211-223).
www.irma-international.org/chapter/bollywood-sporting-spectacles/146626

Mitigating Ethno-Cultural Differences: Ethical Guidelines for ICT Development in an Indigenous Community

Hasnain Falakand Tariq Zaman (2020). *Indigenous Studies: Breakthroughs in Research and Practice* (pp. 312-324).
www.irma-international.org/chapter/mitigating-ethno-cultural-differences/239765

Boycott and Buycott as Emerging Modes of Civic Engagement

Emmanuel Adugu (2014). *International Journal of Civic Engagement and Social Change* (pp. 43-58).
www.irma-international.org/article/boycott-and-buycott-as-emerging-modes-of-civic-engagement/122440