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Abstract

Research suggests that adaptations of advanced-economy business models to challenging base of the pyramid (BoP) market conditions involve experimentation. We analyze the conditions that facilitate developing country entrepreneurs to learn about business models and the incentive of local and multinational firms to carry out experiments for BoP adaptations. We test our frameworks' implications on the evolution of the mobile telecommunications industry across Africa. Contrary to the economic models that posit one-directional investments from the North to the South, our findings suggest a two-step industrialization process. The spillover of modern-industry knowledge from the North through Joint Ventures enables a few entrepreneurial firms in the South to gain access to valuable knowledge with which they actively experiment and, through successful BoP adaptations, gain ownership advantages and further internationalize across the South, catalyzing the growth of the industry. Overall, the thesis shows how these entrepreneurial firms with a particular heritage are at the core and explain most of the development of the mobile industry in sub-Saharan Africa.

This thesis further explores the factors that influenced the diffusion of mobile telephony in Africa. Whereas prior research has focused on the role of country and industry characteristics in country-level measures namely the adoption rate of new products and services, price, total investment and employment in related sector, this thesis examines whether such patterns across countries can be influenced by the heterogeneity in quality of firms that enter in those countries. The thesis also presents a set of detailed case studies of pioneering companies, including two of these key entrepreneurial firms with heritage.

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Introduction

Africa has always been plagued with national challenges. Most countries in Africa have weak infrastructure, poor institutions, rank highly on corruption index, suffer from low human capital and experience frequent political turmoil. And yet, across all countries in Africa there has been a rapid growth of mobile telecommunication services both in terms of the total number of mobile subscribers and mobile penetration rate (Figure 1). How did Africa, devoid of several preconditions of growth perceived by the modern economist, manage to achieve a telecommunication miracle?

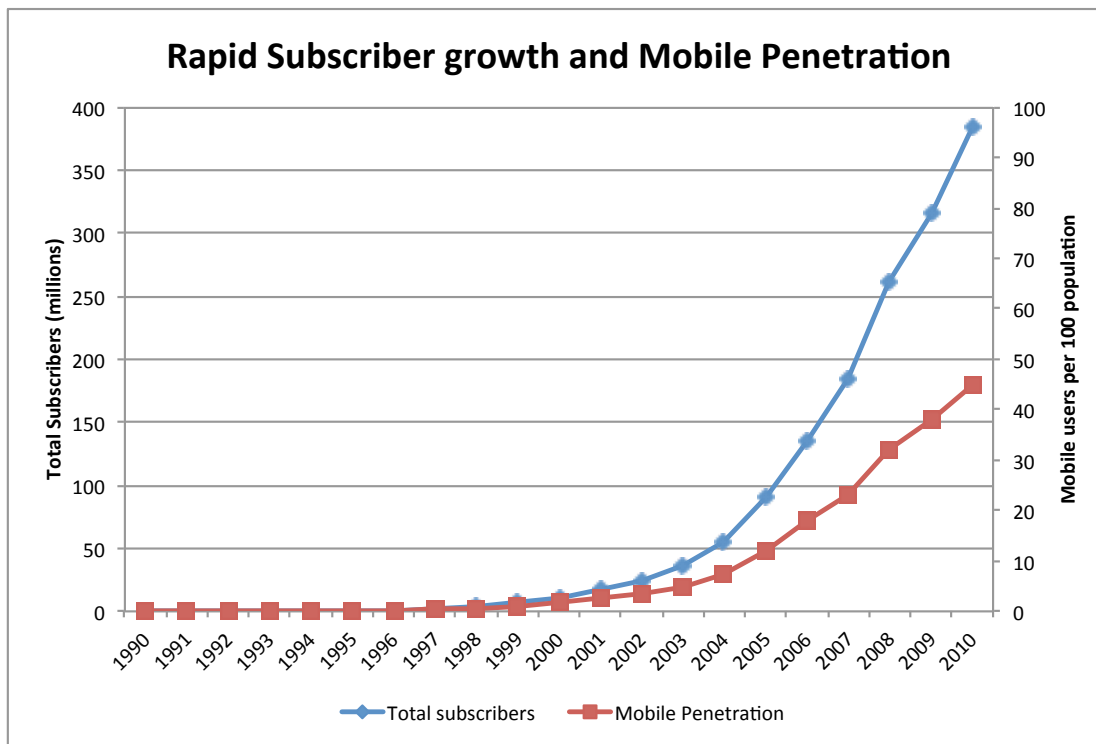


Figure 1: Growth of total subscribers and mobile penetration rate in all Africa countries (source: World Bank data)

The mobile telecommunication industry is a highly knowledge- and capital-intensive industry¹. The traditional literature suggests that such an industry is particularly unlikely to develop in countries burdened by poor institutions, low human capital and underdeveloped capital markets. What then was the driving force behind this phenomenal growth in mobile telecommunication in Africa?

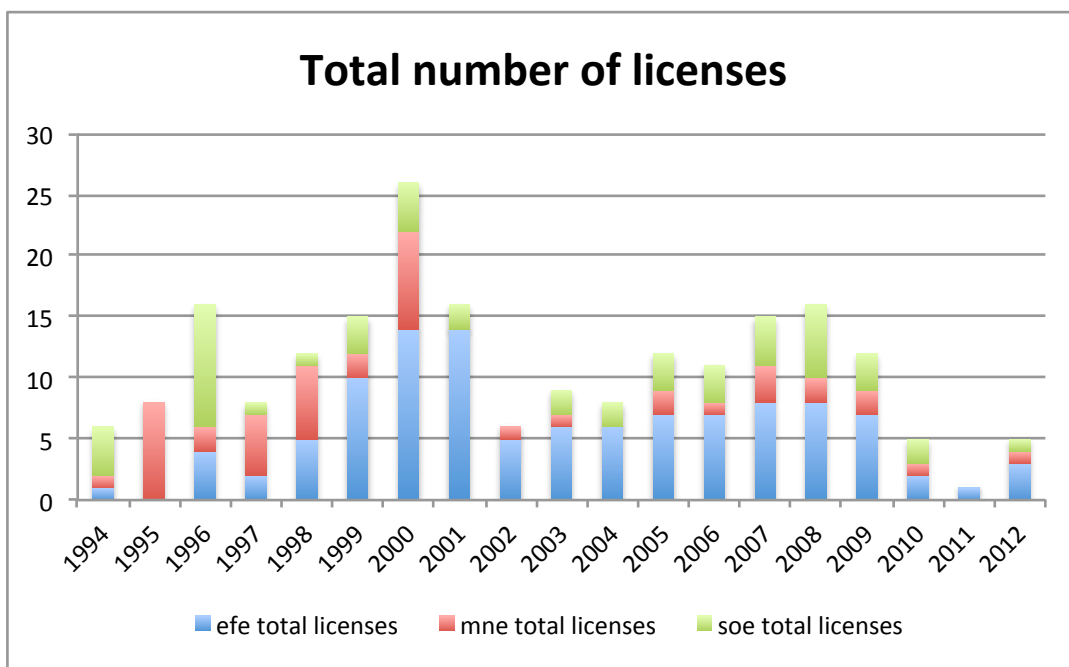


Figure 2: The total number of licenses granted in Africa (source: Author's Excel Database on African Mobile Industry, 1994-2012)

Data compiled by the author² and presented in Figure 2 reveals, the pattern of entry in the industry from 1994 to 2012. As it can be observed, there are a variety of State Owned Enterprises (SOEs) and Multinationals (MNEs)

¹ In some countries, only the entry license fee can be more than \$200 million. For the first round of licensing in Nigeria and Egypt, the license fees were \$285 million and \$512 million respectively.

² The nature of the data and its collection process will be explained in Chapter 1

entering over time, which is to be expected from prior literature (c.f. Shleifer 1998). Yet, there is also a significant presence of Africa-originated, entrepreneur-founded enterprises (EFE), especially in the early stage of the evolution of the industry. Furthermore, a few of such EFEs that became successful in their home country, subsequently expanded their geographical scope, catalyzing the growth of the industry across the continent. Key to the success of these EFEs, as the thesis will reveal, was the accumulation of know-how in telecommunication technologies and markets. Initially, some of these EFEs forged joint-ventures with top global telecommunication firms or had founders with extensive work experience in top global telecommunication firms. This know-how was then exploited in their own entrepreneurial initiatives to enter markets across Africa.

The purpose of this thesis is to shed light on the mechanisms behind the growth of this industry, exploring in particular the role of these Entrepreneurial Founded Firms (EFEs). Through this thesis, I plan to address the following research questions:

- 1- What explains the pattern of entry in the industry?
- 2- How do these Entrepreneurial Founded Entrepreneurs (EFEs) build their capabilities?
- 3- How do the various type of entrants perform in the market?
- 4- How do variations in institutions and distance influence the entry decision of EFEs?
- 5- How entry influence the country-level development of the mobile markets, including penetration, subscription price, and so on?

6- What policy and managerial implications can be derived from the African mobile experience?

Besides providing insights into the underlying forces behind the growth of the mobile telecommunication industry in Africa and offering a set of clear policy recommendations to emerging economies, my research aims to contribute to our broader understanding of the process of economic growth, and the particular role of the entrepreneurial process in this growth. The findings of the thesis suggest an alternate path to development--one that does not simply involve one-directional technology and investment flows from the North to the South, as the current economic models claim, but a rather different one, which involves a two step process. The spillover of key know-how from a few top firms in North sows the seed for a few Southern entrepreneurial firms, which then flowers and, through the expansion of their geographical scope, further seeds other regions of the South.

The Thesis In The Context of The Broader Literature

The distinction between an entrepreneurial firm and other firms is found in the Schumpeterian concept of innovation (Acs and Virgil 2009). Entrepreneurship is the act of innovation performed by the entrepreneur, a process in which either a new good, method of production, market, source of raw material, new organization of an industry or a combination of them is introduced to the market by the entrepreneur (Schumpeter 1934). However, entrepreneurship in developing countries mostly appears in the form of Small and Medium

Enterprises (SME), an informal sector, or petty capitalism (Acs and Virgil 2009). The informal sector and SME contribute 65 percent to 70 percent of the GDP in developing countries (World Bank report of 2003 by Ayyagari, et. al) and the informal sector alone accounted for 42 percent of GDP of 23 African countries in 2000 (World Bank report of 2008 by Adams). The SME and specially the very small firms represent an “overwhelming majority” of African firms, supporting a characterization of the African continent as a “plethora of small traders” and family businesses (Daniels 1994; Fafchamps 1994).

Furthermore, a sizable fraction of entrepreneurs in Africa are entrepreneurs of necessity. The Global Entrepreneurship Monitor (GEM) 2010 suggests this fraction to be roughly between one third to half in several of the African countries. This is important because necessity entrepreneurship is seen as having “no effect on economic development” (Acs 2006). Developing countries are seen as having a low quantity and quality of entrepreneurial opportunities, as well as a low presence of skilled entrepreneurs capable of driving Schumpeterian entrepreneurship (see Naude, 2008 for a discussion). Under such conditions, “constructive” entrepreneurship becomes scarce and “destructive” entrepreneurship becomes common (Baumol, 1990). The destructive entrepreneurship often includes rent-seeking activities and low quality entrepreneurial abilities, which could lead to stagnation and a development trap.

Baumol (1990) also described this entrepreneurship, which is typically associated with activities with low knowledge base: when the activity does not enable economic augmentation; or under similar survival mechanisms that, while very important for the individuals, can't induce employment growth and economic

development in a country. Since the demand for constructive entrepreneurial opportunities is small, the high skilled entrepreneurs have limited incentive to offer anything new and instead prefer to perform rent-seeking activities (Murphy, et al. 1991).

However, several of the entrepreneur-founded enterprises in African mobile industry appear very different from typical entrepreneurial firms in Africa. These EFE were neither informal nor small and they don't fall into category of necessity-based entrepreneurship. As an example, Celtel, which was one of the successful EFEs, employed 3000 high quality positions by 2005, as well as around 30,000 indirect jobs, and worked with more than 120,000 distribution outlets to sell its products mainly the scratch cards (source: Celtel's founder presentation in 2005).

There is a body of literature that looks at entrepreneurship not as an individual phenomenon, but rather one that is embedded in an organizational context with focus on innovation, risk taking and proactiveness (Zahra and George 2002; Miller 1983). When an entrepreneurial firm becomes large, decentralized, and have institutionalized routines, the firm is defined by well-integrated product-market entrepreneurial strategies (Miller 1983). The leading EFE in the African mobile industry appear to represent more of these organized endeavors, rather than a small firm managed by a centralized power represented by the entrepreneur that is more typical of the necessity entrepreneurship. These top firms quickly became large enterprises, and they are, not only entrepreneurial in their strategies, but also are established by a group of entrepreneurs, who acquired capital and know-how and expanded quickly in the market. Most

existing literature has studied these entrepreneurial firms in developed nations and little is known about the characteristics and processes that one may find in firms based in the developing world. This research will explore these dimensions.

A similar disconnect exists when considering a body of literature that looks at entrepreneurial firms and their geographical expansion. Past research has considered mostly developed countries in examining what is known as international new ventures (INV). The INVs are the start-ups that sought to derive significant advantage from the use of resources and the offering of their services in multiple countries from inception (Oviatt and McDougall 1994; Oviatt and McDougall 2005). The entrepreneur founders of INVs are thought to be individuals who were “alert” to possibilities of combining resources from different national markets because of possessing competencies such as network and knowledge, which they had gained from earlier activities (McDougall et al. 1994). They spot opportunities for establishing a venture that operates across national borders, which require competencies distinct from local entrepreneurial activities. Although the African EFEs of the interest of this thesis appear to have followed a similar pattern to that of INVs in their geographical expansion, it is important to note that they acquire their key capabilities in the context of developing countries.

How then do “constructive”, entrepreneur-founded firms develop their key capabilities within the developing country context? Hausmann and Rodrik (2003) suggest that an entrepreneur has to discover an opportunity that fits the “production portfolio” of the developing country--i.e. a product, which could be produced in that country with a lower cost than its cost on the global market. This

process of discovery involves trial and error and that the entrepreneur faces an uncertainty of what the country is good at producing. The model suggests that once a discovery occurs, other entrepreneurs readily observe and imitate the success of the discoverer. The ability of local entrepreneurs to succeed, therefore, could encourage others to enter the market. However, this could also encourage entry of low quality entrepreneurial firms, especially if there are entrepreneurs who are overly optimistic of their own abilities (Kahneman & Lovallo, 1993).

Absent in the previous discussion on “self-discovery” are the mechanisms through which entrepreneurs in less developed economies can access key know-how. Although trial-error may be an important channel for knowledge accumulation, it is unlikely that entrepreneurs in less developed economies without any formal relevant training would be able to establish a highly knowledge intensive industry on their own. The traditional North-South model (Krugman, 1979; Grossman and Helpman, 1991; Coe et al. 1995) suggests that the know-how spills from the North to South through trade and one prominent channel through knowledge spillovers is from MNE investments in Southern countries. Yet, the risks associated in investing in developing countries can become a deterrent to MNEs considering entry. Therefore, among developing nations, those with relatively superior institutions and larger markets, are expected to be the strongest attractors to these MNEs (refer to chapter 2 for literature review). And top MNEs are indeed expected to possess the cutting-edge know-how and therefore offer a key platform for learning future entrepreneurs. This learning environment would be especially meaningful if the

mode of entry is through a collaboration or Joint Venture between an MNE and a local partner (Mowery et. al. 1996; Inkpen 2006).

The literature on pre-entry experience suggests that employee spin-offs from strong parents perform better (Klepper 2009). An entrepreneur-founded enterprise could gain industry knowhow if its founder, prior to establishing his or her own firm, had worked for a local operation of a top multinational enterprise (MNE), which would be expected to possess the key knowledge. Vital production knowhow is often tacit in nature and is usually transferred through on-job training. Therefore, an entrepreneur could access critical “seed knowledge” through prior work experience with a top MNE, or a local joint venture between an MNE and a local firm, as noted above. In addition, some of the employees of top MNE in developed nations come from developing countries and may return to their home countries to establish their own firms (on reverse brain drain, refer to Kapur 2010).

Mostafa (2009) and Mostafa and Klepper (2013) demonstrated that such mechanisms have been key to the development of the garment industry in Bangladesh. What they characterize as a “heritage link” proved to be a significant factor in a relatively low knowledge-intensive industry such as garments. Furthermore, they also show that, while the success of a pioneer firm encourages entry of other local entrepreneurs, those with access to particular and valuable know-how are more likely to be successful. Thus, one could posit that equivalent mechanisms and links could become much more central in the development of a more knowledge intensive industry such as mobile telecommunications. This will be precisely at the core of the thesis.

Data Sources and Collection

To analyze the African Mobile Industry and explore the research questions highlighted above, one needs to obtain very detailed and complete information on the mobile operators license holders. Our data universe is the set of 67 countries in Africa, for which we collected data on the following:

- Ownership and management: firm's background and its ownership periods. This would also reveal whether the local government had been a minority shareholder in MNEs and EFEs, as well as if an SOE is owned by a local government or a non-local government.
- Heritage of know-how: Whether an entrepreneurial firm was linked to a high performance MNEs through spin-off or partnership.
- The year firms initiated operation, which revealed the firm's age and whether it enjoyed a monopoly in the beginning,
- Their total subscribers and market share throughout their operation periods.
- Number of licenses at a given time within a country, which would reveal the number of firm's competitors at any time as well as the liberalization year in each country. Since licences were issued at few stages in a country i.e. liberalization was gradual and staged, this would also reveal at which stage (first, second, or later) the license was issued.
- Government regulations: This includes the total licenses issued by the government and in how many stages they were issued. This would also reveal the competitiveness of the mobile industry within the country as well as the

number of competitors each firm had during its lifetime and the number of competitors a new firm faced when it first started operation.

- Country level demographic data e.g. GDP, GDP per capita, GDP growth, GDP per capita growth, population, mobile penetration, natural resource rent and FDI inflow.

Data sources: In general, obtaining the data from Africa is difficult and the data on mobile sector in earlier years e.g. 1990s is scarce. The few companies that sell data on mobile firms, typically only keep track of current licenses, not bankrupted ones and not the licenses that were issued but not yet operationalized for reasons such as lack of resources or technical difficulties. Despite these difficulties, we were able to gather data based on a variety of sources listed below. Our strategy was to make a master database by overlapping all the available information from these resources. There were a variety of problems, such as cases where a firm is registered with one name but operates under the name of its brand and therefore two databases refer to a firm with two different names. Also, with changes of ownership, often there are name and brand changes. Still, most of these problems were solved by cross checking sources. The following are a list of data sources used in this paper:

- The data prepared by the UN Economic Commission for Africa (ECA) for the African Development Forum 1999 was the first attempt to collect and disseminate information on the ICT sector for the 53 countries in Africa.

- The Telegeography's (Primetrica Inc) database is a thorough data source with company statistics and country statistics. The company statistics has a brief overview of the company's operation and ownership structure, number of subscribers since 2003, the network deployments and recent financial statistics. The country statistics adds an overview of the regulatory section for each country to the data.
- The GSM Association's (GSMA) mobile coverage map and CDMA Development Group (CGD) provide the data on the current active operators and on their network deployment for each operator.
- World Bank database on telecommunication (DECRG) provides data on the bidding process as well as the subscribers data in the interval of 1993-2001.
- International Telecommunication Union (ITU) provides a database on World Telecommunication/ICT Indicators on various telecommunication indicators and industry measures.
- Annual reports for the multinational corporations usually available from since 2000. Some of the larger entrepreneurial or government owned operators published annual report since mid 2000s. Also, some of the telecom regulatory agencies have published occasional annual reports on the ICT statistics of their countries.
- Online journals published on the ICT sector including Telegeography, Wireless Federation, Balancing Act of Africa, Cellular News, Telecom Paper and the Mobile World reveal details with various range including subscriber data, date and new technology deployments, ownership structure, license fees and capital investment, termination of a license, management team, etc.

- Interview with early management of three of the pioneering entrepreneurial firms in African mobile industry, Celtel, MTN, and Telecel. Details of these interview will be discussed in the first chapter.

Outline of this thesis

This thesis is presented in three chapters. The first chapter provides a background of the telecommunication industry in Africa and present detailed case study of three pioneering entrepreneurial firms in this industry. This chapter includes case studies to explore and report on the processes through which EFEs build their capabilities. The second chapter provides a firm level perspective into development a knowledge-based industry through entrepreneurial agents. The second chapter aims to explain the entry pattern and performance of entrants across Africa. The data I have collected on this industry also allows me to examine how entry of different types of firms is conditioned by institutional and regional factors. The second and third chapters are in paper format and each chapter will include its own abstract, introduction, conclusions and references for chapters appeared at the end of each chapter.

Chapter 1: Capability Development of Entrepreneurial Firms in African Mobile Industry

Background of mobile telecommunications in Africa³:

Nowhere in the world are development challenges more acute than in Africa. In the latter half of the 20th century, the poorest continent fell further behind the rest of the world. With the exception of a handful of countries, economic growth in the continent was anemic; in fact, between 1980 and 2000 the average annual GDP per capita growth in the continent's most impoverished sub-Saharan region was *negative* 1.1 percent. Despite having received over \$1 trillion in foreign aid since 1960 (Moyo, 2009), Africa today remains mired in poverty; about 50 percent of the population in sub-Saharan countries live on less than a \$1.25 a day. Most African countries have been ranked consistently in the bottom of country indicators, including regulatory quality, control of corruption and government effectiveness. Many have faced prolonged conflicts.⁴

Remarkably, mobile telecommunications managed to thrive in this continent. Figure 1 shows that the number of mobile subscriptions and the mobile penetration rate in Africa grew from meager 1 million and 0.15 percent, respectively, in 1996, to whopping 645 million and 62 percent, respectively, in 2011. Mobile subscriptions rose rapidly in most African countries, including several most impoverished nations. In the war-torn nation of Somalia, mobile

³ This section was developed based on our interviews with industry veterans and entrepreneurs, and the data we collected on every 2G mobile phone operators in Africa. In the following section, we outline our data collection strategy.

⁴ The World Bank Africa Development Indicators and the World Governance Indicators provide useful macro economic data on Africa. For a more detailed discussion on Africa and its challenges, refer to Collier (2007), Collier and Gunning (1999a, 1999b), Sachs, Mellinger, and Gallup (2001), Sachs and Malaney (2002), and Sachs and Warner (1997).

subscriptions grew at an impressive average annual rate of 60 percent between 2003 and 2011.⁵ During the same period, in Sudan, Equatorial Guinea and Democratic Republic of Congo, which were also burdened by political instability, the annual average growth in mobile subscriptions was even higher—in triple digits. While none of these countries were able to make any measurable improvements in country indicators, by 2011 all of them achieved mobile penetration rates above 50 percent.

The development of mobile telecommunications infrastructure in the region has enabled service providers to offer various mobile applications, beside voice calls and text messaging. In particular, it has been observed that in mobile banking “the poorest continent is miles ahead;” among the 20 countries that had the highest adoption rates for mobile banking in 2011, 15 were African countries (The Economist, 2012). Mobile banking and other mobile applications in healthcare and education have been heralded as transformative development tools (Lehr, 2008). Recent research has linked mobile coverage to enhancing efficiency in agricultural markets, by reducing search costs and facilitating coordination among agents (Aker, 2010; Jensen, 2007); creating employment opportunities in rural areas, particularly for women (Klonner and Nolen, 2008); and, more broadly, generating economic growth, especially when market penetration rate surpasses a critical threshold of 40 percent (Roller and Waverman, 2001).

⁵ Somalia had one of the cheapest call rates and best voice qualities in Africa (The Economist, 2005).

In the 1990s, the development of wireless networks from analog 1G standards to digital 2G standards ushered in a new era in mobile telecommunications. The 2G standards ensured superior voice quality through the use of digital error checks and allowed more calls to be transmitted in the same amount of radio bandwidth than its predecessor (Roberts, Temple, Mills, and Raines, 2006). Technological advances using 2G standards also enabled operators to effectively offer pre-paid services (Sauter, 2010).⁶ Western countries upgraded their networks to 2G standards by early 1990s; starting from mid 1990s, several African countries started to directly adopt 2G standards.

Telecommunication services in independent African countries were initially provided by state-owned enterprises (*SOEs*) that operated as monopolies. However, the *SOEs* had a long history of poor performance, and in the 1980s and 1990s when many economies fell in prolonged recessions their governments found it particularly burdensome to shoulder losses of their *SOEs* (Nellis, 2005a; Shirley, 1999). The distressed economies also became increasingly reliant on foreign funds to finance government expenditure and pay import bills. Some donor agencies often put industrial reforms as a precondition to receiving concessionary loans (*ibid*).⁷ But efforts to both commercialize and privatize

⁶ In the past, pre-paid services relied on hairpin solutions that required additional dedicated trunks to monitor callers' credit during a call. These solutions were costly, and the mobile exchanges and switching equipment of the time did not have the capacity to connect a large number of trunks. With the advent of 2G standards, out-of-band signaling solutions could be introduced to monitor callers' credit without having to rely on costly hairpin solutions.

⁷ The first set of reforms that were pushed by donor agencies were related to the commercialization of the *SOEs*. This typically involved removing subsidies and other privileges previously enjoyed by the *SOEs*, and introducing various initiatives to improve their management practices. The second set of reforms was aimed at privatizing the *SOEs*, which entailed selling off substantial, if not all, government stakes to private partners. For a detailed discussion on the topic, see Aharoni (1986) and Shirley (1999).

SOEs were met with severe backlashes (Nellis, 2005b),⁸ and attention shifted towards allowing private entrants to operate.

Entry in mobile telecommunications, however, is limited and regulated; one or two licenses are issued every few years until no new licenses can be granted due to limited availability of spectrum. Thereafter, entry occurs primarily through acquisitions of existing players. The industry is also characterized by scale economies and network effects. Hence, firms that enter during the early stages of market liberalization are thought to have major advantages over later entrants (Shapiro and Varian, 1998; 1999). In most African countries, the *SOEs* were the first to be granted 2G licenses, and they usually did not pay any licensing fees.⁹ Typically, the *SOEs* created new entities for their mobile operations, so that those new entities did not assume the liabilities of their loss-making landline operations. A few also forged joint-ventures with multinational enterprises (*MNEs*) from the outset.

The footprints of a few *MNEs* in some African countries date back to colonial periods, when colonial powers commissioned their leading country operators to set up communication services in strategically important colonies (Kiplagat and Werner, 1994; Noam, 1999). After independence, several African countries continued to have strong political and economic ties with their former colonial rulers (ibid). As countries allowed private investments in mobile

⁸ Between 1990 and 2003, only 13 percent of total assets in fixed line and mobile telecommunication held by the states were divested (Nellis 2005b).

⁹ There are allegations of corruption regarding the selection of operators. Often, the selection was based on a combination of several factors, such as the applicant's bid amount, technical capabilities, coverage targets, or its employment projections. However, critics have pointed out that often in such "beauty contests" neither were the evaluation criteria transparent nor was it apparent if the evaluation criteria were followed objectively. In some instances, auctions were held, but they too were susceptible to bid rigging. For a detailed discussion on the topic, refer to Karim, Putimahtama, and Mullins (2009), Mullins and Rhodes (2011), and The Economist (2000).

telecommunications, a few *MNEs* with colonial ties also entered in those markets.¹⁰ In some cases, joint cooperation between the governments of an African and non-African nation resulted in the entry of an *MNE* from the non-African nation, even when there was no colonial tie.¹¹ However, most African countries initially did not allow 100 percent foreign ownership in mobile operations. *MNEs* had to forge partnerships with local firms, but in such a partnership, the *MNE* usually had a significant equity stake and assumed management control of the mobile operation, with local players relegated to silent partners (some important exceptions are noted below).

Figure 3 shows the annual number of entries into mobile telecommunication industries in African countries, starting from the first 2G entrants in 1994 until 2012. During the early years, entry occurred predominantly through obtaining new licenses. Figure 3 also reports the number of entrants by their types.¹² Between 1994 and 1996, there were 21 mobile entrants that had

¹⁰ For example, during the colonial time, the British, French and Portuguese governments commissioned their countries' leading operators, Cable and Wireless International, France Cable et Radio, and Marconi Comunicações Globais, respectively, to set up telegraph and other communication services in some of their African colonies (Kiplagat and Werner 1994, Noam 1999). Later in mobile telecommunications, Cable and Wireless International invested in the former British colonies of South Africa and Seychelles; France Cable et Radio in the former French colonies of Central African Republic, Cote d'Ivoire, Congo Republic, Equatorial Guinea and Senegal; and Marconi Comunicações Globais which in the former Portuguese colonies of Cape Verde, Guinea Bissau, and São Tomé and Príncipe.

¹¹ The Swedish firm Telia's involvement in Namibia in 1994 is informative. The cooperation between the governments of Sweden and Namibia facilitated the creation of the joint-venture MTC, which was owned by Telia, the Swedish government and the state-owned Namibia Post and Telecom Holding.

¹² If the entrant had multiple owners, the type of the owner that had the management control is reported. Typically this owner also had a majority equity position.

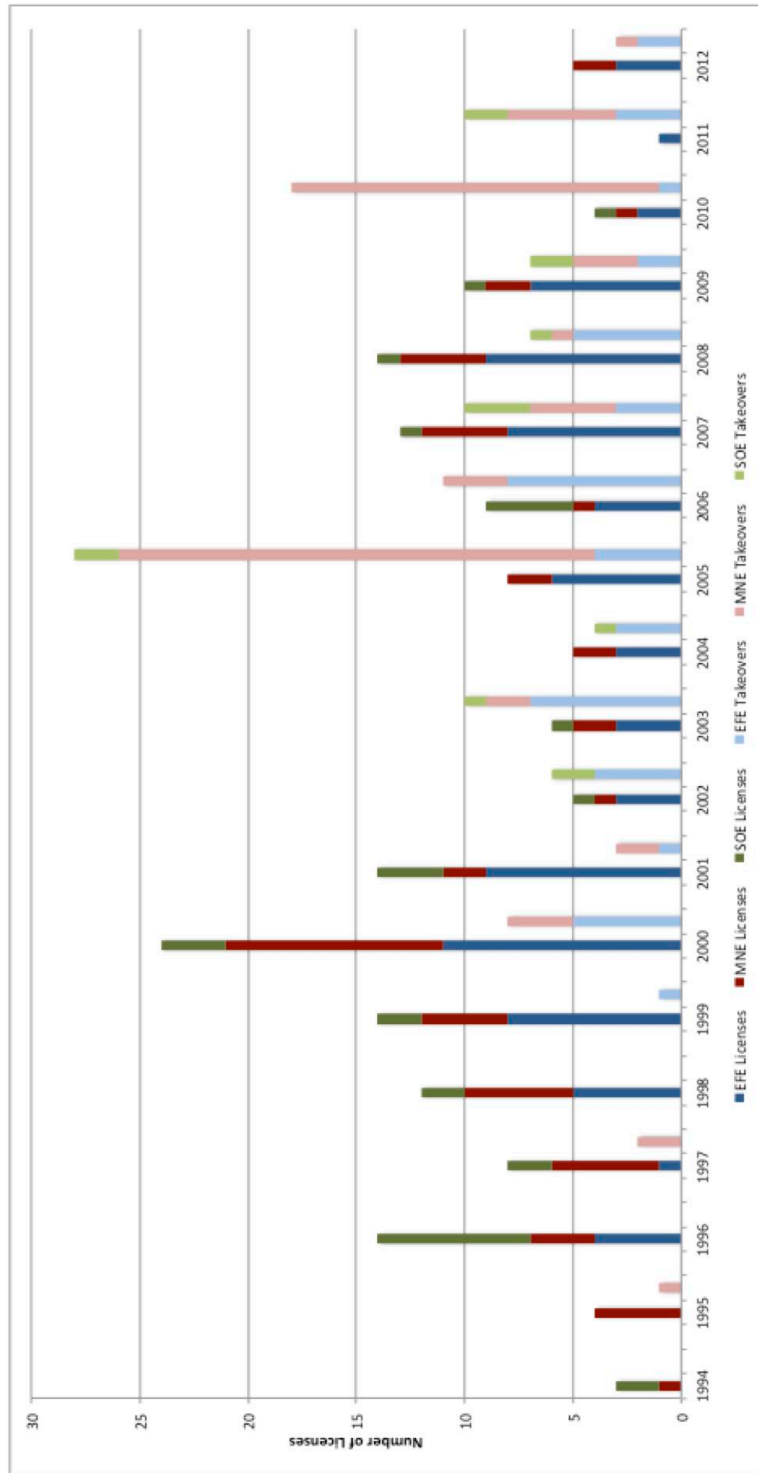


Figure 3: Total number of licenses granted in Africa

obtained 2G licenses in 17 African countries.¹³ While initially there were a few African-origin entrepreneur-founded enterprises (*EFEs*), by 1998, when several markets were further liberalized, *EFEs* became the dominant source of entrants through new licenses. Later, after 2005, as several markets could no longer accommodate new licenses, acquisitions became the predominant entry mode and usually the acquirer was an *MNE*.

Setting up a mobile operation required large investment outlays and the industry attracted *EFEs* that had access to substantial amount of capital. In some instances, key individual members of large family businesses took entrepreneurial initiatives to diversify the groups' operations into mobile operations. Some serial entrepreneurs, who had founded other businesses that turned out to be successful, also later set up mobile operations. A few entrepreneurs sold their stakes in successful firms to generate start-up funds for their mobile operations.

Two such *EFEs*, Celtel and MTN, were pioneers in mobile phone operations in Africa. Their early experience in Africa are instructive about the challenges that the continent—particularly its sub-Saharan region—posed for establishing mobile phone operations, and the key adaptations of existing technical and business practices that were essential to be successful.

¹³ These 17 countries are listed in the chronological order: South Africa (2 licenses), Morocco (1), Namibia (1), Seychelles (1), Malawi (1), Uganda (1), Mauritius (1), Lesotho (1), Tunisia (1), Senegal (1), Tanzania (1), Ghana (1), Zambia (1), Zimbabwe (1), Cote D'Ivoire (3), Burkina Faso (1), Kenya (1) and Equatorial Guinea (1). Of the 21 entrants, nine were *SOEs*, eight were *MNEs* and four were *EFEs*. Note, however, out of the eight *MNEs*, four were set up in partnership with state operators, which had secured the 2G licenses and assumed the role of silent partners.

Data Sources and Methodology for Qualitative Analysis

We studied three cases of EFEs, Celtel, MTN and Telecel in the African Telecom industry to have a better understanding of the capability development of entrepreneurial firms. To gain insight on the companies, I studied existing interviews with some of the early management of Celtel, MN and Telecel. These interviews included to the following sources:

- Makura (2008) provides a chapter on Mo Ibrahim, co-founder of Celtel and Miko Rwayitare, co-founder of Telecel.
- Southwood (2009) provides interviews with some of the early management of Celtel.
- Ibrahim, (2012)¹⁴ is a self description by the co-founder of Celtel about how he built a business on African continent
- Annuals reports published by MTN 2001-2012.
- An internal report that documents the first five years of MTN i.e. 1994-1999, titles “Five Years of Grit and Glory”
- An internal report that documents the first ten years of MTN i.e. 1994-2004, titles “Ten Years of Cellular Freedom”
- Some of the other important interviews of Ibrahim, co-founder of Celtel or those that cover Celtel could be found at Charlie Rose Show, (2010), The BBC, (2001 and 2009), The Economist, (2007), The Guardian, (2009), The New Yorker, (2011),

¹⁴ Ibrahim, M. (2012). Celtel's Founder on Building a Business on the World's Poorest Continent. *HARVARD BUSINESS REVIEW*, 90(10), 41-46.

I conducted interviews with early management team of these three firms to understand the following questions:

- What were the channels through which these pioneering firms gained their origin of their technical knowhow of the industry?
- What were some of the challenges in the early years of the industry that the firm encountered and how did the early management respond to these challenges?
- What were cases of success and failure in encountering some of the early challenges that the firm encountered with?
- What was the process of internationalization of these pioneering firms?
- How did the firm's process of learning from challenges in one market affected its internationalization in another market?

I conducted the interviews with the following people:

- Richard Beveridge, Vice President of Business Analysis (1999-2001) and Director of Business Operations (2001-2007) at Celtel. Three interview conducted on April 2011, April 2012, September 2013.
- Thomas Jonell, Project Management Director and Acting Management Director or Chief Operating Officer for establishment of Celtel network operations in Burkina Faso, Chad, Democratic Republic of Congo, Gabon, Niger, Sierra Leone, and Tanzania during 1999-2002, Director of Engineering and Operations 2002-2004, Chief Technical Officer of Celtel Democratic Republic of Congo 2004-2006, Chief Technical Officer of Celtel Nigeria 2006-2007. Three interviews conducted on May 2001, October 2013, August 2014.

- Martin de Koning, Communications Director of Celtel, 2005-2008. One interview conducted on April 2001
- Frans Bruinzeel, Chief Human Resources Officer at Celtel, 2004-2006, One interview conducted on April 2011.
- Karel Piennar, Founding Chief Technical Officer at MTN since 1994, Chief Strategy and Merger and Acquisition Officer at MTN since 2014. One interview conducted on April 2012.
- Andrew Portokallis, Senior Manager at MTN Group since 1995. Three interviews conducted on December 2011, March 2013, and August 2014.
- Joseph Gatt, Co-founder of Telecel group, Two interviews conducted on November 2011 and December 2011.
- Fred Pichon, Legal Counsel of Telecel Group (1997-1998), Head of Legal Department at Celtel Group 1998-2008, Chief Legal Officer of Telecel Group (part of Orascom group) 2008-2011. One interview conducted on September 2014.

I used standardized open-ended interviews as a method of qualitative research to elicit information on interviews, thus I asked the questions provided earlier in this section from all interviewees and allowed them to explain the details, bring examples and provide analysis of their own account while I gently guided the discussion not to fall beyond the general questions above. The reason for open-ended interview format is that my understanding about the mechanism behind the industrial development, process of knowledge transfer and internationalization process of entrepreneurial founded enterprises developed through this PhD research. Thus for the selected pioneering firms, I conducted

first round of interviews, analyzed the interviews. I then conducted another interview to further develop specific points or dimensions that were left aside in each of the general questions.

In this section we provide an overview of examples of successful EFEs. We started by Celtel since it is a good example of technical knowledge transfer from Europe to Africa through entrepreneur agents. Celtel is also an example of a quick and successful pan-African expansion while maintaining corporate ethical standards. We would then explain a different yet interesting case of MTN. This enterprise started with a technical knowledge transfer from Europe to South Africa but after a few years the locals took control of the company and the company became dominantly owned by black South Africans. MTN flourished to the highest level of success throughout Africa.

Case Study I: Celtel International

In 1993, after repeated failed attempts to attract MNEs, the government of Uganda approached Mo Ibrahim, the founder and chief executive officer (CEO) of a network design consultancy, to set up a mobile telecommunications operation in the sub-Saharan country. A native of Sudan, Ibrahim had worked for British Telecom as a technical director of its wireless division. Although Mobile Systems International (MSI) had designed and delivered turn-key mobile network solutions to various operators, it had no experience in setting up and managing mobile operations. MSI, along with a group of international donors, which backed the Ugandan government in its mobile initiatives, convinced the British mobile telecommunications giant, Vodafone, to set up a mobile operation in Uganda

through a joint venture.¹⁵ This joint venture, MSI-Vodafone, would later become Celtel.

Ibrahim was a founder and key figure in Celtel. Born to a middle-class family in Sudan in 1946, he was raised and educated in Egypt. He was employed by Sudan Telecom after graduation and his job involved travel to several European countries. Ibrahim moved to the United Kingdom for his master's studies and entered a PhD program in 1974. His PhD thesis addressed a question that later became the heart of mobile communications: What happened to a transmitter and a receiver when one or both are moving (Southwood, 2008)? After graduation, in 1985, Ibrahim was recruited by Cellnet, a subsidiary for British Telecom (BT), as a technical manager responsible for the implementation of the first U.K. cellular network. He eventually became chief technology officer of Cellnet (R. Beveridge, personal communication, April, 2011), training several of its technical employees. Ibrahim left Cellnet in 1989, along with a group of about 30 Cellnet employees (Southwood, 2008) to form Mobile Systems International (MSI), a consultancy firm. Those Ibrahim trained had tremendous loyalty to him and many joined his new company (Makura, 2008).

MSI provided consultancy services to firms who wanted to implement cellular networks, especially in developing countries. In a short time, MSI decided to develop software that automated the “dark arts” of designing a radio network, called Planet (Southwood, 2008). The technical person in charge of this software development was Moez Daya, a Kenyan-born engineer who had also completed

¹⁵ Under the three-way partnership, Vodafone was the majority shareholder with 36.8 percent of ownership and Celtel was the junior partner, with 22 percent of the ownership. The remaining shareholders were a group of donor agencies: Commonwealth Development Corporation, the U.K. development fund, and the International Finance Corporation, an investment arm of World Bank.

his education in the United Kingdom. Daya joined Cellnet and became the head of cellular planning for the company, where he met Ibrahim and joined MSI in 1990 (Hardymon & Leamon, 2006). According to Ibrahim, Planet was used to design about one-third of all GSM networks in the world (Southwood, 2008). Gradually, MSI started to evolve from a consultancy and network design company to a firm that could deliver turn-key networks in developing countries, from applying for a license, to full network design and purchase, to installation of equipment. The network was then delivered ready to start. MSI was quite successful, displaying rapid profit evolution: from £200,000 in its first year to £900,000 in the second year, rising to £2.5 million in the fourth year, and £9 million the following year (and continued increases) (Makura, 2008).

Ibrahim noticed that large and capable European-based operators avoided operations in Africa because they thought it posed substantial risk that could not be handled. He assessed the risk and decided that there was a difference between the reality and perception of risk of operating in Africa. Further, since other players were reluctant to enter this market, he decided to start an operation in Uganda in 1995. MSI possessed the capability to deliver a turn-key project on network design but did not have the capability to operate this network; therefore, it sought partnership with Vodafone. The branch responsible for operation was MSI-Cellular Investment (MSI-CI), headed by Terry Rhodes, who later co-founded Celtel. Born in the United Kingdom in 1955, Rhodes had received his education from the London School of Economics and London Business School before becoming a strategist for Cable and Wireless. Rhodes then joined Cellnet

(where he met Ibrahim) and in 1995, he was hired by MSI as deputy CEO and director of MSI-CI (Karim et al., 2008).

Under Vodafone's leadership, a mobile network with a post-paid platform was promptly rolled out in 1995. Vodafone brought in a number of experienced professionals to Uganda, including a team of credit and risk assessment analysts. However, not only was the target customer segment of wealthy consumers rather small in impoverished Uganda, but also, chasing customers to pay outstanding bills proved to be challenging in an environment where laws were weakly enforced. As a result, MSI-Vodafone's account receivables increased and it was soon bleeding cash (Southwood, 2008). In 2000, Vodafone exited Uganda by selling its entire stake to MSI, which had spun off Celtel in 1998 to focus on mobile operations in Africa (Rosenzweig, 2003).

MSI's operation in Uganda was profitable on paper (Vodafone Annual Report, 1998) but not in reality, because many customers (among them wealthy Ugandans) were not paying their bills. One technical problem was coordination between MSI and Vodafone: e.g., billing had to be sent to Vodafone's U.K. office and sent back again, so sometimes it took months for subscribers to receive their bills. Several customers decided not to pay their bills because they were using post-paid services, which allowed customers to pay for the service they receive only after they used it, a regular practice in Europe at the time. In Africa, this service required a credit check and was therefore only available for the wealthy and elite.

Mobile telecommunications practices had developed based on operations in advanced economies, where strong complementary physical infrastructure—

i.e., roads and electricity—allowed for rapid network deployments, and wealthy consumers, along with robust legal infrastructure, provided a basis for a lucrative post-paid business model. The experience in Uganda, however, revealed that such practices were rendered rather ineffective when advanced economy conditions were lacking.

By the mid-1990s, the technology behind pre-paid platforms had been developed. These platforms allowed customers to purchase credit in advance and pay for mobile services using that credit. Thus, a pre-paid platform did not impose creditworthiness as a precondition to providing mobile services to consumers, nor did it involve any debt collection from end customers. However, it was unclear then if business models based on pre-paid platforms would prove to be economically viable. While such a model allowed operators to have a more inclusive target market, adoption of telecommunication services also depended on the price of mobile handsets, which were quite expensive in the mid-1990s.¹⁶ Moreover, a pre-paid platform essentially eliminated any contract between the consumer and the operator, thereby potentially removing a source of switching costs, and encouraging price wars among operators.

In 1997, MTN, another entrepreneurial firm, entered the Uganda market but advertised its services to lower- and middle-class consumers in Uganda, leveraging pre-paid service. Within a month of its entrance, MTN's market share surpassed MSI-CI's and remained market leader by distance (Rosenzweig, 2003). Through this difficult experience, MSI-CI learned to switch to pre-paid and developed the required expertise for distribution and sales of scratch cards in

¹⁶ In fact, in countries with advanced economies, the cost of mobile handsets was amortized over the period of the post-paid contract, thereby making handsets more affordable.

low-income markets (Southwood, 2008). Celtel proved to be flexible enough to learn from its business rivals. For instance, in 2002, Celtel realized the importance of marketing after it lost market leadership to a newcomer, Vodacom, in DRC due to the rival company's successful marketing. At the time, Celtel was still a hardcore technical firm focused on the quality of service it provided and did not invest in marketing; however, after this incident, it recruited a Kenyan-born expert in marketing, Tito Alai, as chief marketing officer (Hardymon & Leamon, 2006). Alai adopted the brand of "Celtel," which became the company's name, and the motto of "making life better," as well as red and yellow colors for the company (Southwood, 2008). In 2004, Celtel adopted the new brand, colors, and motto in all of its operations and gained back its lost leadership while strengthening its leadership in other markets (Southwood, 2008).

In 1996, the U.S.-based General Atlantic Partners acquired 20 percent of MSI and decided to merge it with another mobile software services to form a software house (Hardymon & Leamon, 2006). MSI-CI was not aligned with the new business concentration and was spun off by Ibrahim and Rhodes in 1998. The company took few employees from MSI and an asset value of \$11 million, which was in the form of shares in mobile operators in a few developing countries (Hardymon & Leamon, 2006). MSI-CI changed its name to Celtel in 2004.¹⁷ Ibrahim remained in MSI's management until 2000, when MSI was acquired by Marconi Corporation plc for \$916 million.¹⁸ Since 30 percent of MSI was owned by its employees (Southwood, 2008), this shift made several members of its early team millionaires.

¹⁷ Accordingly, I will henceforth use the name Celtel to refer to MSI-CI throughout this section.

¹⁸ Bedell, G. The man giving Africa a brighter future. Feb 2009. The Observer, Guardian.co.uk.

In Sub-Saharan Africa, assessing market opportunities was particularly challenging because of frequent political and economic turmoil, and the lack of demographic data. After the Uganda experience, Celtel focused on bringing flexibility into its network design so that its initial network for an underdeveloped site could be scaled up depending on market response. In this endeavor, its past technical experience was invaluable. In contrast to standard practice, Celtel designed its initial network to have fewer base transceiver stations (commonly known as base stations), but with towers that were higher and packed with more communications equipment than conventional ones.¹⁹ This strategy addressed a few key challenges. As the supply of electricity was limited, the base stations had to rely on generators for power. Because Celtel had more equipment in each station, it used larger generators, which were more efficient. Moreover, fewer base stations meant fewer establishments to guard from theft and fewer trips to transport fuel. Over time, however, if mobile traffic substantially increased in a region, the company increased the number of base stations to add more network capacity and lowered its communication equipment on the towers to reduce interference.

Celtel also decided to install pre-paid platforms and worked with an engineering firm to roll them out. To make its prepaid cards readily available in the areas around its base stations, the firm developed robust distribution channels by adopting practices of regional fast-moving consumer goods (FMCG) multinational firms.²⁰ Starting in 1998, Celtel aggressively expanded its

¹⁹ Celtel's towers were usually 30 to 40 meters high, whereas conventional towers were 10 to 20 meters high.

²⁰ In fact, according to my informants, Celtel hired some key workers from FMCG MNEs operating in Sub-Saharan Africa.

operations to various sub-Saharan countries—including Sierra Leone, Republic of Congo, Sudan, and Chad—that were politically volatile. In Sierra Leone, the firm's deployment of mobile networks in the capital, Freetown, coincided with a bloody rebel invasion (The Economist, 2002). Trapped in the city, Celtel's technical team had to be evacuated by the Royal Air Force (Southwood, 2008). Yet such adaptations and big risks paid off. By mid-2005, Celtel had operations in 13 sub-Saharan countries, and in 10 of those countries (including Sierra Leone) it had the leading market position.

With the start of Celtel, Ibrahim became its chairman and CEO, and Rhodes became chief strategy officer. The company was headquartered in the Netherlands for tax purposes; later this became advantageous because the Dutch had less history of colonization in Africa. Many ex-MSI employees joined the firm. Daya became chief technology officer, responsible for the network design team—a position he held until the company was sold in 2005. Ibrahim recruited Kamiel Koot, a professional banker of African origin, as chief financial officer in 1998; he was responsible for providing the firm with financial resources (Southwood, 2008). In 1999, Koot recruited Rick Beveridge to prepare strong business plans because attracting funds for investment in Africa relied on the same (R. Beveridge, personal communication, April, 2011). Beveridge was British and had been educated in business administration at London Business School. He also had experience in marketing FMCG (e.g., beverages, cigarettes, etc.), and he decided SIM scratch cards could be marketed as such (Southwood, 2008).

Ibrahim recruited Mamadou Kolade, from Senegal, for business development and license management while Celtel began applying for licenses in Africa (Southwood, 2008). Kolade's job was to convince presidents and/or ministers of telecommunication to set reasonable prices for licenses, and to pay the license fees, which was a difficult task because of poor banking infrastructure.²¹ He also facilitated the environment for the operation team until a branch CEO was appointed to take over the responsibilities (Southwood, 2008). Tanzanian-born Omari Issa joined the board of Celtel and later became chief operating officer in 2001, remaining until the company was sold. Educated in the United Kingdom and the United States, Issa had several years of experience at the World Bank and International Finance Corporation (IFC), the World Bank's arm for investment in developing countries (Hardymon & Leamon, 2006). The operation team was headed by Thomas Jonell, who joined Celtel as the technical manager responsible for setting up networks in 1999. Jonell was Swedish and had worked for Ericsson before, providing contacts to buy equipment from the company.²² He would move with his operation team to a country to investigate the region's geography and decide on locations to install towers and antennas (Hardymon & Leamon, 2006). This information was then sent to headquarters and Daya's team would design the network while another small group would order the required equipment from equipment vendors such as Ericsson. Finally, Jonell's team would install it on location.

²¹ Interview with Thomas Jonell, Project Manager and CTO of various Celtel regional operations, May 2011.

²² Interview with Thomas Jonell, Project Manager and CTO of various Celtel regional operations, May 2011.

Ibrahim believed that having a strong board was key for high ethical standards in Africa and he therefore gathered prominent people as board members at Celtel, including Gerry Whent (founding CEO of Vodafone), Sir Alan Rudge (deputy executive of British Telecom), and Jay Metcalf (ex-president and CEO of Millicom International). Celtel's ethical vision was not to pay bribes to advance local operations and not to tolerate bribe payment by its employees (Karim et al., 2008). It remained successful in this vision according to Ibrahim and Celtel's top executives.

As I reviewed the founding team of Celtel, I found that this network had a good knowledge of the business environment in Africa since several of its members were African-born professionals and many had been engaged with project developments in Africa prior to joining Celtel. I also noticed that this network accumulated several of the essential technical capabilities required to operate a mobile network and learned the rest of the necessary skills through partnership or from business rivals. Together, this managerial and technical knowledge gave Celtel capabilities that were more than sufficient to operate in Africa. Specifically, the knowledge of network design (i.e., where to put each wireless tower and how much capacity to put on each), and how to adjust parameters such as angles and directions of antennas, put Celtel at an advantage to increase capacity through changing parameters or redistributing resources, and to order equipment only when it was absolutely required. This capability allowed Celtel to reduce the cost of its network design and support to about half (i.e., double the return on investment) compared to a firm that

outsources its network design.²³ This capability was critical in an emerging market like Africa where the rapid growth of the market required faster network updates and re-design to keep the system efficient. In addition, Celtel hired professionals such as Koot and Beveridge to attract funds because this industry required huge investment for infrastructure.

Initially, Celtel aggressively applied for licenses and received licenses of operation for Zambia, Republic of Congo, and Sierra Leone in 1998, and for Malawi, Chad, DRC, and Gabon in 1999.²⁴ It then received licenses for Burkina Faso and Niger in 2000, and acquired licenses in Tanzania and shares in Sudan mobile in 2001 (ibid). These licenses were strategic choices because Celtel selectively bought licenses that were unpopular and on low demand (e.g., from countries engaged in wars) (Southwood, 2008), and hence, were very cheap or sometimes even free of charge. This trend changed as more companies were drawn to the African mobile industry, but Celtel's strategy differed from other operators (such as MTN and Vodacom) that had home markets and applied for licenses to expand their presence as they grew in size, rather than applying for several licenses first and thinking of the operation later. Celtel's main regret was losing a bid for a license in Nigeria in 2001, when Celtel declined to increase its bid from \$250 million and the winning bid became \$285 million (Southwood, 2008); later, in 2006, Celtel had to pay \$1 billion to acquire an existing operator in Nigeria.

²³ Interview with Thomas Jonell, May 2011.

²⁴ Mo Ibrahim. Celtel: An African Success Story. May 2005. Presentation for IFC Private Equity Conference, Washington.



Figure 4: Celtel pan-African presence by 2005 (reference: Mo Ibrahim, “Celtel: An African Success Story”, IFC Private equity conference, May 2005)

Figure 15 shows the countries where Celtel had a presence until 2005, and Figure 16 shows the timeline of Celtel’s expansions. As the figures reveal, Celtel’s operations are concentrated in central Sub-Saharan Africa with little or no interest in West or Southern Africa, or the Horn of Africa. In addition, with the exception of a few countries, Celtel engaged with countries with difficult business environments; in this way, it seems Celtel’s pre-entry resources and capabilities gave it confidence to operate in these markets.

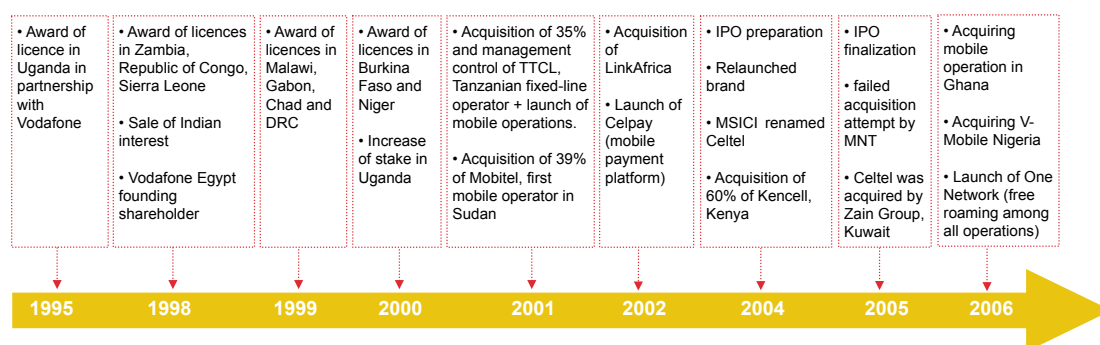


Figure 5: Timeline of Celtel's operations (reference: Mo Ibrahim, "Celtel: An African Success Story", IFC Private equity conference, May 2005)

The company's large foothold required numerous experts to maintain it, and Celtel quickly ran out of technical staff to run its operations. There were few professionals who had technical experience running a mobile network and working in the African business environment. Ibrahim approached Jay Metcalf, president and ex-CEO of Millicom, a Swedish entrepreneurial firm established in early 1990s to provide cheap mobile services to Latin America, Asia, and Africa.²⁵ Metcalf became an investor in CELTE in the late 1990s and facilitated bringing in several technical staff from Millicom to the firm (ibid). Another source of hiring was Telecel, which I examine in the third case study; its pool of professional and technical staff was partially absorbed by Celtel since Telecel was going out of business at the time (ibid). Because Celtel was facing a shortage of technical staff for its various operations, it had to be very efficient with its pool of experts.

The standard practice in the mobile industry is to send a team of 20 to 30 experts to initiate the operation and to maintain it for a few years, after which point, the operation becomes routinized and the operator reduces technical staff

²⁵ Interview with Richard Beveridge, Director of Business Development, April 2011.

or replaces them with less experienced staff.²⁶ However, Celtel had to enter a market with the least number of expert staff possible, train local engineers and managers, transfer the job to them, and leave for the next country operation (ibid). This strategy had some advantages: firstly, the employees knew about the possibility of promotions and arguably worked harder with this incentive, and the best employees might prefer Celtel because of this better chance of promotion; secondly, Celtel achieved better efficiency from its trained staff. To strengthen this effort, the company held training programs for successful local employees in top institutions such as London Business School.²⁷

Celtel's capability in managing human resources could be seen as an example of the "heritage effect" predicted by Mostafa and Klepper (2009), because the experts virtually spin off to bring their know-how to operations within a new country. Since these experts disseminated their expertise and the new operation received a heritage of Celtel's know-how, its chance of success was significantly higher compared to another firm started by local entrepreneurs who were new to mobile industry. Human resource management also supports firm heredity because by the mechanism explained above, Celtel could reproduce its operations in a shorter time. This might be similar to the auto, tire, and semiconductors industries, in which a few high-quality pioneering entrepreneurial firms established the industries in Detroit, Akron, and Silicon Valley, respectively (Klepper, 2007, 2010; Buenstorf & Klepper, 2009). In the case of the African mobile industry, these pioneering entrepreneurs included Celtel, MTN, Orascom, and Investcom, some of which will be investigated in further case studies. These

²⁶ Interview with Thomas Jonell, Project Manager and CTO of various Celtel regional operations, May 2011.

²⁷ Interview with Frans Bruinzeel, Chief Human Resource Officer, April 2011.

firms began to spawn through expanding operations in different countries in a short period of time, and achieved success because of their superior know-how and performance throughout Africa.

Once Celtel grew larger, Ibrahim stepped down as CEO in 2001. The firm initially recruited an interim CEO until 2003, followed by Marten Pieters, former executive of KPN (Dutch fixed-line). By this time, Celtel had established itself as a large operator in Sub-Saharan Africa. A few years had passed since “the Tech Bubble,” and global investors were showing a new interest in the African information and communications technology (ICT) market. Celtel expanded to acquire 60 percent of the mobile operations in Kenya for \$260 million in 2004. Given that Kenya was the third-largest mobile market in Africa, this development established Celtel’s name alongside the large operators in the market.²⁸ Celtel was fourth in the African market after Vodacom, MTN, and Orange in terms of total number of subscribers, and it was first in terms of presence in the most sub-Saharan countries (notably, Vodacom was a joint partner with Vodafone, and Orange was the mobile subsidiary of France Telecom).

In 2004, Celtel prepared for IPO as the first African listed company in the London Stock Exchange, and began to receive offers to be acquired. Although MTN proceeded with an offer of merger for \$2.7 billion (Southwood, 2008), Zain Group, a Kuwait-based company, offered \$3.4 billion and better conditions, and acquired Celtel in 2005.²⁹ Several of Celtel’s executive team members remained until 2007, transforming V-Mobile Nigeria and a cellular operator in Ghana, both

²⁸ Jones, A. Celtel and KenCell in mega deal. July 2004. African Business (part of IC Publications).

²⁹ MTC completes acquisition of Celtel in 13 African countries. 4 May 2005. Zain Group media center.

acquired in 2006, to become more competitive in the market. Celtel also launched One Network in 2006, which was essentially a free roaming between all operations of Celtel throughout Africa. These decisions helped Celtel to become third in terms of mobile subscribers in Africa after MTN and Vodacom.

The successful acquisition of Celtel had an impact on several entrepreneurial firms from Africa and investment firms from the Middle East that entered the African market either by applying for operation licenses or acquisition of smaller operations in other African countries. One example is Etisalat, a mobile operator from the United Arab Emirates, whose investment in Africa occurred between 2005 and 2008. Etisalat acquired Atlantique Telecom, an African mobile operator operating in seven countries, in 2005, increasing its share on the holding in 2007, and purchasing the complete shares in 2008. Etisalat also bid and won for license of operation in Egypt and Nigeria in 2006, along with other partners, and won acquired mobile operation in Sudan and Tanzania in 2007. European cellular firms such as Vodafone and Orange also increased their subsidiaries in Africa. In 2006, MTN had to pay \$5.5 billion, twice as much as its former bid for Celtel, to acquire Investcom, a smaller entrepreneurial firm, to establish its leadership in the African mobile market.

Case Study II: MTN

MTN started in South Africa in 1993, as a partnership between local technical firms and the Cable and Wireless International Mobile (CWIM), which brought industry experience (Rivera-Santos et al., 2009). CWIM had similar partnerships with countries with historical ties to the United Kingdom. In the case

of MTN, CWIM secured 25 percent of the firm's shares, along with management responsibility, in return for its expertise (ibid). The local partners were M-Cell, which was the telecom division of a cable television channel (M-Net) as well as the telecom division of a state-owned transportation system called Transnet (ibid), and a satellite television firm called Multichoice. While all local partners had a degree of relevant background in telecommunications, none had prior experience in cellular operation; therefore, MTN had to rely on recruiting young college graduates with backgrounds relevant to wireless communications.³⁰ By 1998, CWIM decided to sell its shares in South Africa and concentrate on other markets. During the five years of CWIM's presence, MTN had successfully transferred its knowledge of network operation, network management, billing, and several other components to its local employees. In this way, it seems the origin of the capabilities of MTN came from CWIM.

The opportunity for mobile operation was spotted in 1990, by a group of South Africans who decided to bring GSM technology to South Africa in partnership with CWIM (Rivera-Santos et al., 2009). The founding team included Karel Pienaar from Multichoice (who later became CTO of MTN), Robert Nisbet from the financial and auditing industry (who became CFO), and Buckley McGrath (who became chief of operations). These members played very important roles throughout the progress of MTN. M-Net (MTN predecessor) faced some difficulty since Telkom, the state-owned telecom, had just received a 1G mobile license in 1990, and South African legislators did not find enough justification to issue a 2G license to MTN because of the anticipated small size of

³⁰ Interview with Andrew Portukallis, senior planning engineer and an early employee of MTN, December 2011.

the market (ibid). However, in 1993, the mobile market proved to be large enough for more than one license, and two 2G licenses were issued: one for Telkom, who partnered Vodafone, and one that was left open for bidding. MTN won the second license for a fee of \$14 million plus five percent of net operational income per year, along with mandatory social and community obligations (Rosenweig, 2003 a; Rivera-Santos et al., 2009). The company had phenomenal domestic growth, projecting 50,000 subscribers for its first year but achieving 95,000 subscribers, and becoming profitable after 22 months (Rosenweig, 2003 a). This rapid growth enabled MTN to accumulate knowledge and experience, which helped the company in its future expansions and made a home market and a financial base for its operation.

Most of MTN's South African founding members came from Multichoice, which provided satellite television services to underdeveloped communities. Under their leadership, MTN established a pre-paid platform in 1996, and embarked on developing applications to facilitate adoption of mobile services among BoP populations. As handsets were initially quite expensive, MTN introduced community payphones, which were connected to MTN's network and installed at schools, hospitals, and other high-traffic areas. The company also pioneered "me2u," an application which allowed credit sharing among subscribers over the phone. This feature became popular among family members and friends, and encouraged financially dependent individuals to become subscribers as well.³¹

³¹ In addition to developing such applications, MTN also had to make some key adaptations of existing practices to effectively roll out networks in low-income communities. These adaptations were crucial for addressing challenges endemic to those markets (such as limited infrastructure and poor security) and were similar to Celtel's,

It is worthwhile to compare MTN with Vodacom, which was a state-owned enterprise. Whereas Vodafone struggled in Uganda, in South Africa its joint venture with the country's SOE, Vodacom, met with resounding success. In 1993, Vodacom rolled out a post-paid platform and focused on wealthy neighborhoods that had relatively better infrastructure than the rest of the country. Its early competitor in South Africa, MTN, which forged a partnership with the U.K.-based Cable and Wireless International (CWI), also deployed a post-paid platform in 1994. However, with Vodacom's market dominance in the wealthy neighborhoods, MTN began to target low-income areas that were neglected by Vodacom. Within two years, these low-income neighborhoods were the main engines for MTN's subscriber growth, and the company substantially narrowed its sales gap with Vodacom. In 1998, after foreign owners sold their stakes in MTN, the local owners embarked on expanding mobile operations outside South Africa.³² By 2005, MTN had operations in 11 sub-Saharan countries.

MTN was unlikely to become market leader in South Africa because of Vodacom's head-start and other advantages (e.g., additional resources since it used to be a 1G operator). Yet Vodacom was a follower and lagged behind MTN in its growth throughout Africa. Vodacom is an example of a successful state-owned firm, focused on retaining its market dominance and growing internationally. Having a strong competitor like Vodacom was beneficial for MTN because it pushed MTN to be aggressive in the domestic market and to explore opportunities outside this market. In the domestic market, MTN sought the

³² SBC was forced by the government to sell shares due to legal conflict. CWI sold its stake for \$415 million to focus on smaller operations.

opportunity to invest more in rural areas and it became more successful by offering subsidized mobile services in underprivileged areas through community payphones (Rosenweig, 2003 a). This strategy could be used later in MTN's international expansion since most of the countries that MTN expanded to had a poor base of customers and infrastructure. In this way, MTN's experience in building an efficient infrastructure in a short time became a strategic strength of the company during its expansion in Africa (Baron, 2008).

At first, MTN only provided mobile services to customers and other tasks were outsourced. For instance, South African regulations demanded that network services and maintenance to be performed by a separate firm and MTN outsourced this task to a firm called M-Tel. MTN decided to acquire M-Tel in 1995 (MTN Annual Report, 2004). Zunaid Bulbulia, finance director of M-Tel, said of M-Tel, "the systems were unstable, accounts were chaotic, and there was evidence of warehouse theft. The enterprise had bad debt and no system. The first year we just fought fires and plugged holes" (Rivera-Santos et al., 2009). However, MTN successfully transformed the controversial merger in one year to be one of its most successful strategic moves; Vodacom later adopted this strategy as well (Rivera-Santos et al., 2009).

Another important capability that MTN internalized was network design. MTN used MSI's software, Planet, for network design but it developed a network design team and trained them by sending them for training programs with Ericsson. Like Celtel, it avoided outsourcing its network design to contractors. MTN continued internalization of capabilities through the acquisitions of a satellite operator, Orbicom, in 1999, a service provider, i-Talk, in 2000 (MTN

Annual Report, 2001), a customer loyalty program, e-Bucks, with 30 percent shares in 2001 (MTN Annual Report, 2001), an Internet service, Citec, in 2001 (MTN Annual Report, 2001), and a customer application provider, Leaf, in 2002 (MTN Annual Report, 2002). MTN also established a research and development (R&D) unit, Airborn Wired and Wireless, in 2001 (MTN Annual Report, 2001), which developed four technologies that MTN claimed to have pioneered in their application: a computer to phone SMS service, free SMS, a pre-paid SIM card in partnership with Ericsson, and a GSM payphone which could be installed on bicycles, boats, etc. and powered by solar energy. Airborn Wired and Wireless received the Novell Convergence Age of Innovation Award in 2001 (Rivera-Santos et al., 2009).

Five years after its inception, MTN started international expansion—i.e., in 1998, when it reached stability in its domestic market and accumulated enough capabilities for expansion. However, in 1996, in order to find the best market that matched MTN's pre-entry resources and capabilities (Helfat and Liberman, 2002), it formed an investment subcommittee (ISC) to assess opportunities and approve funding (Rosenweig, 2003 a). The ISC suggested Uganda, Rwanda, and Swaziland (Rosenweig, 2003 a). MTN succeeded in securing a license in those three countries in 1998 (MTN Annual Report, 2001) but the ISC rejected its license bidding offer to Botswana since it assessed that the country would not prove profitable (ibid). Later, however, MTN realized the profitability of the Botswana market and acquired one of its operators, Mascom, to enter it in 2005 (MTN Annual Report, 2005). All of the above-mentioned countries were in Southern or East Africa and all had small populations with English widely spoken.

ISC also suggested Cameroon, where MTN failed to win a license in 1998, and acquired Camtel's license in 2000 to enter its market (ibid). Cameroon was a different market: it had a large population, it was in Central Africa, and French was commonly spoken. The previous three international expansions were run under a division called MTN Africa Group, which consisted of few employees. MTN Africa sought formal and informal help and guidance from the MTN South Africa managers in the fields of marketing, finance, human resources, technology, and networks, since the managers in South Africa had more experience. Some of MTN's operations, such as the scratch cards and billing, were done at headquarters and this caused delays for its Africa operations and distracted the South African management team (Rosenweig, 2003 b). Once the large and complicated market of Cameroon was added to MTN Africa, MTN was forced to institutionalize its outside operations to perform independently from its domestic operations (Rosenweig, 2003 b).

In 2001, MTN bid and won for the license in Nigeria, which was the second-largest mobile market at the time. Accordingly, the company overtook South Africa in terms of mobile subscribers in 2008.³³ Nigeria was a challenge for MTN Africa because it was so large that the investment required was soon more than MTN could afford (Rosenweig, 2003 b). For example, MTN had to build a 12,000-kilometer digital microwave transmission link due to poor backbone infrastructure in Nigeria. To overcome the lack of human resources, MTN developed a large expatriate program in which it hired and trained managers for expatriate positions and also provided incentives such as free housing and

³³ Cellular News. Nigeria Overtakes South Africa As Largest African Market. 8 October 2008.

schooling, higher salaries, tax-free salaries in USD, and higher levels of authority compared to other markets (ibid). Unlike Celtel, MTN's strategy was not to replace top management with local forces but to continue the operation with expatriates. Therefore, MTN quickly learned to institutionalize its international expansion in a very different way from Celtel's expansion.

Another important step for MTN was to align with the Black Economic Empowerment (BEE) initiative in South Africa, which started in the late 1990s and required firms to hire a certain ratio of black South Africans or otherwise pay a penalty. MTN had invested and operated in rural parts of South Africa from the beginning, and was open and receptive to BEE. With the BEE initiative, many black South Africans were returning to their country, some with very powerful skills. In addition, MTN had a BEE investment group, Johnnic Group, as a shareholder and these two brought Mr. Phuthuma Nhelko to be MTN's Chief Executive Officer from 2002 to 2011, so that Nhelko led MTN through its international expansion. A considerable number of black South Africans also became board members, technical managers, and even expatriate managers with MTN. Overall, the company leveraged these social changes for growth opportunities and used them for its international operations with Africa.³⁴

Finding financial resources for MTN's operations was another challenge. Robert Nisbet, chief financial officer and one of the founding members of MTN, was responsible for the profitability and due diligence of the expansion plans, attracting the capital requirement while travelling to target countries, and closely monitoring the investments of MTN. Profitable investment in countries with poor

³⁴ Interview with Andrew Portukallis, senior planning engineer and an early employee of MTN, December 2011

infrastructure was difficult; MTN's rival, Telkom had invest in Nigeria and had to exit in failure. To maintain authority over key decisions such as top management appointment and capital expenditure, MTN insisted on being the lead partner for any bid. Its ideal was to have 40 percent share while the local operating partner kept 30 percent share and the rest went to local shareholders (ibid). This ideal meant that MTN invested less than half of the shares in the operator and shared the burden with other local investors, as well as with local partners. One important constraint was the restriction by the South African Reserve Bank to limit foreign investment to 250 million rand (equivalent to \$43 million in 1999) per company in the South African Development Community (Mozambique, Zimbabwe, and Botswana), and 50 million rand for other countries (ibid). Nisbet knew that "in telecom, 50 million rand is extremely low." Consequently, the company had to finance the rest of the investment through loans, which MTN usually financed with South African banks that had branches outside South Africa (ibid). However, this strategy put pressure on early profitability since MTN had to pay interest on these loans. To solve this problem, the firm demanded a fee for management and technical know-how from its local partners, which started immediately, and its value was usually sufficient to pay loan interests during peak investment periods while the network would later generate more cash to pay back the loans and reach profitability (ibid). During peak funding, MTN used a large number of its expatriate managers and invested heavily in the beginning to gain supremacy in market share and service quality.

The next challenge for MTN was to consolidate its brand over all operations. In 2002, when the executive committee launched an investigation to

pinpoint areas where the company could cut costs by standardizing and coordinating, it found there were duplicating costs from supporting multiple brand messages. Therefore, MTN decided to pursue a global brand identity and hired Santie Botha, who had built successful branding experience in South Africa, as its executive director of marketing in July 2003 (Townsend et al., 2005). Botha and Serame Taukobong, chief marketing officer of MTN, started negotiations with local operations but “the new point of view was almost immediately rejected for the simple reason that the representatives of the countries felt they were not consulted,” Taukobong recalled (ibid). The rest of the African operation saw MTN management as imposing centrally made decisions on everyone outside of headquarter in what they called a “South African attitude.” Botha and Taukobong worked to adopt the “Y’ello” brand, which was adopted from MTN Nigeria, so that other operations would not feel it was forced from Johannesburg. They wanted to gather various opinions about the brands and develop an inclusive approach that involved all operations in the process. It took MTN marketing two years to solidify all brands and in April 2005, MTN finally adopted the pay-off line, “everywhere you go” (ibid), along with yellow color and “Y’ello” brand greeting for its operations.

After enjoying stability and profitability in all international markets (especially Nigeria) and solidifying operations in a single brand, and a few years after the Tech Bubble when attention was returned to the ICT sector, MTN started a new phase to transform from a significant operator to a giant operator in Africa and internationally. The company acquired operators in four African countries—Zambia, Cote d’Ivoire, Republic of Congo, and Botswana—and made

its first investment outside Africa into Iran, owning 49 percent of the GSM license in the country. South Africa, Nigeria, and Iran later became major sources of subscribers and revenue, accounting for 30 percent, 30 percent and 7 percent of the group's \$16.6 billion revenue in 2009 (MTN Annual Report, 2009). In the same year, MTN bid to acquire Celtel for \$2.7 billion but it lost the bid to Zain Group. In 2006, MTN acquired the next-largest operator in Africa, Investcom, for \$5.5 billion. Investcom had licenses or existing operations in 10 countries in Africa and provided a stronger presence for MTN. Figure 17 shows MTN's operation after the acquisition of Investcom.

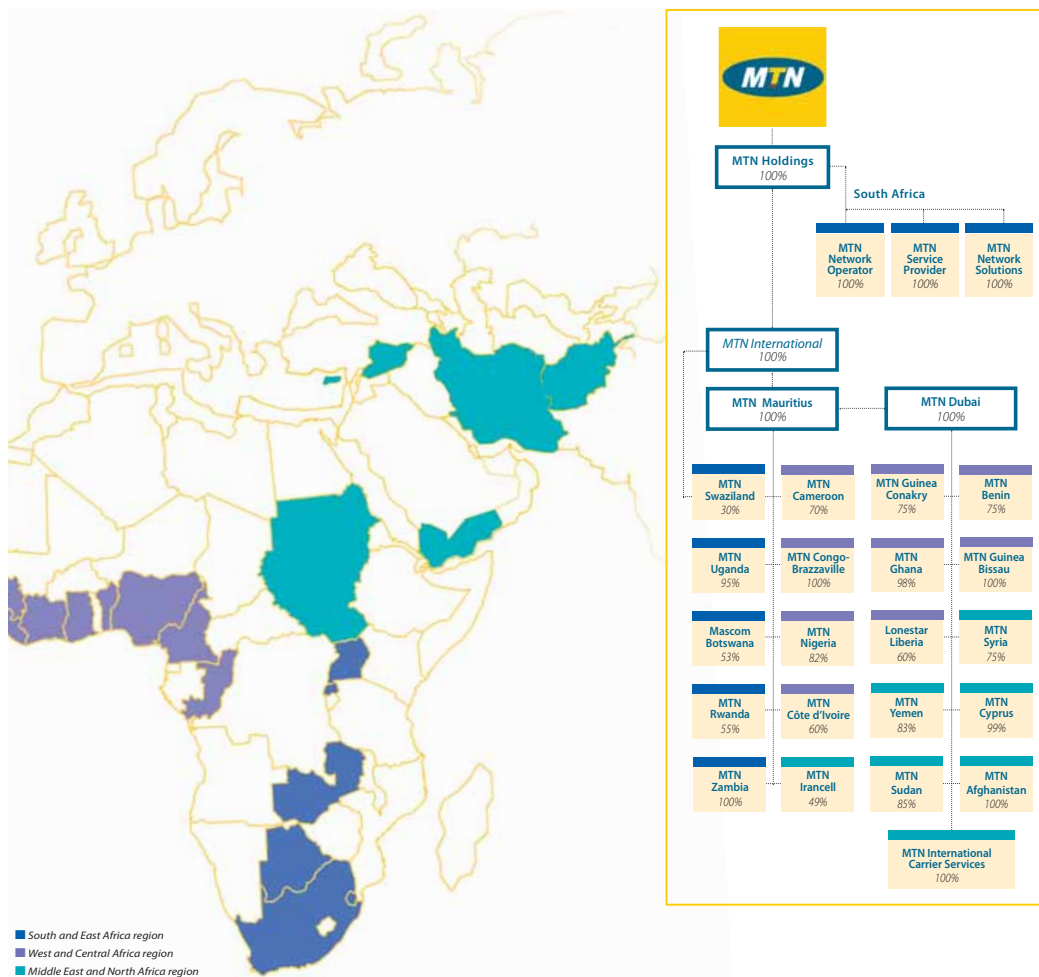


Figure 6: MTN's presence after the acquisition of Investcom (Source: MTN Annual Report, 2006)

Case Study III: Telecel:

Telecel international started in DRC in 1987, as a joint venture between Miko Rwayitare and Joseph Gatt. Gatt was an American pilot who used to run the Intercontinental Hotel and Air Zaire in Kinshasa, DRC, where he met Rwayitare (Makura, 2008). Rwayitare was born in French Rwanda in 1942, grew up in DRC, studied electrical engineering in Karlsruhe University in Germany, and returned to DRC afterwards (ibid). He served as technical manager in the DRC president's data processing center and later became vice-president of marketing for Gécamine, DRC's mining conglomerate (ibid). Rwayitare's job in Gécamine involved extensive travel and gave him exposure to international trade (ibid). He set up a business in DRC to distribute Xerox and HP products with maintenance services (ibid), which proved successful enough to expand to Gabon, Rwanda, Cote d'Ivoire, and Ethiopia (ibid).

Rwayitare established a sociopolitical network and gained business experience throughout Africa prior to establishing Telecel. His background gave him a thorough understanding of the African market's opportunities and possibilities. Gatt also had a sociopolitical network in the continent. In 1975, he learned of a military communication technology called AMPS, which was just being declassified for civilian use. He shared this information with Rwayitare and they both saw an opportunity to deploy this technology in African countries that were suffering from poor telecommunication infrastructure.³⁵ AMPS was a first-generation cellular technology that was gradually replaced by second-generation technologies in the 1990s in Africa.

³⁵ Interview with Joe Gatt, co-founder of Telecel.

Once the partners recognized the opportunity at hand, their next step was to remove legal barriers and receive a license of operation to start mobile services, as well as to raise funds to install the network. Both tasks turned out to be a challenge: none of the African banks or Rwayitare's friends agreed to invest in the project because the technology was unknown in Africa and therefore associated with a high risk of failure. Rwayitare invested \$35,000 of his own money and managed to take a loan of \$200,000 from Canada to order the necessary equipment from the United States (Makura, 2008). To avoid tax, the company had two companies in Reston, Virginia and in Kinshasa, DRC, respectively (ibid). Rwayitare hired lawyers to reinterpret the regulations and convince governments to grant a mobile license in DRC for \$1.5 million (ibid). The second possible method for obtaining licenses in countries that had already issued licenses was to buy them from individuals who received the licenses from the state, mostly in rent-seeking activities.³⁶ In this case, Rwayitare identified these individuals and Gatt negotiated to buy their licenses; in this way, Telecel obtained licenses in Cote d'Ivoire, Zimbabwe, Zambia, and Madagascar.³⁷ Rwayitare had powerful network in DRC and negotiated to buy licenses in Burundi and the Central African Republic (CAR) as well.³⁸ Clearly, Telecel faced challenges due to being the first to introduce cellular services to Africa. The licenses acquisition of Telecel was very similar to Celtel's in that both acquired several licenses at a faster pace than their financial and technical human resources allowed. Further, in both firms, the licenses were acquired when their

³⁶ Interview with Joe Gatt, co-founder of Telecel.

³⁷ Interview with Joe Gatt, co-founder of Telecel.

³⁸ Interview with Joe Gatt, co-founder of Telecel.

prices were very low and the licenses later became a very valuable asset for the firms, which gave them a geographic diversity.

To provide the technical know-how, Telecel sought assistance from Motorola, from whom they ordered cellular equipment. However, from the beginning, Telecel selected a few top graduates from technical universities per year in the countries of their operations and sent them for training at firms like Motorola, Siemens, Huawei, etc. This pool of experts consisted of about 120 engineers at its peak, and was specifically tuned to understand the cellular equipment. Telecel also used separate technicians for jobs such as setting up microwaves and installing antennas on cellular towers. The pool of technical employees was a critical asset for Telecel but after the company's business began to decline in the early 2000s, these engineers were mostly absorbed by Celtel.

In most African countries, the telecommunication ministry and government provided contracts to relevant European telecom firms with colonial associations—e.g., France Telecom or Portugal Telecom—as well buying the equipment. When Telecel entered the market, it upset this existing balance by bringing its own equipment and providing services through a different channel that cut the benefit of the existing players. These players in return increased the inertia of legal decisions and legal channels for Telecel. In addition, as Telecel became popular among customers, it was taking away a part of the incumbent post telephone and telegraph (PTT) business; accordingly, PTT denied to share infrastructure or gateway access for international calls with Telecel. To eliminate this problem, Telecel started to guide its traffic through satellites with reliable and

quality service but at very expensive prices: \$16 per minute for clients for a 36 MHz satellite band cost the company \$2.5 million a year.³⁹ Telecel eventually expanded to a number of satellites above Africa with a central station in Brussels (which became its own company, AfriLink, another valuable asset for Telecel), thereby solving the problem of gateway communication for firms who came later. For example, Celtel was its largest customer at one time and in 2002, decided to acquire AfriLink, which it later sold to Gateways Communications (which eventually became part of Vodafone) for over \$800 million.

By 1991, Telecel had expanded to Burundi, Guinea, Madagascar, and CAR, and by 1998, it added another three—Cote d'Ivoire, Zambia, and Zimbabwe (Makura, 2008). Telecel's marketing and expansion strategy was controversial and was criticized by several analysts. Since Telecel operated as a monopoly for some years in many of its markets, it charged high rates (e.g., \$5,000 per month for regular subscription) and its customers were the small wealthy percentage in each country. These customers could not rely on poor and unreliable alternatives that existed against Telecel's services and had to pay the price. Telecel's business model did not encourage the company to expand to small towns and rural areas, and the firm was therefore criticized for not investing in bringing communication to non-elite customers in Africa while it secured its presence in several African countries and had a profitable operation (Southwood, 2009).

³⁹ Interview with Joe Gatt, co-founder of Telecel.

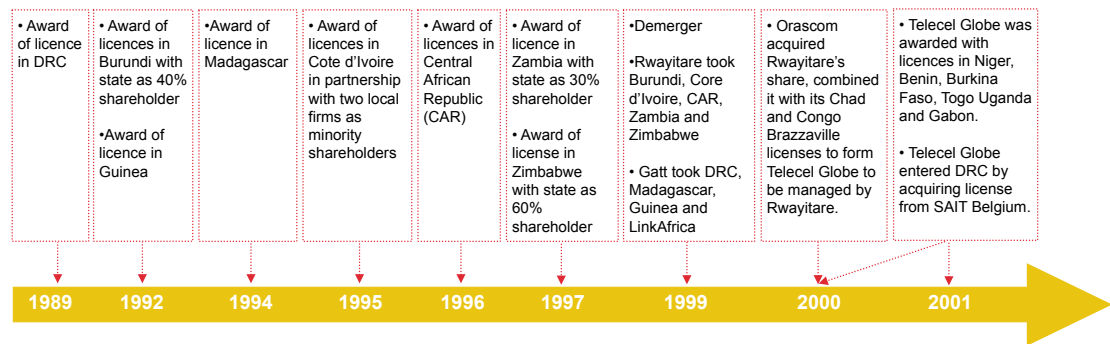


Figure 7: Timeline of Telecel operations

Telecel was the first mobile operator in Africa and as such, it faced significant problems, such as re-interpreting local laws to gain mobile licenses, building its own international traffic backbone, and training a large technical pool to support its operations for the first time. It is these pioneering efforts that make Telecel an especial case—even more so since these solutions were created by two founders rather than by a large group (as in the case of Celtel or MTN). In this way, Telecel was strongly based on Rwayitare's vision and Gatt's detail management. Unlike Celtel or MTN, which absorbed technical know-how of operations from multinational mobile operators, Telecel gained its knowledge of managing services and installing equipment from its vendors, and this made it vulnerable to technological change. Indeed, in the late 1990s and early 2000s, with the emergence of 2G mobile technology (which required digital equipment) and pre-paid SIM cards (which changed the business model and enabled mobile operators to sell services to rural areas), Telecel lost its dominance in all of its markets. Also, since Telecel used AMPS technology, it needed to upgrade to GSM technology and therefore incurred a huge sunk cost.

In December 1998, Telecel's two partners decided to demerge their shares of the company since Rwayitare had joined Orascom, an Egypt-based entrepreneurial pan-African mobile operator, for an IPO.⁴⁰ Orascom paid \$413 million for 80 percent of Rwayitare's shares in 2000 (Orascom Annual Report, 2000). Since Telecel was based on its two founders, and relied heavily on Gatt for technological connections, it eventually declined in business. The technology bubble hastened its downfall and Gatt soon sold the operations he had taken over after the demerger—which were in Madagascar, DRC, Guinea, and AfriLink—and Orascom sold the operations it acquired from Rwayitare. Rwayitare left Orascom and later started a firm to bring broadband services to Africa but he died in 2007.

Comparison of the Three Pioneering Firms on Know-how, Internationalization, and Experimentation

Heritage of Know-how: Celtel and MTN inherited their know-how through spin off and joint partnership with MNE, but Telecel did not have any similar background. This difference in heritage played a significant role in the company's success:

- i. Celtel was a spin off of MSI, which in turn was a spin off of the cellular section of British Telecom called Cellnet. Celtel's founder, Mo Ibrahim, was CTO of Cellnet. MSI was founded by most of Cellnet's technical team and it developed Planet. Some of the early founding team members were: Moez Daya (Cellnet's head of cellular planning, responsible for Planet in

⁴⁰ Interview with Joe Gatt, co-founder of Telecel.

- MSI, who later became CTO of Celtel), Terry Rhodes (strategist for Cable and Wireless and later Cellnet, who joined MSI and then Celtel as chief strategy officer), Kamiel Koot (an African-born professional banker in Europe who joined Celtel as CFO), and Tito Alai (chief marketing officer). Celtel had no experience in operation and therefore had to partner with Vodafone for its first operation. This proved inefficient and Vodafone sold its shares to Celtel in 1998. Celtel learned from the experience, managing the rest of its operations alone.
- ii. MTN was a partnership between locals who came from Multichoice, a satellite television firm, Transnet, a transportation firm, and CWI (30 percent). Trevor Morris of CWI was in charge of engineering, and network designs were done from London in 1994, but the local engineering team soon learned the design process and took over the engineering from 1995. Also in 1995, SBC Bell South invested (15.5 percent) in the company conditioning on appointing Robert Chaphe as CEO. Chaphe organized the marketing, advertising, and sales departments at MTN. However, SBC had to sell its stake in 1998 due to conflict of interest. SBC invested in the incumbent operator as well. CWI also sold its 30 percent in 1998 to focus on other operations. At the same time, MTN's engineering team successfully established a relationship with Ericsson and sent technical teams there for training.
 - iii. Telecel's founders did not have a technical understanding of cellular operations so it was decided that Rwayitare, the African partner, would send local technicians to the United States, and Joseph Gatt, the

American partner, would send them to Motorola, the company who provided the equipment. While these equipment technicians could operate the network well, they could not design or optimize the network and relied on external contracts for that purpose.

Geographical Scope: The three firms experienced a quick growth in geographical scope, primarily due to learning to improve resource management and devote external resources to expansion. Celtel and MTN's growth were sustainable but Telecel had some difficulties in maintaining its operations and sold most of them to Orascom, another EFE.

- i. Celtel: After starting its first operation in Uganda in partnership with Vodafone in 1995, Celtel started its own operation in 1997 in Sudan through privatization of the incumbent operator. The next operations were started as greenfield operations between 1998 and 2001 in Zambia, Malawi, Chad, DRC, Republic of Congo, Gabon, Sierra Leone, Burkina Faso, Niger, and Tanzania (although in Tanzania Celtel entered as a privatization partner for the incumbent fixed-line operator who had a mobile license). None of Celtel's operations were in large telecom markets in Africa due to financial constraints, and its first entry to such a market was through an acquisition in Kenya in 2004. The firm's operations were acquired by Kuwait's Zain Group in 2005. Celtel did not have a "home market" to help finance its expansions. Its financial resources were provided through development organizations (e.g., World Bank's IFC, Germany's DEG, the United Kingdom's CDC (Actis), the Dutch FMO, etc.), private equity (e.g., Bessemer Venture Partners, Emerging Capital

- Partners, Citigroup, Capital International, etc.), and African banks and investments, mostly based in South Africa (e.g., Standard Bank, Zephyr Asset Management, and WorldTel Africa). Therefore, Celtel eventually had to choose between an IPO or being partially or fully acquired to repay its investors.
- ii. MTN: After starting its home operation in 1994 in South Africa with CWI and later SBC, MTN began its international expansions in Uganda, Swaziland, and Rwanda in 1998, through greenfield operation. It acquired an existing operation in Cameroon in 2000, and its major entry was in 2001 into Nigeria. In the next round of expansion, MTN competed with Celtel in the acquisition of a Kenyan operator but lost. In 2005, MTN acquired three operations in Republic of Congo, Cote d'Ivoire, and Zambia, respectively, and a greenfield license in Iran, which was a large Middle Eastern telecom market. MTN bid to acquire Celtel in 2005, but lost to Zain. Therefore, in 2006, MTN acquired Investcom, the next-largest available EFE after Celtel, which was active in Africa and the Middle East with 10 operations. MTN provided finance both from its home operation in South Africa and from the second-largest African market, Nigeria, where the company entered into the first steps of liberalization. MTN also received financing from South African banks and investments.
 - iii. Telecel: After its first operation in DRC in 1987, Telecel started its next operations in Madagsacar in 1994, Zambia and Cote d'Ivoire in 1996, and Zimbabwe in 1997. Rwayitare's network was essential in most of these license acquisitions. Telecel further expanded to Burundi, CAR, and

Guinea but in 2000, the two partners had disagreements and separated their operations. Gatt kept most of the data and radio transmission while Rwayitare took most of the operations and was acquired shortly afterwards by Orascom in 2000. Following the dot-com boom of the early 2000s, and due to the fact that Telecel's operations were fragile, Orascom quickly disposed of most of the operations, which were mainly sold to Atlantique Telecom, which was in turn acquired by Etisalat.

Experimentation: In the early years of the mobile industry, entrepreneurial firms faced major challenges. Over time, those entrepreneurial firms with a heritage of know-how were more likely to develop solutions to these challenges through a costly experimentation process. This process included cases of success and failure. Below are a few cases that demonstrate the initial challenges that pioneering entrepreneurial firms faced, and the subsequent experimentation to develop a solution.

- i. At first, Celtel and several other operators that erected towers in rural areas faced a challenge. While Celtel made initial investments for towers and equipment, in several cases, the number of users was below the necessary threshold so the tower was not financially viable and was shut down. The termination of these towers had political as well as financial costs as their closure greatly annoyed local politicians. After initial losses, Celtel decided to modify its towers and put as much radio equipment as possible on top in order to cover larger ranges. This made the towers financially viable and avoided aggravating local politicians. In effect, this was a trial and error situation in which Celtel learned to adapt.

- ii. One of the differences between serving low-income customers in Africa and wealthy customers in advanced economies was the sharp difference in average revenue per user (ARPU). The ARPU for low-income areas of Africa was typically \$4 per customer per month, but for wealthy customers in Europe, it was around \$120 per customer per month. MNEs therefore avoided initial investments in low-income areas. Celtel had a similar problem in its early years, which it solved by micromanaging each tower. The company used data-mining tools and network analysis software, and devoted considerable resources to track each tower. It gave instructions to local managers based on this analysis—e.g., start installation immediately because a region will need an extra link on a certain tower soon due to predicted excessive congestion in a month. This aggressive micromanaging was obviously impossible once the network grew larger but was vital to initial operations. Further, this level of micromanagement was not likely to be adopted by MNEs because they made the bulk of their revenue from their vast operations. In a similar circumstance, an MNE would just shut a site down if it was not profitable, or even sell the whole operation.
- iii. In the early years of the industry, in remote areas, Celtel and several other operators used satellite services to provide coverage. The problem that Celtel faced in these initial years was that in some regions the demand rose very quickly. However, it took three to six months to file a request to the satellite service provider to allocate more bandwidth and to install additional equipment to support the rising demand. Celtel used

compression equipment to compress voice into the same bandwidth and accommodate more users, but this action degraded voice quality. One of Celtel's early mistakes was overestimating the voice quality due to compression, and it lost customers because of poor voice quality in remote areas. To resolve this problem, Celtel ordered larger bandwidth and more equipment, and redeployed bandwidths and equipment from areas with low growth to areas with high growth. Of course redeployment of resources was not a new tactic—Vodafone, Orange, and several other MNEs had similarly redeployed their resources between countries.

- iv. Another one of Celtel's early problems was distributing its SIM cards to remote areas and collecting cash from sales in these areas. Celtel used one-time helicopters and planes to install towers and equipment, and sent staff to service towers by bicycle, boat, etc. when necessary. However, distribution/cash collection was a routine trip and could not be arranged by the same methods. Celtel made initial losses but gradually developed a sophisticated distribution system to store and collect cash despite lack of roads and infrastructure.

Table 1 provides a summary of some of these important challenges, along with successful and unsuccessful experimentations.

Table 1: Summary of challenges, along with successful and unsuccessful experimentation

Challenge	Unsuccessful Experimentation	Successful Experimentation
The demand for mobile services in rural areas was unpredictable in the early years of mobile industry.	Pioneering mobile operators made upfront investment and offered mobile services. If the number of users was below a threshold in a rural area and the tower was subsequently not financially viable, the firm shut down the tower.	After initial losses, Celtel decided to modify towers and place tall towers (about 80-100 meters tall compared with conventional 20 meter towers) and place as much radio equipment as possible on top it to cover larger range. This reduced the cost of generators for electricity as larger generators are more efficient and saves fuel and fuel trips to resupply generators. Once demand picked up, Celtel lowered radio equipment on towers and adds new conventional towers.
The Average Revenue Per User (ARPU) in base of the pyramid market was significantly lower than ARPU among high-income customers. Therefore some mobile towers were not profitable.	The MNEs often avoided initial investments in low-income areas. The ARPU for low-income place in Africa was typically \$4 per customer per month compared with \$120 for wealthy customers in Europe. If a tower were not profitable, an MNE management would just shut a site or even sell the whole operation in a country if it was not profitable.	Celtel's had a similar problem in the early years the solution evolved to deal with this problem was to aggressively micro manage each tower. Celtel used data mining tools and network analysis software and devoted considerable resources to track each tower. They would give instructions to local managers e.g. a region will need an extra link on tower #1 soon because of predicted excessive congestion in a month, so start installation before problem occurred. This aggressive micro managing was very vital for the initial stage to make operation profitable.
The demand for mobile services rose very quickly in some remote areas that used satellite communication for mobile services coverage.	It took long time to (3-6 months) to request to the satellite service provider to allocate more bandwidth and to install additional equipment. Therefore pioneering EFes like Celtel used compression equipment to compress voice into same bandwidth and accommodate more users, but this action degraded voice quality. One of the mistakes Celtel made in early years was that it overestimated the voice quality due to compression and lost customers due to poor voice quality in remote areas.	After initial losses in early years, Celtel ordered larger bandwidth and various equipment and redeployed bandwidths and equipment from areas with low growth to areas with high growth. Redeployment of resources was not a new tactic and MNEs e.g. Vodafone, Orange, other MNEs redeploy their resources between countries similarly.

Conclusion

The cases above illustrate the process through which local EFEs acquire knowledge of the industry. These EFEs are formed when key family members of local business groups take entrepreneurial initiatives to diversify their businesses into mobile telecommunications. Some serial entrepreneurs also set up mobile operations. According to the North-South framework of economic development, EFEs often rely on the knowledge created in industrialized countries through MNEs because they are not expected to generate vital industry knowledge indigenously (Finley, 1979; Krugman, 1979; Grossman & Helpman, 1991).

Because some knowledge is tacit (Polanyi, 1962; Winter, 1987), it has been argued that entrepreneurs in developing countries cannot simply imitate knowledge; rather, that knowledge must be “seeded” into local firms by MNEs (Mostafa & Klepper, 2013). However, if the transferred knowledge is based on advanced economy industries, it would mostly reflect capabilities and solutions developed for markets prevailing in developed countries. As the cases presented above clearly demonstrate, to successfully enter into a BoP market, the knowledge-recipient firm in the developing country has to experiment until it develops an economically viable business model for the BoP market.

Prior research has also argued that industry-specific pre-entry experience is key to a firm’s early-stage learning and development of capabilities in that industry (Klepper, 2002; Helfat & Lieberman, 2002; Agarwal et al., 2004; Dencker et al., 2009; Argyres & Mostafa, 2013). Therefore, it is expected that having some relevant experience prior to the joint venture would enable local partners to

access and assimilate new knowledge from their MNE partners through the joint venture process, thereby facilitating the first step of knowledge transfer. The cases included in this chapter, Celtel and MTN in particular, illustrate the value associated to this prior knowledge, and the process by which such knowledge brings particular value as the firm continues to develop.

The process becomes especially relevant once the focal firm continues its developments efforts beyond the joint venture. In fact, subsequent to a joint venture, local partners such as Celtel and MTN become such “experienced” and can set up their own firms. These firms, which are no longer joint ventures and thus are entrepreneurial in nature, can be denoted as EFEs with Heritage, precisely because of this prior valuable knowledge seeded from the MNE and experience adapting a BoP business environment. This characterization also allows a finer characterization of the set of firms that enter the mobile operation industry in Africa. Besides the MNEs and SOEs, the well-established players in the literature, we can further refine the set of EFEs that enter a market into EFEs with Heritage, and all other EFEs. This characterization can be used to illustrate entry into this market over time, as noted in Figure 8 below.

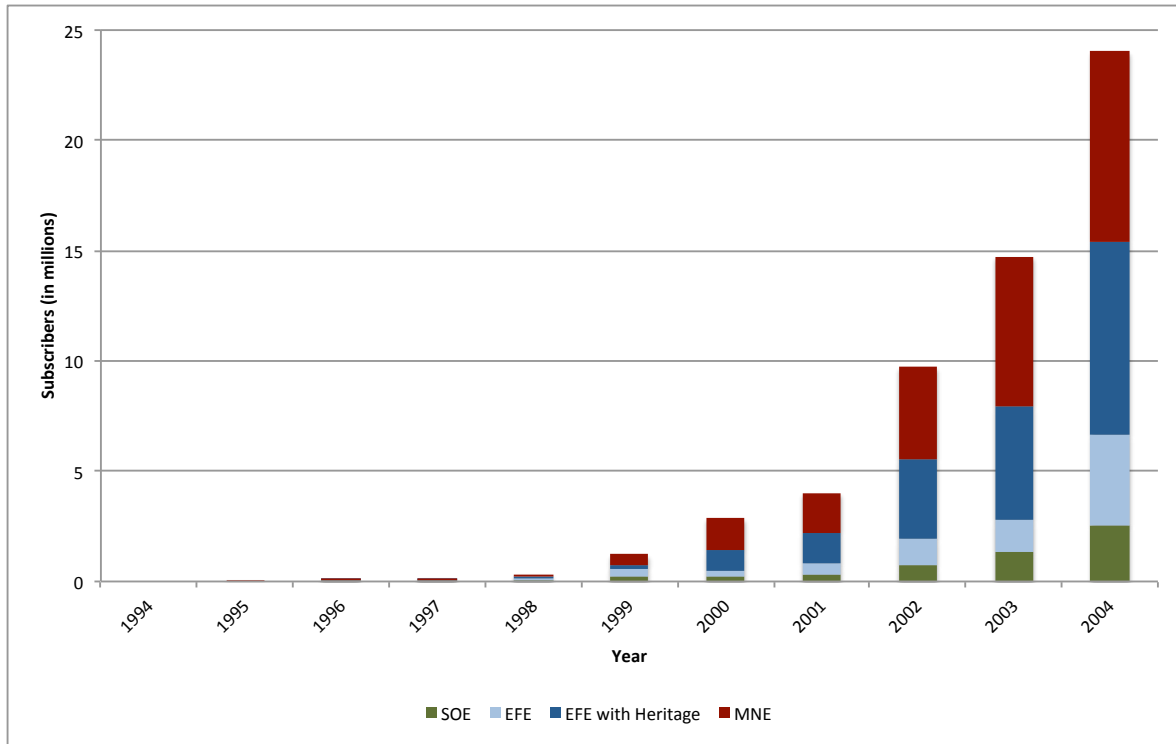


Figure 8: Total subscribers in Sub-Saharan Africa under the management of each type excluding South Africa (source: Author's Excel Database on African Mobile Industry, 1994-2012)

Figure 8 shows the number of subscribers in Sub-Saharan Africa, excluding South Africa, by firm types, from 1994 through 2005, before the large wave of acquisitions. Among the 19 *EFEs*, five were *EFEs with Heritage*, including Celtel and MTN. They accounted for 37 percent of all subscribers in the region in 2004, which confirms the difference in capability development among *EFEs with* and *without heritage*. *EFEs without heritage* usually relied extensively on international contractors for some core activities (e.g., network design, billing, marketing applications, etc.). Such contractors usually offered solutions based on existing practices.

Chapter 2: A North-South-South Framework of Industrial Development, Experimentation in and Internationalization across Mobile Telecommunications Markets of Africa⁴¹

Introduction

A central question in strategy and economic development concerns making modern industry goods and services affordable and accessible to consumers at “the base of the pyramid” (BoP). The world’s four billion BoP consumers have extremely low income and live primarily in developing countries, but collectively represent a \$5 trillion market (Hammond, Kramer, Katz, Tran, & Walker, 2007). Scholars have argued that a firm can simultaneously generate profits and improve BoP consumers’ living standards by developing strategies to tap their surplus, while satisfying some of their many untapped needs (Arnold & Quelch, 1998; Prahalad, 2004).

Recent studies suggests that adaptations to challenging BoP market conditions by advanced-economy multinational enterprises (MNEs) usually involve experimentations in their business models (London & Hart, 2004; Seelos & Mair, 2007), which raises questions about the motivation behind their investments in BoP markets (Garrette & Karnani, 2010; Rivoli & Salorio, 1996). Moreover, although MNEs have been the main focus of research on BoP markets, the recent rise in foreign direct investments (FDI) in various developing countries are attributed to investments made mostly by firms originating in *developing countries* (United Nations, 2012), suggesting that such firms can play

⁴¹ This chapter includes my job market paper, submitted to Strategic Management Journal.

an important role in developing BoP markets. Some studies have begun to unpack the differences between the characteristics of MNEs and those of developing-country firms (Cuervo-Cazurra & Genc, 2008; Guillen & Garcia-Canal, 2009; Hoskisson, Wright, Filatotchev and Peng, 2013), but far less is known about how developing-country firms build modern industry capabilities for their BoP markets, what is the impetus behind their internationalization, and how traditional MNEs respond to such expansions.

This paper examines the determinants and consequences of entry into BoP markets by considering both MNEs and developing-country firms. Our analysis focuses on a region comprising several developing countries that vary in their market conditions. We consider the conditioning host-country factors that can attract MNE entries in the region (Henisz, 2000; Holburn & Zelner, 2010; Makino & Tsang, 2011), which we suggest provide an opportunity for regional entrepreneurs to learn about modern industries. According to the literature on knowledge transfer, when entrepreneurs in the “South” cannot generate key organizational knowledge about a modern industry, they need to rely on its transfer from successful organizations in the “North” to build capabilities for the industry (Findlay, 1980; Krugman, 1979).⁴² Because the organizational knowledge has tacit elements (Polanyi, 1962; Winter, 1987), we focus on partnerships that allow tacit learning between MNEs and local partners (Lane, Salk, & Lyles, 2001; Mowery, Oxley & Silverman, 1996).

However, as the transferred organizational knowledge is based on market conditions prevailing in developed countries, we argue that the knowledge-

⁴² The “key organizational knowledge” may be thought as the underlying knowledge about a business model comprising of a system of activities that allows the firm to create, deliver, and capture value (Zott & Amit, 2010).

recipient partners in the South, similar to MNEs, would be required to also experiment in order to create and capture value in the BoP markets. We examine the incentives for local entrepreneurs and MNEs to carry out such experiments and contend that experiments, when successful, contribute to ownership advantages (Dunning, 1980; Rugman & Verbeke, 1992), which can be leveraged to internationalize across BoP markets. Our theoretical framework thus generates hypotheses on firms' internationalization and performance that are based on their backgrounds.

We study the evolution of the mobile telecommunications industry across Africa, which is a particularly appropriate test bed for our theoretical framework. African countries have substantially large BoP markets, with several countries having as many as 95 percent of their populations in BoP markets (Hammond *et al.*, 2007). The continent is also burdened by various socio-economic challenges (Collier, 2007). Yet, mobile subscribers grew rapidly in almost all African countries; by 2012, Africa's mobile penetration rate had reached 60 percent. Moreover, the industry was characterized by rapid technological change, and given the BoP market conditions across Africa, uncertainty loomed large over adaptations of core aspects of business models in mobile telecommunications. Finally, starting from the early 1990s, African countries adopted policies that opened up their mobile telecommunications markets to private and foreign investments, thus providing a setting suitable for examining entry dynamics and firm performance over a long horizon — from the industry's effective beginning to its maturity.

Collecting firm-level data across several developing countries is exacting, but we were able to identify every mobile firm that has operated in every country in Africa. Using datasets developed by reputable international research organizations, and information in published trade journals, and corporate annual reports, we documented various characteristics of each mobile operator since its entry into the country, including its ownership structure and the yearly number of its subscribers in each country where it operated. We augmented these data with information on country-level characteristics that has been widely used in the literature (Cuervo-Cazurra, 2006; Surroca, Tribó, & Zahra, 2013). To shed light on the key challenges that African BoP markets presented and various important adaptations that were carried out by industry pioneers, we carried out unstructured interviews with founders and top managers of several early entrants.

Our paper has important implications for the literatures from which it draws. Studies on BoP markets have highlighted the importance of experimentations for adapting to those markets (Chesbrough, Ahern, Finn, & Guerraz, 2006; London & Hart, 2004), but less attention has been paid to firm incentives for undertaking such experiments. Our analyses suggest that once a developing-country firm is seeded with organizational knowledge about a modern industry, it is more likely than an MNE to discover successful BoP adaptations, potentially because of its greater incentives to experiment. Although scholars of international management have attributed internationalization by developing-country firms to their ownership advantages (Cuervo-Cazurra & Genc, 2008; Guillen & Garcia-Canal, 2009), the key sources of such advantages remain

understudied. Our findings indicate that successful experiments contribute to the development of capabilities that can be exploited to enter into several BoP markets. Moreover, among developing country firms, those with pre-entry experiences conducive to learning about modern industry business models from MNEs are most likely to be successful in making BoP adaptations. Our paper thus synthesizes the literatures on BoP, knowledge transfer, and international management to provide a unified framework for analyzing entry dynamics and performance of both MNEs and developing country firms in BoP markets.

Finally, our findings have implications for industrialization in developing countries. In contrast to the economic models that posit one-directional investments from the North to the South, our framework outlines a two-step industrialization process. The spillover of knowledge from the North enables a few entrepreneurial firms in the South to actively experiment, and through discoveries of BoP adaptations they gain ownership advantages and internationalize across BoP markets in the South, catalyzing the growth of the industry.

Literature review and hypotheses development

Firms offering modern industry products in BoP markets face a fundamental challenge of developing business models that enable them to create value for and capture value from consumers who have extremely low income and are difficult to reach (Chesbrough *et al.*, 2006; London & Hart, 2004; Prahalad, 2004). Developing countries have substantially large BoP markets (Hammond *et*

al., 2007) and also weak institutions (North, 1990). Weaknesses in institutions contribute to several economic challenges—e.g., limited protection of property rights, poor governance, and imperfections in capital markets—that impede entrepreneurial initiatives and industrial development (Acemoglu, Johnson, & Robinson, 2002; Stiglitz & Weiss, 1992). Historically, a lack of private and foreign investments in developing countries has been associated with a preponderance of state-owned enterprises (SOEs), but their SOEs typically suffered from poor management and played a limited role in contributing to economic growth (Megginson & Netter, 2001).

Nonetheless, BoP consumers collectively represent a \$5 trillion market (Hammond *et al.*, 2007), which is projected to grow with the rapid pace of economic development in emerging economies (Hoskisson, Eden, Lau, & Wright, 2000). Finding opportunities in BoP markets thus has become critical, for not only local firms but also MNEs, which face an increasingly competitive landscape in maturing markets of developed countries (Arnold & Quelch, 1998).

Scholars of international management have long suggested that the internationalization of markets under common ownerships can offer several benefits, including centralization of control and economies of scale (Bartlett & Ghoshal, 1999; Buckley & Casson, 1976). Moreover, MNEs can leverage their transferable “ownership advantages,” often in the form of hard-to-imitate managerial and technological capabilities, and complementary assets, to enhance their subsidiaries’ competitiveness (Dunning, 1980; Rugman & Verbeke, 1992).

Benefits of internationalization notwithstanding, there are investment uncertainties due to the unfamiliarity of a foreign environment (Hymer, 1976; Vernon, 1983). In particular, when investing in developing countries MNEs encounter various sources of uncertainties. First, there are operational hazards that arise from the weak institutions of host countries, including the expropriation of foreign assets (or their returns) by host country governments (Delios & Henisz, 2000, 2003; Henisz, 2000; Holburn & Zelner, 2010), extortion by host country government officials (Guriev, 2004), and lack of clarity in host country administrative procedures (Javorcik & Wei, 2009). Second, several studies suggest that when MNEs target BoP markets of developing countries they have to significantly alter their existing business models to make their products and services affordable and accessible to BoP consumers (Balu, 2001; London & Hart, 2004). Some studies document the failure of MNEs to adapt to BoP conditions altogether (Garrette & Karnani, 2010; Simanis & Hart, 2001). The various cases examined in the literature indicate that MNEs' adaptation for BoP markets usually involves experimentation in their existing business models, a process that is rife with uncertainty.⁴³

Although an emerging BoP literature offers important insights into some strategies for entering into low-income markets,⁴⁴ missing is a careful examination of the dynamics of entry into BoP markets. Because of challenging

⁴³ Balu (2001) discusses the revolutionary changes that the Indian subsidiary of Unilever, Hindustan Level Limited, made to its marketing and distribution practices, which turned out to be successful in tapping into BoP markets across India. Simanis and Hart (2001) document Monsanto's experimental efforts to create and market genetically modified seeds for BoP markets, but to no avail. Examples of experimentation in BoP markets are also provided in Chesbrough *et al.* (2006); Ellison, Moller, and Rodriguez (2002); Marquez and Rufin (2011).

⁴⁴ For example, Webb, Kistruck, Ireland and Ketchen (2010) underscore the importance of partnership with nongovernment organizations to overcome challenges arising from institutional voids in BoP markets, Vachani and Smith (2008) focus on building scalable distribution networks in BoP markets by engaging rural communities.

conditions, investments in BoP markets in developing countries are particularly fraught with uncertainty. According to the real option theory, there can be value in waiting when making an investment decision under uncertainty (McDonald & Siegel, 1986; Pindyck, 1991); the valuable information about market conditions that may be obtained in the future—e.g., through either policy changes in the host country or the experiences of other firms—may reduce uncertainty and, thereby, make the investment attractive financially. The greater the uncertainty, the greater the value of waiting, and, therefore, the more likely the investment will be postponed. Whereas ownership advantages can create an impetus for internationalization, given uncertainty, such advantages can, paradoxically, provide greater latitude in delaying investments (Rivoli & Salorio, 1996), as hard-to-imitate resources or managerial expertise may be exploited to establish competitiveness in the future, when uncertainties recede. Thus, instead of investing to develop highly uncertain BoP markets early on, MNEs from developed countries, because of their considerable ownership advantages (Helpman, 2006; Rugman, 1982; Teece, 1986), could find it optimal to choose a wait-and-see strategy.

Whereas existing research primarily focuses on the role of MNEs in developing BoP markets, the recent substantial increase in FDI into developing countries has been attributed to investments made mostly by firms originating in *developing* countries; such investments are being heralded as a driving force behind the development of various modern industries in many low-income countries (United Nations, 2012). Compared with multinational firms from developed countries, international firms with developing-country origins are

thought to have fewer resources, less brand equity, and inferior technology (Bartlett & Ghoshal, 1999). Nonetheless, some scholars suggest that, for firms originating in developing countries, their home-country origins provide some advantages over MNEs when investing in developing countries (Cuervo-Cazurra & Genc, 2008; Ramamurti & Singh, 2009). Far less is known, however, about how firms from developing countries build capabilities in a modern industry.

According to the literature on knowledge transfer, when key organizational knowledge about an industry cannot be generated indigenously, developing countries rely on knowledge from industrialized countries (Findley, 1980; Krugman, 1979). As organizational knowledge has tacit elements (Polanyi, 1962; Winter, 1987), firms in developing countries cannot simply imitate the business models of successful firms in the “North”; the knowledge has to be transferred from the successful firms to firms in the “South” (Mostafa & Klepper, 2014). However, if the transferred knowledge is based on advanced economies, it would be reflected in capabilities and solutions developed for markets prevailing in those countries. To successfully enter into a BoP market, the knowledge-recipient firm in the developing country would also need to experiment until it develops an economically viable business model for the BoP market. Thus, for a developing-country firm building modern industry capabilities for BoP markets is expected to follow a two-step process: first, the knowledge needs to be seeded into the local firm and, second, the regional firm, similar to MNEs, needs to experiment and make the requisite BoP adaptations.

But what conditions facilitate the transfer of organizational knowledge from the North to the South? What motivates developing country firms to engage in

experimentation for BoP adaptations, and why despite having seemingly similar home country experiences only a few developing country firms internationalize? How do traditional MNEs respond to such expansion? The relevant literatures provide little insights into the answers to these questions. To fill this gap, we propose a theoretical framework that explains the process of learning by developing country firms and the impetus behind carrying out experiments by MNEs and developing-country firms in order to identify the type of firms that potentially carry out BoP adaptations. In our analysis below, we consider MNEs, and, among developing-country firms, both SOEs and those founded by regional entrepreneurs, denoted by entrepreneur-founded enterprises (EFEs).

Entry and Performance in BoP Markets

In the early stage of the evolution of an industry, aspirant firms enter into the industry seeking to capitalize on potential market opportunities (Klepper, 1996; Suarez & Utterback 1995). Similar conditions exist when developing countries open their industries to allow investments by private and foreign firms (McMillan & Woodruff, 2002). MNEs, as argued above, are likely to delay investments in highly uncertain BoP markets, but there are conditioning factors that can influence their entry into a developing region.

Within a developing region, countries differ in their institutional quality and the shape of their consumer pyramids. Countries with relatively high-quality institutions have less pronounced operational challenges and also tend to have greater proportions of consumers above the base of the pyramid, and therefore, their market conditions are more likely to resemble those in developed countries

(Delios & Henisz, 2000; Holburn & Zelner, 2010; London & Hart, 2004).

Additionally, MNEs are expected to be more familiar with the operational environment of host countries when those countries have a long history of political and economic interaction with MNEs' home countries (Frynas, Mellahi, & Pigman, 2006; Jones & Khanna, 2006; Makino & Tsang, 2011). Such interaction is especially pronounced when home and host countries share colonial ties (Ghemawat, 2001).⁴⁵ Thus, when MNEs consider entering into a developing region, they are more likely to choose host countries with relatively higher quality of institutions and those that have colonial ties with their home countries.

The entry by MNEs in the region in the form of joint ventures with local partners, we suggest, provide an opportunity for the local partners to learn about modern industry business models. Joint ventures allow MNEs to spread the costs and risks of investments with their local partners. Moreover, host countries often restrict complete foreign ownership to encourage local participation in its industrialization.⁴⁶

Developing country firms have used various documented channels to access organizational knowledge: from "knowledge-for-cash" contracts (e.g., licenses), to joint development programs, to joint ventures (e.g., Chandra, 2006). However, the first-step learning about modern industry business models is expected to be complex, requiring access to knowledge on the model's various

⁴⁵ Most developing countries inherited their administrative and legal infrastructure from their former colonial rulers, with which they have maintained strong bilateral political and economic relationships (Huillery, 2009). Moreover, the government of the home country could leverage its political and economic influence to promote and safeguard its interests in former colonies (Jones, 1996).

⁴⁶ Joint ventures are not without risks; in particular, opportunism by partners could lead to their disbandment (see Beamish and Banks, 1987; Hitt, Dacin, Levitas, Arregle and Borza, 2000; and Luo, 2007).

aspects—technological, operational, marketing, and so on. Such organizational knowledge is embodied deeply in experienced workers and organizations (Winter, 1987). Because of the uncertainty surrounding its inter-firm transfer, it is difficult to write market-based contracts governing its acquisition (Pisano, 1990; Mowery *et al.*, 1996). At the other end of the spectrum are joint ventures, which combine ownership incentives with administrative control of an internal organization and, therefore, are superior transmission channel for organizational knowledge (Kogut, 1988, Si & Bruton, 1999; Mowery *et al.*, 1996).⁴⁷

Learning through a joint venture, however, is likely to be influenced by the local partners' own "absorptive capacity" (Lane, *et al.*, 2001; Lane & Lubatkin, 1998), which facilitate the acquisition and assimilation of new knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002). Absorptive capacity is, in turn, likely to be conditioned by the local partner's experiences prior to the formation of the partnership (Dencker, Gruber, & Shah, 2009), particularly when those work experiences are relevant to the focal industry (Agarwal, Echambadi, Franco, & Sarkar, 2004; Helfat & Lieberman, 2002).

Thus, when local partners have industry-relevant experience prior to the establishment of joint ventures with MNEs, they are more likely to learn about modern industry business models. Such "experienced" entrepreneurs are also more likely to learn about business models than entrepreneurs who rely on channels that are insufficient for the effective transfer of organizational knowledge. We denote the independent firms established by such experienced

⁴⁷ Given their importance in the literature, we focus on joint ventures with MNEs as a potential channel for accessing organizational knowledge by local entrepreneurs, although the arguments that follow are consistent with any other channel that may, in certain settings, be sufficient for the effective transmission of organizational knowledge.

entrepreneurs subsequent to their joint venture experiences as EFEs with Heritage to distinguish them from other EFEs. Because the success of the first-step learning becomes a critical foundation for the second-step experimentation, among all EFEs, EFEs with Heritage are expected to have the best prospect for experimentation.⁴⁸ We now analyze whether local entrepreneurs or MNEs have the greater incentives to carry out the second-stage experimentation.

Scholars studying competition have argued that firms strategically position themselves in markets based on their capabilities (Argyres & Mostafa, 2014; Porter, 1996). Our arguments above suggest that MNEs are more likely to enter into markets with relatively high-income consumers, where they are likely to have substantial ownership advantages because of their long history of experience and accumulated capabilities (Bartlett & Ghoshal, 1999; Cuervo-Cazurra & Genc, 2008). If regional firms were to enter into those markets, MNEs would be expected to outcompete them. However, MNEs are likely to delay their decision on investments in BoP markets until uncertainties inherent in those markets recede. This delay in entry by MNEs, we argue, offers a window of opportunity for regional entrepreneurs to establish their operations in BoP markets and avoid direct competition with MNEs in those markets early on, thereby incentivizing entrepreneurial firms to carry out experiments for BoP market adaptations.

⁴⁸ Based on our arguments, essentially, EFEs can have founders with four types of backgrounds: 1. Founders who had industry relevant experience and forged joint ventures with MNEs prior to establishing their independent firms in the industry—these firms have the relevant “knowledge heritage;” 2. Founders who have industry relevant experience but do not form joint ventures with MNEs; 3. Founders who do not have relevant experience but forge joint ventures with MNEs prior to establishing their independent firms; 4. Founders who neither have the relevant experience nor forge joint ventures with MNEs. According to our theoretical framework both prior experience and joint ventures with MNEs are essential for learning about modern industry business models, and, therefore, we group firms with founder backgrounds of 2, 3 and 4 under one category—“other EFEs.”

Uncertainties notwithstanding, successful experiments can generate new organizational knowledge (Grant, 1996; Kogut & Zander, 1992), which, in turn, enables the discoverer to build capabilities for creating and capturing value in the BoP markets. The discoverer can exploit the ownership advantages gained through such capabilities to enter into other BoP markets (Dunning, 1980, 1988). In summary, our arguments suggest that among entrepreneurial firms, EFEs with Heritage are most likely to be successful in the first-step learning process; and because EFEs with Heritage have a greater incentive than MNEs to carry out the second-step experimentation, they are more likely to discover successful BoP adaptations. Accordingly, we suggest that

Hypothesis 1a. *EFEs with Heritage will have a higher probability of internationalization across multiple BoP markets than other EFEs.*

Hypothesis 1b. *EFEs with Heritage will have a higher probability of internationalization across multiple BoP markets than MNEs.*

As managerial accountability and motivation in SOEs are limited (Buchanan, Tollison, & Tullock, 1980), they have limited incentive to learn or experiment.⁴⁹ Therefore,

Hypothesis 1c. *EFEs with Heritage will have a higher probability of internationalization across multiple BoP markets than SOEs.*

BoP markets across developing countries can vary in their characteristics. But research suggests that firms are able to overcome adaptation challenges in markets that are geographically and culturally proximate to their home countries (Hu, 1995). Because EFEs with Heritage are more likely to develop better

⁴⁹ Organization scholars have long argued that both motivation and accountability are central to organizational learning and experimentation (see March & Olsen, 1976; Osterloh & Frey, 2000).

capabilities than other firms in their home countries, and because in the subsequent new BoP markets, in which they enter, they can apply their superior capabilities with limited adaptations, it follows then,

Hypothesis 2a. EFEs with Heritage will have better performance than other EFEs across multiple BoP markets.

Hypothesis 2b. EFEs with Heritage will have better performance than SOEs across multiple BoP markets.

We do not derive any performance implications for MNEs in BoP markets, because of their strategic orientation towards the affluent markets in developing countries. However, over time, as the organizational knowledge generated through successful experiments diffuses in the industry, uncertainty associated with BoP markets can recede, spurring entry by MNEs.⁵⁰

Background Of Mobile Telecommunications In Africa

Nowhere in the world are development challenges more acute than in Africa. Between 1980 and 2000, the average annual gross domestic product (GDP) per capita growth in the continent's most impoverished sub-Saharan region was *negative* 1.1 percent. Today, Africa remains mired in poverty. Most of its countries are ranked at the bottom of country development indicators, including assessments related to regulatory quality and government effectiveness; many have faced prolonged conflicts (see, for example, Collier, 2007; Sachs & Warner, 1997).

⁵⁰ The discoverer is expected to intensify its internalization efforts when facing increased competition through entry by other firms. If discoveries can be easily imitated, then the entrepreneurial incentive to discover may be limited. The implications of positive externalities associated with discoveries are considered in the discussion section below.

Remarkably, mobile telecommunications managed to thrive in this continent. Figure 4 shows that mobile subscriptions and penetration rates in Africa grew from meager 1 million and 0.15 percent, respectively, in 1996, to whopping 645 million and 62 percent, respectively, in 2011. Adoption of mobile telecommunications has been impressive in several low-income countries. For example, in Sudan, Equatorial Guinea, and Democratic Republic of Congo, the annual mobile subscriptions during the 2000s grew at triple-digit rates. Although none of these countries was able to make any measurable improvements in its country development indicators, by 2011, all had achieved mobile penetration rates greater than 50 percent.⁵¹

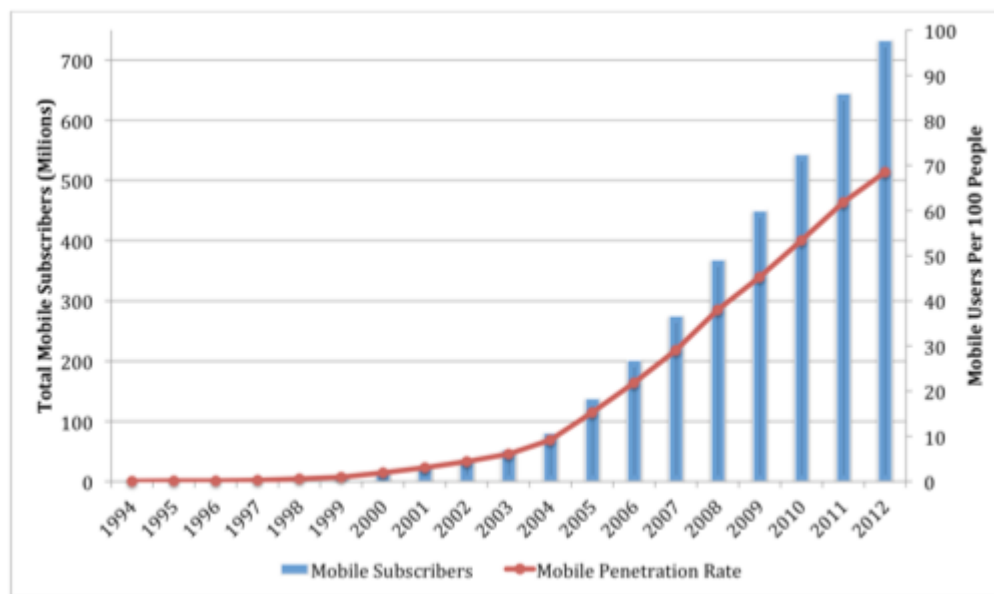


Figure 9: Total subscribers and mobile penetration rate in Africa

⁵¹ The development of mobile telecommunications infrastructure in the region has enabled service providers to offer various mobile applications in addition to voice calls and text messaging. Recently, mobile banking, along with other transformative development applications in agriculture, healthcare, and education, has become widespread in some sub-Saharan countries (Lehr, 2008). Studies have linked mobile coverage to enhancing efficiency in agricultural markets (Aker, 2010; Jensen, 2007), creating employment opportunities in rural areas (Klonner & Nolen, 2008), and, more broadly, generating economic growth (Roller & Waverman, 2001).

Telecommunications services in African countries were initially provided by their SOEs. Although the SOEs had a long history of poor performance, efforts to commercialize or privatize them were met with severe backlashes, and international development agencies stepped up the pressure on African governments to open up their mobile telecommunications markets (Nellis, 2005). However, in mobile telecommunications, only a few licenses could be granted in each country because of the limited availability of spectrum.⁵² Thereafter, entry occurred primarily through the acquisition of existing players.

SOEs were the first to be granted mobile licenses in most African countries.⁵³ Most African countries did not allow 100 percent foreign ownership, and a few MNEs, especially those from former colonial powers, initially entered into the region. MNEs typically had a significant equity stake in the joint ventures and assumed their management control. The industry also attracted regional entrepreneurs with access to substantial capital, as setting up a mobile operation required large investment. In some instances, key family members of local business groups took entrepreneurial initiatives to launch businesses into mobile telecommunications. Some overseas returnees and serial entrepreneurs also set up mobile operations.

⁵² Due to scale economies and network effects, early entrants are thought to have some advantages over later entrants (Shapiro & Varian, 1998).

⁵³ Allegations of corruption abound regarding the selection of operators. Often, the selection was based on a combination of several factors, such as the applicant's bid amount, technical capabilities, coverage targets, or its employment projections. However, critics point out that such "beauty contests" lacked transparency. In some instances, auctions were held, but they too were susceptible to bid rigging. For a detailed discussion on the topic, refer to Karim, Putimahtama, and Mullins (2009), Mullins and Rhodes (2011), and *The Economist* (2000).

Table 2: List of EFEs with Heritage, their pre-entry experience, and their mobile operations

Firm Name	Founders' Relevant Industry Experience prior to Foreign Partnership Engagement	MNE Partner	First Independent Operation	Subsequent International Operations (Year Entered)
CelTel	The founder, Mo Ibrahim left British Telecom's wireless operations in 1989 and founded MSI. MSI provided network design solutions.	Vodafone, in Uganda (1995)	Uganda (1998)	Zambia (1998), Malawi (1999), Congo Brazzaville (1999), Chad (2000), Democratic Republic of Congo (2000), Gabon (2000), Sierra Leone (2000), Sudan (2001), Burkina Faso (2001), Niger (2001), Tanzania (2001), Kenya (2004)
Investcom	A family business that provided telecommunications engineering services mainly to satellite communications terminals in Lebanon.	France Telecom, in Lebanon (1995)	Ghana (1996)	Guinea (1997), Burundi (2000), Liberia (2001), Guinea Bissau (2004), Benin (2005), Sudan (2005)
MTN	Founding team operated Multichoice, a South African firm that provided satellite TV solution to underdeveloped communities.	Cable & Wireless, in South Africa (1993)	South Africa (1998)	Uganda (1998), Swaziland (1998), Rwanda (1998), Cameroon (2000), Nigeria (2001), Congo Brazzaville (2005), Cote d'Ivoire (2005), Zambia (2005), Botswana (2006)
Orascom	The founder, Naguib Sawiris, an engineer by training, took the initiative to diversify the family owned Orascom Group's business into information technology and telecommunications, which later spun off as Orascom Telecom.	France Telecom and Motorola, in Egypt (1998)	Togo (1999)	Gabon (2000), Benin (2000), Burundi (2000), Zambia (2000), Chad (2000), Cote d'Ivoire (2000), Congo Brazzaville (2000), Zimbabwe (2000), Burkina Faso (2001), Uganda (2001), Central African Republic (2002), Tunisia (2002), Algeria (2002), Democratic Republic of Congo (2003), Namibia (2003)

As Table 1 indicates, the industry had four EFEs with Heritage. All of them had their first independent mobile operations in Africa, subsequent to their founders' involvement in joint ventures with MNEs. Their founders had experiences relevant to telecommunications prior to their partnerships with MNEs. Based on our interviews with founders and top managers of several early entrants, and historical documents, including published annual reports, we document below their entry experiences to illustrate some of the important challenges that African BoP markets presented, and key adaptations that were carried out by industry pioneers (cf. Baron, 2008; Hardyman & Leamon, 2005).

Experiences of Early Entrants in African Mobile Telecommunications

In 1993, MSI, a mobile network solutions provider, teamed up with Vodafone, the British mobile telecommunications giant, to set up a joint venture in Uganda with the support of the UK government and the World Bank.⁵⁴ The founder of MSI, Mo Ibrahim, was a native of Sudan and had worked for British Telecom as a technical director of its wireless division. In 1995, under Vodafone's leadership, the joint venture rolled out a mobile network with a post-paid platform covering mostly urban areas. However, in Uganda, the wealthy customer segment was small, and chasing customers to pay outstanding bills proved to be challenging. As losses mounted, Vodafone sold its entire stake in the joint venture to MSI (Southwood, 2008). Subsequently, in 1998, MSI spun off its mobile operations as an independent firm named Celtel.

⁵⁴ Vodafone had a majority ownership (36.8 percent) and Celtel was the junior partner (22 percent). The remaining shareholders were: Commonwealth Development Corporation (the UK government) and International Finance Corporation.

Existing business models for mobile telecommunications were based on advanced-economy markets, where strong complementary physical infrastructure allowed for rapid network deployments, and wealthy consumers, along with robust legal infrastructure, provided a basis for a lucrative post-paid business model. The Uganda experience, however, revealed that such practices were rendered ineffective when advanced-economy conditions were lacking.

By the mid-1990s, the technology behind the prepaid platform was already available. This platform neither imposed creditworthiness as a precondition to providing mobile services to consumers, nor did it involve any debt collection from customers. Although a prepaid platform accommodated a more inclusive target market, the adoption of mobile services also depended on the price of mobile handsets, which, in the 1990s, was quite expensive.⁵⁵ Additionally, in sub-Saharan Africa, assessing market opportunities was challenging because of frequent political turmoil and the lack of availability of consumer data.

After the Uganda experience, Celtel adopted pre-paid platform and explored ways to bring flexibility in its network design to deal with various challenging BoP market conditions. In contrast to standard practice, it built its initial network to have fewer base stations, and also put up higher towers that were outfitted with more communications equipment. Such adaptations addressed a few challenges. In BoP markets, base stations usually relied on generators for power, but as Celtel included more equipment in each station, it used larger generators, which increased efficiency. Fewer base stations also meant fewer establishments to guard from theft, and fewer trips to transport fuel.

⁵⁵ In advanced economies the cost of mobile handsets was amortized over the period of the post-paid contract, thereby making handsets more affordable.

Over time, however, if mobile traffic increased, Celtel would build more base stations to enhance network capacity and reduce the equipment on its towers to reduce interference. Soon low-income consumers became the firm's largest consumer segment.

Whereas Vodafone struggled in Uganda, in South Africa, its joint venture with the government, Vodacom, met with resounding success. In 1993, Vodacom rolled out a post-paid platform and focused on wealthy neighborhoods that had relatively better infrastructure than the rest of the country. MTN, its early competitor in South Africa, forged a partnership with the UK-based Cable and Wireless International (CWI). But as Vodacom took a commanding lead in wealthy neighborhoods, foreign owners sold their stakes in MTN, and its local owners focused on targeting low-income areas (MTN Group, 1999, 2004).

Most of MTN's South African founding members came from MultiChoice, which had provided satellite television services to underdeveloped communities. Under their leadership, MTN established a prepaid platform and developed applications to facilitate adoption of mobile services for BoP markets (MTN Group, 1999). As handsets were quite expensive, MTN installed community payphones that were connected to its mobile network in schools, hospitals, and other high-traffic areas. It also pioneered an application that allowed airtime transfer among subscribers to encourage financially dependent individuals to also become subscribers. Before long, the low-income neighborhoods became the main engines for MTN's growth.

The key adaptations made by the pioneers were rarely apparent from the outset. For example, Celtel's initial failure to recoup the costs of base stations in

rural areas due to poor customer response led to a sense of urgency in bringing flexibility to its network design. Its top management debated how exactly such a design could be achieved, then took the risk of modifying its existing practices and updating its approach based on trial and error. Sometimes, adaptation strategies were scrapped altogether. For example, to economically distribute its prepaid cards in rural areas, Celtel initially dispatched them with its technical team who were sent to the sites for fixing technical glitches. But it was difficult to predict technical teams' visits and Celtel could not ensure a steady supply of prepaid cards in rural areas, prompting its top management to search for ways to create a dedicated distribution network. The company eventually hired a few managers from fast-moving consumer goods (FMCG) multinational firms that were already doing business in the region to build its distribution network for scratch cards.

Although their founders had some experience relevant to telecommunications, they had not set up nor managed mobile operations by themselves. The joint ventures with MNEs allowed them to learn various existing practices in which they had had no experience and subsequently carry out key adaptations (Makura, 2008). For example, initially MTN's foreign partner, CWI, provided network design solutions for the operation in South Africa. The local owners sent engineers to CWI's London office to learn about network design, and upon their return, these engineers formed an internal network design group, which initially carried out site planning for wealthy neighborhoods and later adapted existing practices to bring service to the townships.

Other EFEs and SOEs relied extensively on international contractors for many of their core activities, including network design and mobile applications (Table 2). Contractors delivered turnkey solutions, which were based on advanced-economy business models that focused on wealthy consumers. More often than not, these regional firms had difficulty in rolling out their networks, and when they did, they offered poor service and limited coverage.

Both Celtel and MTN created departments that focused on scouting new markets within Africa and introducing their successful adaptation strategies when they entered into a new country. Starting in 1998, they aggressively expanded their operations to various African countries. In Sierra Leone, Celtel's deployment of a mobile network in the capital, Freetown, coincided with a rebel invasion;

Table 3: Founding and internationalization experiences of firms during the early evolution of the industry

Firm	Name and Background	Initial Years	Internationalization Patterns
MNE	Established MNEs with multiple operations in other regions; e.g. France Telecom, Portugal Telecom, Vodafone (UK)	<p>Followed existing business models and focused primarily on wealthy consumers; carried out rapid network deployments; adopted post-paid billing system</p> <p>A few exited (e.g. Vodafone in Uganda in 1998), a few abandoned their operation due to political unrest (e.g. Portugal Telecom in Guinea-Bissau in 1998), some lost significant market-shares after the entry by EFEs with Heritage (e.g. France Telecom in Cameroon; see also Rivera-Santos & Rufin, 2009a)</p>	<p>Mostly entered into host countries that were former colonies of their home countries. e.g. France Telecom in Equatorial Guinea (1996), Cote d'Ivoire (1997); Vodafone in South Africa (1994) and Uganda (1995); and Portugal Telecom in Cape Verde (1997)</p>
EFEs with Heritage	<p>Celtel, Investcom, MTN & Orascom</p> <p><i>See Table 1 for more details</i></p>	<p>Put a large emphasis on tapping BoP consumers (see also Anderson & Kupp, 2009); rolled out flexible networks in for BoP consumers (see also Jones & Campbell, 2014); adopted pre-paid system (see also Rivera-Santos & Rufin, 2009b); developed various mobile applications to stimulate demand in BoP markets (e.g. Me2U by MTN) and distribution networks for supplying pre-paid cards to remote areas</p>	<p>Aggressively expanded to other countries in Africa, including in countries that have significantly large BOP markets, and are mired in conflicts</p>
Other EFEs	<p>A few founders had had some relevant training but had not forged joint ventures with MNEs—e.g. The founder of Econet (established in Zimbabwe, in 1998) had worked for the country's state-owned fixed line operator</p> <p>A few founders had forged joint ventures with MNEs, but had no relevant training—e.g. The founder of Africel (Gambia, 2001) had a minority stake in Libancell, a joint venture with Finland Telecom in Lebanon</p> <p>Most founders had neither the relevant training nor joint venture experiences with MNEs—e.g. The founder of Congolese Wireless Network (DRC, 1999) had had a coffee export business</p>	<p>Focused on imitating existing business models for targeting wealthy consumers; some emphasized on serving business clients e.g. Afripa Telecom (established in Central African Republic, in 1999)</p> <p>Relied heavily on contractors to do core activities</p> <p>Often faced long delays in rolling out networks and offered poor service quality</p>	<p>International expansion was usually limited. A couple of firms bought some licenses only to sell them later on</p>
SOEs	e.g. Algerie Telecom, Zambia Telecom, Onatel Burkina Faso, Gabon Telecom	<p>Focused on imitating existing business models; relied heavily on contractors to do core activities</p> <p>Often faced long delays in rolling out networks and offered poor service quality</p>	<p>International expansion was limited</p>

trapped in the city, Celtel's technical team had to be evacuated by the Royal Air Force (Southwood, 2008). But such big risks paid off. By mid-2005, Celtel had operations in 13 sub-Saharan countries, and in 10 of those countries, including in Sierra Leone, the firm was a market leader. In 2005, MTN had its operations spread out to 11 African countries.

Data And Methods

To test our hypotheses, we assembled a dataset on the African mobile telecommunications industry from its effective beginning in 1994 to 2012.⁵⁶ We collected firm-level data from multiple reputable sources. For firms that entered prior to 2000, we relied on detailed surveys of African mobile operators by the Development Research Group at the World Bank (DECRG) and the United Nation Economic Commissions in Africa. For later years, we collected the firm-level data mostly from Private Participation in Infrastructure and CommsUpdate databases, which were developed by the World Bank and Premetrica Inc., respectively. Where data were missing, we incorporated information from corporate annual reports, trade journals, and databases from GSM Association and CDMA Development Group. Data from multiple sources were cross-checked for consistency and accuracy.

For each country, we documented the timing of entry of all mobile operators and their various characteristics, including ownership structure and yearly subscribers. We augmented these data with yearly data on country

⁵⁶ Prior to 1994, Africa had only a handful of analog (1G) operators, who offered post-paid solutions focusing on wealthy consumers. In 1993, these firms combined had 80,000 subscribers, representing a less than 0.01 percent penetration rate in Africa. All 1G firms that failed to transition to 2G standards exited the industry early on. Accordingly, we focus our analyses on all firms that use the 2G and its successor standards.

characteristics from the World Bank's development indicators. We dropped observations from Somalia, because data on firm characteristics was sparse, and those from Comoros, Djibouti, Eritrea, Ethiopia, Libya, Sao Tome and Principe, and Swaziland, as none of those countries allowed more than one operator during the period of our study. The remaining dataset contains information on mobile operators from 45 African countries.

Following previous research, we categorize firms based on their type of ownership at the time of their founding (La Porta & Lopez-de-Silanes, 1999; Megginson & Netter, 2001).⁵⁷ Table 3 summarizes internationalization patterns in our sample of African countries by firm types for two epochs: 1994–2004, when entry occurred primarily through greenfield operations (panel 1) and 2005–2012, when the main mode of entry was acquisition (panel 2). After 2005, several markets could no longer accommodate new licenses. As Panel 2 shows, the majority of the acquisitions were made by MNEs. Most acquisitions in the later years occurred when the target and the acquirer firm shared the same background (Panels 2 and 3). EFEs with Heritage showed a higher average number of entries than any other type (Panel 6), especially in earlier years.

Entry Analyses

Following previous studies (cf. Chang, 1995; Chang & Rosenzweig 2001; Holburn & Zelner, 2010), we model the decision to enter into a host country as one option, along with a consideration of all other potential country choices available to the firm in a given year.

⁵⁷ When the entrant had multiple owners, we reported the type of the owner that had the management control. Typically, this owner also had a majority equity position.

Table 4: Internationalization in Africa

	1994–2004	2005–2012
# of foreign entries by obtaining license (Greenfield)	105	65
MNEs	39	21
EFEs with Heritage	25	3
Other EFEs	20	32
SOEs	21	9
# of foreign entries by acquisition, by	40	90
MNEs	15	54
EFEs with Heritage	12	11
Other EFEs	9	14
SOEs	3	12
# of acquisitions when the target and the acquirer or of different type	31	32
Acquired by MNEs	12	18
Acquired by EFEs with Heritage	9	2
Acquired by Other EFEs	7	6
Acquired by SOEs	3	6
# of total foreign entries (Acquisition+ Greenfield)	145	155
MNEs	54	76
EFEs with Heritage	37	14
Other EFEs	29	46
SOEs	24	21
# of firms operating in one or more African countries	62	69
MNEs	21	20
EFEs with Heritage	4	3
Other EFEs	14	25
SOEs	23	21
Average # of foreign entries (Acquisition+ Greenfield)	2.3	2.2
MNEs	2.6	3.8
EFEs with Heritage	9.3	4.7
Other EFEs *	2.1	1.8
SOEs	1.04	1

* A few of them bought licenses in multiple countries only to later sell their fledgling operations

Accordingly, we create a panel dataset in which each firm-year has multiple observations, and each observation reflects an entry choice available to a firm. Once an African country opens up its mobile telecommunications market, it is added to the firm's set of country choices for potential entry. If the firm enters into a host country, that country is dropped from the firm's set of country choices. The dependent variable *Entry* takes the value one if a firm enters into a host country in a given year, or zero otherwise. Entry can occur by establishing

greenfield operations or acquiring existing operations. We estimate *Entry* by using logistic regression.⁵⁸

The explanatory variables of prime interest are firm backgrounds. We code each of the background variables—*MNE*, *SOE*, *EFE with Heritage*, and *Other EFE*—one if the firm belongs to the appropriate category, and zero otherwise. *Other EFE* is dropped and used as the baseline for this analysis. Only one SOE entered in more than one country; thus, SOEs are not included in this analysis. According to our framework, EFEs with Heritage have a higher probability to internationalize than other EFEs (H1a), MNEs (H1b), and SOEs (H1c). Thus, we expect the coefficient estimate of *EFE with Heritage* to be positive and significant (H1a), and significantly greater than that of *MNE* (H1b). Although we cannot formally test hypothesis 1c, the limited internationalization by SOEs is consistent with our theoretical framework.

To explore the role of the quality of host-country institutions on the entry decision by MNEs, we use a measure of institution quality, *Rule of Law*, developed by the World Bank.⁵⁹ Our framework suggests that MNEs that choose to enter a developing region prefer host countries that have relatively high-quality institutions and are former colonies of their home countries. Thus, we expect positive and significant effects of the interaction of *Rule of Law* and *MNE* and the

⁵⁸ Although entry occurrence is a small fraction of total observations, following King and Zeng (2001), we found no evidence of whether rare entry occurrences could potentially bias our results. One major source of bias is sampling, which we eliminated because our data contains all entry events. Finally, we also confirmed robustness of our results by analyzing entry using rare event logistic estimations (e.g. Tomz, King, & Zeng, 2003).

⁵⁹ World Bank, 2012. World Governance Indicator.

<http://info.worldbank.org/governance/wgi/index.aspx#doc> [14 November 2014]. Rule of Law is defined as “perceptions of the extent to which agents [survey respondents] had confidence in and abide by the rules of society, in particular the contract enforcement and property rights.” Our results are similar when we use other indicators provided by World Governance Indicators on host-country institutions: control of corruption, political stability, government effectiveness, and regulatory quality.

interaction of *MNE* and *Colonial Match*, which is coded one if the host country is a former colony of its home country, and zero otherwise. *Colonial Match* is not entered separately as only MNEs have home countries that were once colonial powers.

We include several important control variables in our entry estimations. As entry is likely to be influenced by the growth potential in host countries (Porter, 1990), we include *Mobile Penetration Rate*, which is the ratio of the number of subscribers in the country to its population. We also add $\# \text{ of Operators}_{t-1}$ and $(\# \text{ of Operators}_{t-1})^2$, which are the number of competitors in the country in the immediate past year and its squared value, respectively. Prior studies suggest an inverted-U relationship between entry and industry concentration (Baum & Korn, 1996; Haveman, 1994). To control for the country's potential market size and standard of living, we include *Log GDP* and *Log GDP per Capita*, which are log-transformed values of GDP and GDP per capita, respectively.

Macro-economic fluctuations can also influence entry decisions (e.g. Ilmakunnas & Topi, 1999). Accordingly, we add the variable *Std. GDP Growth*, which is calculated as a standardized score of the country's GDP growth in a given year using the mean and standard deviations of growths of countries in the sample in the same year. Similarly, we construct a standardized score of the country's inflation and include the variable, *Std. Inflation*. We use a dataset on conflicts developed by Uppsala University and Peace Research Institute (Themner & Wallensteen, 2014), and add the variable, *Armed Conflict*, which is coded 1 if the host country in a given year faced armed conflicts that claimed at least 25 deaths, and zero, otherwise. Finally, we enter *Log Geographical*

Distance, which measures the geographical distance between host countries and the firm's home country, based on the great circle formula, widely used in the prior studies (see, for example, Makino & Tsang, 2011). Table 4 provides descriptive statistics and inter-correlations for variables used in our entry estimations.

Performance Analyses

Our theoretical framework provides performance implications for firms operating in BoP markets. However, information on firm performance by customer segmentation is difficult to come by, and our dataset is no exception. We use subscription growth rates as a proxy for firm performance in BoP markets because firms that successfully penetrate BoP markets are likely to have high subscription growths because of African countries' substantial BoP markets.⁶⁰ Following prior research on firm growth (Chen, Williams, & Agarwal, 2012; Dunne *et al.*, 1989), we calculate $Growth_{cit} = \text{Log} (Subscriber_{cit}) - \text{Log} (Subscriber_{cit-1})$, where $Growth_{cit}$ and $Subscriber_{cit}$ are the growth of subscribers and the number of subscribers of the firm i in country c in period t , respectively, and $Subscriber_{cit-1}$ is the number of subscribers of the firm i in the same country in the previous period. We estimate $Growth_{cit}$ using OLS.⁶¹ Our key independent variables are *MNE*, *EFE with Heritage*, and *SOE*, with *Other EFE* as the omitted

⁶⁰ In the telecommunications industry, the number of subscribers is highly correlated with profitability, as large fixed costs can be spread across more users (Shapiro and Varian, 1998). Having a large subscriber base is particularly important in BoP markets, where margins are very thin.

⁶¹ About nine percent of observations are dropped due to missing subscription data, which, do not systematically vary based on firm backgrounds.

category. We expect the coefficient estimate of *EFE with Heritage* to be positive and significant (H2a) and significantly greater than that of *SOE* (H2b).

Table 5: Descriptive statistics and variable inter-correlations for entry analyses

Variable	Mean	Std. Dev.	Min	Max	1	2	3	4	5	8	9	11	12	13	14	15	16
1. Entry	0.01	0.09	0	1													
2. MNE	0.56	0.50	0	1	-0.003												
3. <i>EFE with Heritage</i>	0.06	0.24	0	1	0.06	-0.29											
4. <i>Other EFE</i>	0.38	0.49	0	1	-0.02	-0.88	-0.20										
5. <i>Rule of law</i>	-0.62	0.66	-1.95	1.06	-0.01	-0.004	0.03	-0.01									
8. <i>Colonial match</i>	0.03	0.18	0	1	0.04	0.17	-0.05	-0.15	-0.02								
9. <i>Log Geographical Distance</i>	8.47	0.88	0	9.63	-0.01	0.46	-0.10	-0.42	0.09	0.02							
10. <i># of Operators_{t-1}</i>	3.04	1.59	1	11	0.004	-0.08	-0.05	0.11	-0.21	-0.01	-0.07						
12. <i>Mobile Penetration Rate</i>	29.98	31.59	0	148.69	-0.04	-0.13	-0.04	0.15	0.30	-0.04	-0.03	0.16					
13. <i>Armed Conflict</i>	0.14	0.35	0	1	0.002	0.001	-0.002	0.0001	-0.29	0.02	-0.06	0.01	-0.12				
14. <i>Std. Inflation</i>	0	1	-0.49	28.68	0.01	0.02	0.005	-0.02	-0.10	0.004	-0.003	0.04	-0.05	0.10			
15. <i>Std. GDP Growth</i>	0	1	-5.25	20.04	-0.01	0.01	0.01	-0.02	-0.05	-0.02	0.002	-0.01	-0.09	0.03	-0.06		
16. <i>Log GDP</i>	22.65	1.43	19.92	26.43	-0.004	-0.04	-0.01	0.04	0.05	-0.004	-0.08	0.20	0.27	-0.03	0.02	-0.03	
17. <i>Log GDP per capita</i>	6.75	1.15	4.97	9.52	-0.02	-0.02	0.01	0.01	0.46	-0.03	0.01	-0.19	0.54	-0.19	-0.05	0.03	0.34

If EFEs with Heritage are most likely to be successful in BoP adaptations, as our theoretical framework suggests, we expect them to have higher growth rates in African countries that have larger BoP markets. Using the World Bank's poverty data, we create a proxy for the size of a country's BoP market by multiplying its population with the percentage of its population who earn four dollars or less a day.⁶² We add the variable *Std. Population below \$4/day* and its interaction with *EFE with Heritage*, where *Std. Population below \$4/day* is calculated as the standardized score of the country's BoP market size in a given year using the mean and standard deviations of BoP market sizes of countries in the sample in the same year.

In our growth estimations, we enter all control variables related to host country macroeconomic fluctuations, and also include *Mobile Penetration Rate*, *# of Operators*, *Log GDP*, *Log GDP per Capita* and *Log Geographical Distance*. We also include *Entry Order*, which is the firm's rank of entry in a given country, and *Log Age_{t-1}* and *Log Subscriber_{t-1}*, which are the firm's log transformed age and subscribers, respectively, in the period $t - 1$, as these variables are expected to influence firm growth (Chen *et al.*, 2012). Table 5 provides descriptive statistics and inter-correlations for variables used in our growth estimations.

Our analysis of firm growth does not take into account the impact of acquisitions. Most acquisitions occurred later in the industry when the target firms and the acquirers were of the same type. However, for further robustness check, we pool firm-year-country observations across all years prior to acquisitions, if any, and analyze firm growth.

⁶² BoP consumers are defined in the literature as those with a yearly income of \$1500 or less (Prahalad, 2004; Hammond *et al.*, 2007).

Table 6: Descriptive statistics and variable inter-correlations for performance analyses

Variable	Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18
1. Subscriber Growth	0.46	0.58	-3.64	5.52																	
2. MNE	0.34	0.47	0	1	-0.04																
3. EFE with Heritage	0.18	0.38	0	1	0.02	-0.42															
4. SOE	0.18	0.38	0	1	-0.02	-0.40	-0.27														
5. Other EFE	0.21	0.41	0	1	0.04	-0.39	-0.26	-0.25													
6. Rule of Law	-0.68	0.64	-2.21	1.06	0.01	0.26	-0.12	0.06	-0.26												
8. Population below \$4/day	0	1	-1.30	4.43	-0.03	-0.02	-0.04	-0.01	0.08	-0.32											
9. Log Geographical Distance	5.93	3.82	0	9.38	-0.001	0.47	0.28	-0.77	-0.08	0.09	-0.10										
10. Entry order	1.08	0.95	0	4	0.05	0.03	-0.01	-0.32	0.30	-0.29	0.19	0.18									
11. # of Operators	3.61	2.01	1	11	-0.15	-0.04	-0.03	-0.14	0.22	-0.29	0.53	0.03	0.45								
12. Mobile Penetration Rate	28.16	30.74	0	148.69	-0.27	0.03	-0.09	0.04	0.02	0.24	-0.12	-0.01	0.19	0.24							
13. Armed Conflict	0.06	0.24	0	1	-0.005	-0.07	-0.02	-0.01	0.12	-0.21	0.04	-0.08	0.04	-0.01	-0.03						
14. Std. Inflation	0	1	-0.77	17.06	0.02	0.003	-0.02	-0.04	0.06	-0.22	0.26	-0.05	0.05	0.06	-0.11	-0.01					
15. Std. GDP growth	0	1	-6.18	23.75	0.02	0.01	0.05	-0.05	-0.01	-0.02	0.14	0.03	0.003	0.10	-0.09	0.01	-0.09				
16. Log GDP	43.50	1.44	40.49	47.15	-0.09	-0.02	-0.08	0.24	-0.14	0.07	0.49	-0.23	0.08	0.23	0.25	-0.02	0.02	0.01			
17. Log GDP per capita	13.51	1.09	11.85	16.43	-0.09	0.05	-0.09	0.19	-0.15	0.49	-0.18	-0.12	-0.09	-0.20	0.53	-0.08	-0.13	-0.13	0.42		
18. Log Subscribers	12.27	2.32	3.00	17.52	-0.44	-0.01	0.03	0.09	-0.11	0.04	0.18	-0.05	0.07	0.33	0.51	0.04	-0.12	0.05	0.58	0.22	
19. Log Age	1.61	0.79	0	3.00	-0.43	0.01	0.03	0.06	-0.11	0.08	-0.09	0.01	-0.29	0.15	0.39	0.04	-0.16	0.03	0.09	0.10	0.63

Results

Entry Estimations

Table 6 presents our main findings on firm entry. In all models, we include country- and year-fixed effects, and report robust standard errors, clustered by firm-year. Consistent with our Hypothesis 1a, the coefficient estimates of *EFE with Heritage* is positive and significant across all the models (1–4), and consistent with Hypothesis 1b, the absolute value of the difference between the coefficient of *EFE with Heritage* and that of *MNE* in models 1 and 2 is significantly different from zero (e.g., for model 2, $\chi^2 = 16.39$; prob. $> \chi^2 = 0.0001$).⁶³ These results suggest that, EFEs with Heritage had higher rates of internationalization than other EFEs and MNEs.

To provide meaningful interpretation of the coefficient estimates of interest, Figure 5 illustrates the effect of firm backgrounds on the predicted probability of entry when all the control variables are at their mean (continuous variable) or mode (dichotomous variable). As expected, the effect of the background MNE, as measured in terms of percentage change in predicted probability of entry, is greater when host countries and MNEs' home countries have colonial ties. Moreover, this effect rises with the increase in the quality of host-country institutions. The figure also suggests the effect of *EFE with Heritage* on entry is greatest in countries with relatively low quality institutions. These findings are consistent with our theoretical framework that suggests that MNEs

⁶³ We also split the full sample and analyze entry decisions in early years, from 1994–2004, and from 2005–2012, when entry was predominantly through acquisitions. The results, not reported here, are similar to those presented in Table 4, except that the absolute value of the difference between the coefficient estimates of *EFE with Heritage* and *MNE* is not statistically different in the sample of firms in later epoch. This finding is consistent with our framework that suggests that MNEs, like EFEs with Heritage, become a dominant source of entrants in later years.

and regional firms strategically position themselves based on host country conditions.

Table 7: Analyses of foreign entry

	Model 1 Logit	Model 2 Logit	Model 3 Logit	Model 4 Logit
<i>MNE</i>	0.182 (0.312)	0.182 (0.312)	0.671 ⁺ (0.344)	0.470 (0.378)
<i>EFE with Heritage</i>	1.433 ^{***} (0.307)	1.434 ^{***} (0.307)	1.478 ^{***} (0.309)	1.473 ^{***} (0.309)
<i>Rule of Law</i>		-0.251 (0.528)	-0.581 (0.549)	-0.590 (0.549)
<i>MNE × Rule of law</i>			0.641 ^{**} (0.226)	0.656 ^{**} (0.227)
<i>MNE × Colonial Match</i>				1.412 ^{***} (0.314)
<i># of Operators_{t-1}</i>	0.771 ^{**} (0.273)	0.791 ^{**} (0.273)	0.793 ^{**} (0.274)	0.795 ^{**} (0.274)
<i>(# of Operators_{t-1})²</i>	-0.042 ⁺ (0.022)	-0.043 ⁺ (0.022)	-0.043 ⁺ (0.022)	-0.043 ⁺ (0.022)
<i>Mobile Penetration Rate</i>	-0.013 (0.008)	-0.014 ⁺ (0.008)	-0.012 (0.008)	-0.012 (0.008)
<i>Log GDP</i>	-5.181 (3.590)	-4.964 (3.590)	-5.045 (3.598)	-5.112 (3.594)
<i>Log GDP per capita</i>	5.474 (3.833)	5.312 (3.820)	5.416 (3.835)	5.465 (3.835)
<i>Country Engaged in Armed Conflict</i>	-0.409 (0.291)	-0.427 (0.291)	-0.440 (0.292)	-0.447 (0.292)
<i>Std. Inflation</i>	-0.020 (0.030)	-0.022 (0.030)	-0.020 (0.032)	-0.019 (0.033)
<i>Std. GDP growth</i>	-0.100 (0.102)	-0.096 (0.098)	-0.091 (0.098)	-0.090 (0.098)
<i>Log Geographical Distance</i>	-0.104 ⁺ (0.050)	-0.103 ⁺ (0.051)	-0.092 ⁺ (0.050)	-0.071 (0.053)
Country fixed effect and Year fixed effect	Yes	Yes	Yes	Yes
Observations	30112	30112	30112	30112

Robust standard errors, clustered by firm-year, are reported in parentheses

⁺ $p < 0.10$, ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$

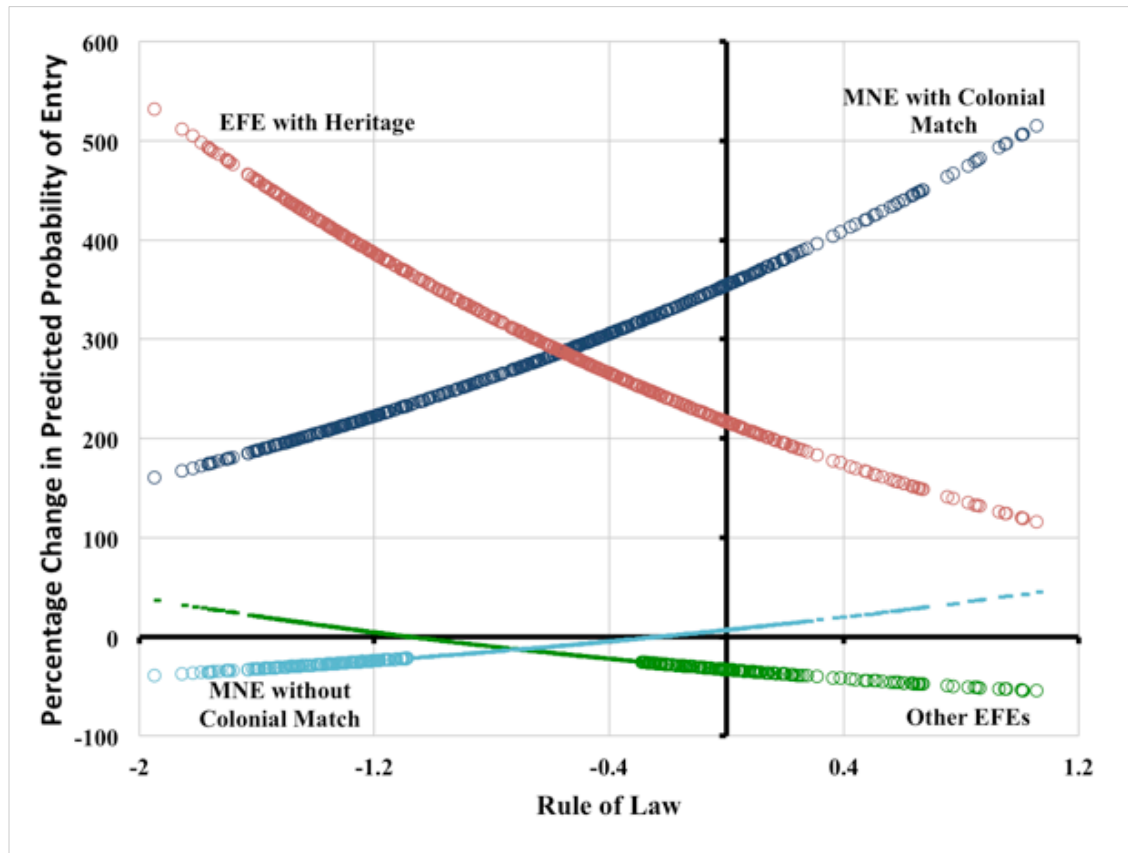


Figure 10: The estimated effects of firm backgrounds on predicted probability of entry

(Note: The circles on each schedule indicates the regions where the change in predicted probability of entry differs significant from zero at $p \leq 0.10$.)

Performance Estimations

Table 7 presents our findings on firm growth. In addition to explanatory and control variables, models 5–8 include country- and year-fixed effects. In models 5–7, we analyze firm growth in the full sample; and in model 8, we consider growth rates only in the years prior to any acquisitions. All standard errors reported are robust and clustered by firm-year.

Table 8: Analyses of subscriber growth

	Model 5 Growth OLS	Model 6 Growth OLS	Model 7 Growth OLS	Model 8† Growth OLS
<i>MNE</i>	−0.030 (0.070)	−0.038 (0.071)	−0.034 (0.072)	0.150 (0.108)
<i>EFE with Heritage</i>	0.210* (0.082)	0.193* (0.083)	0.195* (0.083)	0.415*** (0.106)
<i>SOE</i>	−0.159 (0.106)	−0.185 (0.119)	−0.196 (0.120)	−0.323+ (0.180)
<i>Std. Population below \$4/day</i>		−0.109 (0.071)	−0.121+ (0.071)	−0.146+ (0.081)
<i>EFE with Heritage × Std. Population below \$4/day</i>			0.099+ (0.051)	0.128 (0.062)
<i># of Operators</i>	−0.034 (0.023)	−0.037+ (0.023)	−0.034 (0.023)	−0.030 (0.027)
<i>Mobile Penetration Rate</i>	−0.004*** (0.001)	−0.004*** (0.001)	−0.004*** (0.001)	−0.005** (0.002)
<i>Rule of Law</i>	0.049 (0.124)	0.009 (0.126)	0.012 (0.126)	0.047 (0.145)
<i>Log GDP</i>	1.774** (0.543)	1.576** (0.598)	1.552** (0.597)	0.904 (0.663)
<i>Log GDP per capita</i>	−2.015*** (0.547)	−2.025*** (0.600)	−1.992*** (0.601)	−1.247+ (0.677)
<i>Country Engaged in Armed Conflict</i>	0.039 (0.042)	0.049 (0.043)	0.050 (0.043)	0.082 (0.058)
<i>Std. Inflation</i>	−0.012 (0.011)	−0.310* (0.136)	−0.312* (0.136)	−0.409** (0.155)
<i>Std. GDP Growth</i>	0.051*** (0.012)	0.052*** (0.012)	0.052*** (0.012)	0.055*** (0.015)
<i>Log Geographical Distance</i>	−0.004 (0.013)	−0.004 (0.014)	−0.005 (0.014)	−0.017 (0.021)
<i>Entry Order</i>	−0.132*** (0.037)	−0.134*** (0.039)	−0.131*** (0.038)	−0.057 (0.056)
<i>Log Subscribers_{t-1}</i>	−0.276*** (0.034)	−0.282*** (0.036)	−0.285*** (0.036)	−0.302*** (0.039)
<i>Log Age_{t-1}</i>	−0.186** (0.057)	−0.180** (0.057)	−0.174** (0.057)	−0.184** (0.062)
<i>Country fixed effect and Year fixed effect</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	1213	1162	1162	753

†Firm-year-country observations prior to acquisition, if any
Robust standard errors, clustered by firm-year, are reported in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We find that the coefficient estimates of *EFE with Heritage* are positive and significant in models 5 through 7. Note also that the coefficient estimate of *EFE with Heritage* is larger in magnitude when we restrict the sample to years prior to any acquisitions (model 8). The absolute difference in coefficient estimates of *EFE with Heritage* and *SOE* is significantly different from zero (e.g., for model 6, $\chi^2 = 7.46$; prob. $> \chi^2 = 0.006$). Thus, consistent with hypotheses 2a and 2b, our findings suggest that EFEs with Heritage outperformed Other EFEs and SOEs. We also find that EFEs with Heritage to have higher growth rates than MNEs (e.g., the absolute difference between the coefficient estimates of the two variables is significantly greater than 0 in model 6; $\chi^2 = 9.92$; prob. $> \chi^2 = 0.002$). Moreover, we find that the interaction between *Std. Population below \$4/day* and *EFE with Heritage* to be positive and significant (model 7). According to model 7, the subscription EFEs with Heritage had, on average, 19.5 percent higher growth rates in subscriptions than other EFEs. An increase in BoP market size by one standard deviation increased the growth of EFEs with heritage by about 10 percent.⁶⁴

Alternative Explanations

One potential competing explanation could be that EFEs with Heritage are better able to make BoP adaptations because of their local origin and their ability to assimilate organizational knowledge of a modern industry. Thus, the key to success in BoP markets is not experimentation per se but rather the combination

⁶⁴ If successful firms have high growth, they would also attain large market shares in terms of subscribers over time. Accordingly, we also analyze the market share of firms in later years; and, consistent with the predictions with our theoretical framework, the findings, not reported here, suggest that EFEs with Heritage have the largest market share.

of local and organizational knowledge. This explanation, however, cannot account for the inability of joint ventures between MNEs and local partners, who presumably have local knowledge, to successfully adapt to BoP market conditions. Moreover, if local and organizational knowledge were all that were required, the adaptation process would have been deterministic. Rather, our qualitative findings suggest that pioneers discovered successful adaptations through trial and error.

Another potential concern may be that firms with greater access to capital were more likely to fund costly experimentations and internationalization initiatives. This supposition cannot account for the heterogeneity in entry and performance between EFE with Heritage and MNEs, which are thought to have substantial access to funding (Bartlett & Ghoshal, 1999; Teece, 1986), but it could provide a competing explanation for the superior performance of EFEs with Heritage relative to other local firms, if EFEs with Heritage had greater access to capital than other EFEs. There are several regional firms in our dataset that were founded by local entrepreneurs who also owned large conglomerates. Presumably, those firms were well capitalized and yet they performed poorly, relative to EFEs with Heritage.⁶⁵

⁶⁵ As a robustness check, we include in all our estimations a control variable that is coded 1 if the founder belongs to a business group and zero, otherwise. The results, available upon request, are similar to those reported here.

Discussion

Africa comprises substantially large BoP markets and faces various socio-economic challenges. Surprisingly, mobile telecommunications have been widely adopted in this continent. Our findings suggest that a few regional, entrepreneur-led firms with exemplary performance entered into multiple African countries, catalyzing the growth of the industry across the continent. Their historical experiences suggest a two-step capability development process. First, they learnt about modern mobile telecommunications and, second, they actively carried out experimentations to make adaptations of existing business models to BoP market conditions. Successful adaptations contributed to their ownership advantages, which they exploited to enter into multiple African countries.

Our key findings regarding experimentations in and internationalization across mobile telecommunications markets of Africa share striking similarities with anecdotal evidence from the evolution of the global microcredit industry. The pioneering microcredit firm, Grameen Bank, carried out several lending experiments to develop a self-sustaining financial model for those living in poverty, and once a successful microcredit model emerged in Bangladesh, Grameen replicated its model in numerous countries (Yunus & Jolis, 2003).

Our study suggests that at the early stage in the evolution of the mobile telecommunications industry, a key source of uncertainty stemmed from radical adaptations that were required to create and capture value from BoP markets. Instead of focusing on BoP markets, MNEs chose to enter countries with relatively high-quality institutions and cater to the needs of wealthy consumers.

As the industry developed, investments in BoP markets presumably became less risky, encouraging entry by MNEs.

Among regional firms, we also find their performance has substantial heterogeneity, which suggests that having local knowledge may alone be insufficient for successful BoP adaptations. The historical experiences of the local firms suggest that they, too, needed to experiment to successfully adapt. Among local firms, those with relevant pre-entry experience in telecommunications had exemplary performance, presumably because such an experience enabled them to more effectively learn about modern industry through their partnerships with MNEs and, therefore, carry out experiments with greater success. Our study thus points to the variation in pre-entry experiences of local firms as a key source of their heterogeneity (cf. Agarwal *et al.*, 2004; Helfat & Lieberman, 2002; Klepper & Simons, 1997).

Our findings indicate that when successful entry into BoP markets requires radical adaptations—which discourage MNEs' entry into BoP markets—the development of such markets may be limited, both by regional firms' lack of opportunities to learn about modern industries and by the positive externalities that may be associated with the discoveries of successful adaptations. Because organizational knowledge about modern industries has tacit elements, the first-step learning process requires mechanisms that allow such knowledge to be transferred from foreign firms to local firms. The second-step experimentation can potentially reveal successful adaptations, which can limit the returns of the discoverer.

In this regard, some conditions may have aided the development of the African telecommunications industry. First, most African countries prohibited full foreign ownership in mobile telecommunications; MNEs that chose enter needed to forge joint ventures, thereby creating potential opportunities for their local partners to learn from their MNE partners, especially those with some prior experience relevant to telecommunications. Second, at the early stage in the evolution of the industry, various development agencies were willing to become investors, essentially sharing the risks of experimentations. Third, scale economies and regulated entry may have incentivized pioneers to actively experiment or rapidly internationalize across BoP markets. Future studies can readily modify our general theoretical framework to explore the pattern of industrialization when such conditions are absent.

In this paper, we have focused on joint ventures as a key mechanism for the transfer of organizational knowledge, given their importance in the current literature (Kogut, 1988; Mowery *et al.*, 1996). This literature typically focuses on industries that are knowledge intensive, which is also a key characteristic of mobile telecommunications. An important question for future research is whether the effectiveness of mechanisms for international knowledge transfer may essentially depend on the extent to which an industry is knowledge intensive, with less intensive industries requiring mechanisms with less hierarchy (Williamson, 1993). Yet, another question for future research concerns the process by which the pioneers' BoP adaptations are imitated in the industry. That is, what mechanisms allow later entrants to access knowledge generated through

discoveries from pioneers, and what potential strategies can the pioneers take to limit the spillover of the new knowledge?

Investigations into the above questions should shed light on the conditions and the mechanisms that can aid or deter the development of modern industries catering to the needs of BoP consumers, who represent the majority of the world's population. In this line of inquiry, our paper takes a first step in providing a unified framework for analyzing entry dynamics and performance of both multinational enterprises and developing-country firms in BoP markets.

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Chapter 3: Impact of Entrant Firms' Ownership and Strategy on Industry Development: The Case of the African Mobile Telecommunication Sector

Introduction

Until the early 1990s, the telecommunications industry in Africa (mostly available as fixed-line services) was characterized by its poor quality, unreliability, and low penetration rate. In addition, services were mostly offered exclusively through state-owned incumbents. For example, in 1992, only three of 42 member states of the International Telecommunication Union (ITU) in Africa had a private telecommunication service provider other than a state-owned incumbent (International Telecommunication Union, 1998 a). By the same year, Sub-Saharan Africa (excluding South Africa) had reached just 0.64 fixed lines per 100 people, compared with 8.2 lines in East Asia and 13.2 lines in Latin America and the Caribbean (Gebreab, 2002).

However, beginning in the early 1990s, a wave of restructuring and reform swept through the telecommunication sector across the African continent. These reforms were mainly supported by international development agencies such as the World Bank and the International Monetary Fund (IMF). The adoption of the policy reforms by various African countries occurred in different years, but most countries initially privatized their state-owned operator and allowed private firms—either multinational enterprises (MNEs) or local African entrepreneurial firms and diversifiers—to enter and compete in their market shortly afterwards. When compared with the fixed-line telecommunications sector in Africa, the

mobile subscribers grew at a phenomenal pace. This rapid spread of mobile services brought a significant increase in capital investment and employment.

The growth of mobile telecommunication in Africa was not uniform across different countries. Figure 6 demonstrates the adoption of digital mobile services measured by number of mobile phones per 100 people across a sample of African countries. The figures have been adjusted so that the starting year in which mobile services were introduced in all countries is the same in all plots. As demonstrated by countries in the first row, in a few countries, mobile services barely took off even after several years. In other countries, the adoption rate sharply accelerated after initial years of slow growth, as demonstrated by countries in the second row. The adoption of technology typically follows an S-curve as demonstrated by countries in the third row. However, in some countries, the adoption rate followed rapid growth from the beginning, which more closely resembles a linear growth, as demonstrated by countries in the fourth row.

The heterogeneity in country-level measurement of mobile telecommunication industry growth is not limited to adoption rate. African countries also experienced non-uniform effects in their mobile telecommunication industry growth, capital investment, and employment opportunities. Figure 7 shows the amount of investment per capita in fixed USD in a few African countries across three periods of time: early years (2000), middle years (2005), and recent years (2010). Although the selected countries in Figure 7 had private operators, there seems to be substantial heterogeneity among countries in different years.

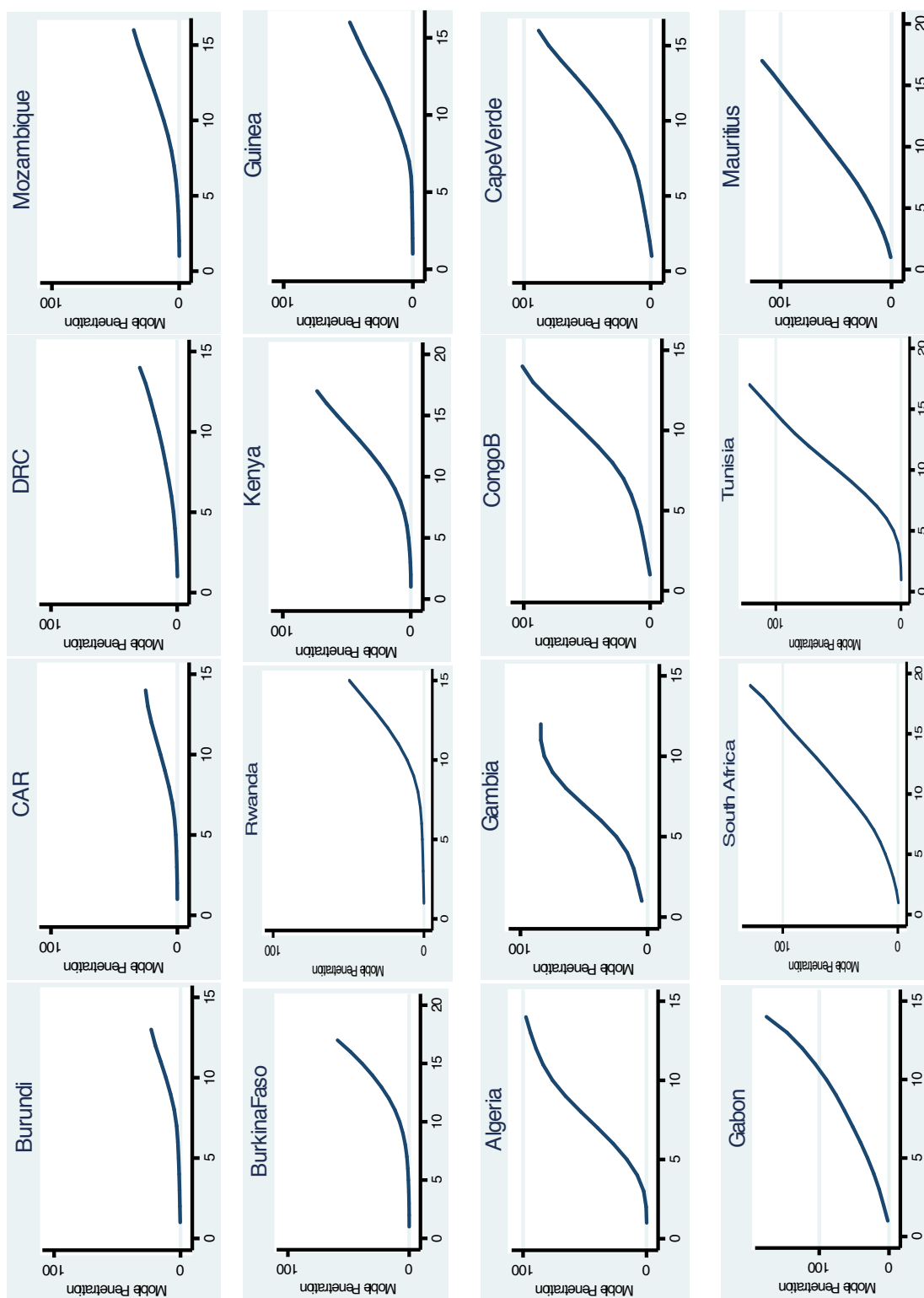


Figure 11: Adoption of mobile services measured by number of mobile phones per 100 people across African countries (Source: International Telecommunication Union, 2014)

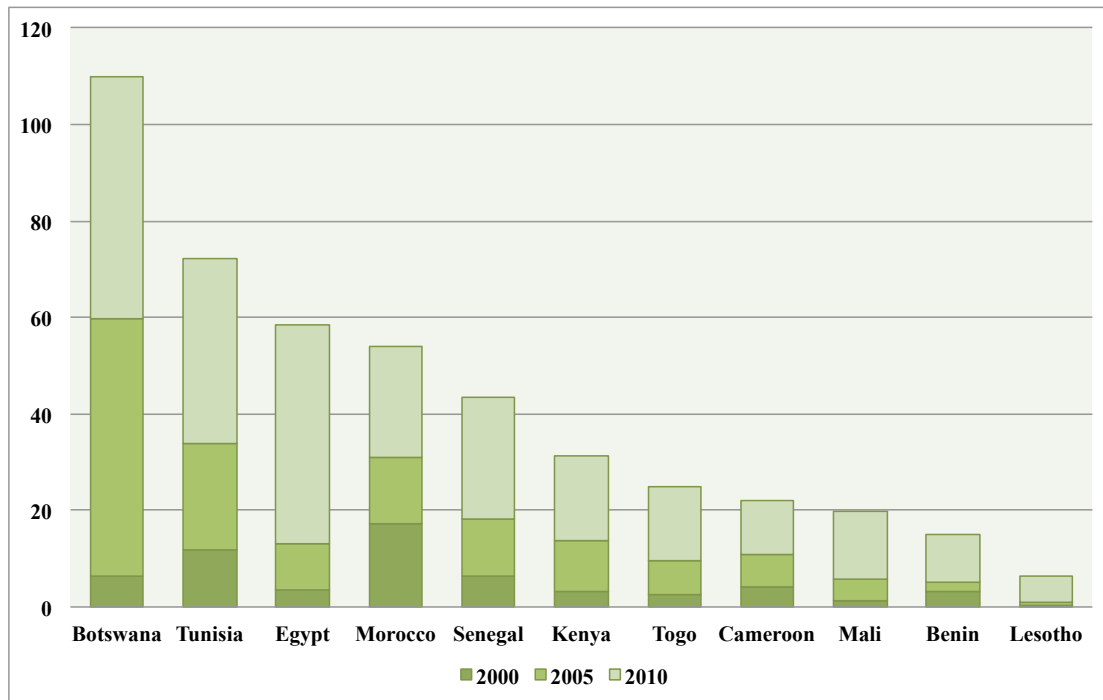


Figure 12: Investment per Capita in fixed USD across selected countries in 3 years: 2000, 2005, and 2010 (International Telecommunication Union, 2014)

Prior literature suggested that this heterogeneity could be partially explained by differences in the timing of countries' policy reforms—particularly in the privatization of state-owned enterprises (SOEs) and the introduction of competition in the market (cf. Gruber & Verboven, 2001; Koski & Kretschmer, 2005; Li & Xu, 2004). While privatization and competition influenced the mobile telecommunication industry in the early stages of its development, they may not explain the heterogeneity among countries in later years. This research aims to enhance the extant literature and investigate the causes of heterogeneity in mobile industry growth measures: namely, with respect to adoption of mobile services, efficiency in capital and labor investment, and pre-existing price of services.

The second section of this chapter explores the early years of the mobile industry's development, including the aforementioned policy reforms (i.e., privatization and introduction of competition in the market). The same section also looks at different private firms (such as multinationals, African entrepreneurial enterprises, and diversifiers) that entered the African mobile industry. The third section provides an overview of past literature regarding country-level industry growth, focusing on adoption rate, employment, and capital investment in the industry through policies that changed ownership of state owned enterprises or introduced competition in the market. The preliminary hypothesis of this chapter is presented at the end of the third section. The fourth section explains the data sources, variables, controls, and statistical method used in this research. The final section of the chapter presents results and conclusions.

Entry of Mobile Operators in the African market

Before 1990, incumbent telecommunication operators (mostly state-owned monopolies) lacked organizational and legal structure. They had jurisdiction over postal services and were generally self-regulated (Gabreab, 2002). After decades of feeble growth, underinvestment, and poor population coverage (ITU World Telecommunications Development Report, 1994), African countries began to introduce reforms in this industry due to pressure from international development organizations to privatize their industries. The World Bank and IMF pioneered the reforms, which later became known as the "Washington Consensus" (cf. Nellis, 2005; Williamson, 2004).

Beginning in the early 1990s, African countries began to enact telecommunication legislation in multiple phases to separate and regulate their telecommunication sectors from postal services. The effectiveness of the independent regulatory bodies varied across countries, especially in the early years after they were established. In several cases, government ministries appointed the agency heads and controlled their budgets. Furthermore, the autonomy of the regulatory agency depended on its supervising body (e.g. prime minister's office, parliament, or related government ministry) and whether the regulatory agency was established by parliamentary law or ministerial decree (Gabreab, 2002).

While reforms created separate telecommunication operators and regulatory bodies, the full benefits of corporatization reforms could not be realized without managerial and financial independence. From 1990 to 1995, several African countries passed legislation to privatize their state-owned telecommunication operators. Prior research suggested that during the early years of industry reform, privatization reforms resulted in a significant change in the rate of mobile penetration when independent regulatory was present (Wallsten, 2001).⁶⁶

Although past literature stated that privatization could improve the performance of SOEs, it also indicated that the type of firm that entered through privatization could influence its post-privatization performance. Prior research claimed that among private firms, those that possessed core resources and

⁶⁶ However, by the early 2000s, most African countries introduced independent telecommunication regulatory bodies. Once all African countries established regulatory bodies, the effect was likely to lose its significance in explaining heterogeneity in countries' mobile industries. The literature that showed significance for the role of the regulatory body (e.g., Wallsten, 2001) used data from the early years of mobile industry development.

capabilities that better matched pre-entry requirements of an industry were more likely to enter the market and succeed (cf. Helfat & Liberman, 2002). Entry into the mobile telecommunication industry demands considerable initial investment and technical expertise. Firms that possess pre-entry experience in core technical expertise and enter at the early stage of industry development appear to be more likely to succeed in the market (Eggers, Grajek, & Kretschmer, 2014). Since MNEs were perceived to possess technical expertise and capital investment superior to that of their local entrepreneurial competitors, most firms that entered into African mobile operations through privatization of state-owned entities were expected to be MNEs.

Following privatization, African countries opened their markets for private entry and introduced competition in the mobile telecommunication industry. The first private license for digital mobile operators was created in South Africa in 1994. By 1997, 50 percent of ITU member states had opened their markets to private operators (International Telecommunication Union, 1998b).

The entry of new firms generally occurred through license tender. The selection process was based on a variety of criteria for bidders such as technical capability, bidding amount, coverage targets, and employment projection. It has been argued that lack of transparency in selection criteria turned some tenders into 'beauty contests,' which were susceptible to corruption (cf. Karim, Putimahtama, & Mullins, 2009; Mullins & Rhodes, 2011; The Economist, 2000). Thus, in some cases, local entrepreneurial firms with core resources and capabilities that were not matched to the industry's required capabilities and resources were able to win the tender and enter the market.

The firms that won the tender and subsequently entered the market faced significant ambiguity and an adverse environment for industrial growth due to poor regulatory quality. The nascent regulatory bodies in most African countries were ill-prepared for private operator entrants. The provisions for additional frequency allocation after licenses were granted were often undefined. Similarly, arrangements for renewing licenses after expiration were not clear, and neither were the terms of revocation and suspension if operators' commitments were not fulfilled. Furthermore, private operators faced challenges with respect to interconnection tariffs involved in connecting their subscribers to the state incumbent's network users. While the state set tariffs based on agreements with private operators in some countries, in several others, state-owned incumbents set interconnection fees unilaterally and regulatory bodies often did not have the authority to set guidelines for interconnection or to arbitrate disagreements (International Telecommunication Union, 1998b). Private operators did not have full control over the price of calls in their networks. In most African countries, private operators could propose prices to the supervising regulatory body, but they were required to obtain approval from the regulatory body or related government ministry before effectively changing prices—a cumbersome process which inhibited timely prices changes (International Telecommunication Union, 1998b). Finally, in most countries, the private operators had obligations for promoting economic empowerment for disadvantaged communities; however, the provisions for such universal service obligations were often ambiguous (International Telecommunication Union, 1998b).

Yet despite numerous challenges for private operators, mobile services were quickly adopted across Africa. Mobile penetration rates measured by mobile subscribers per 100 people rose from 0.06 in 1994, to over 68 in 2012 (Fig. 8). This rapid adoption rate of mobile services in 2010, 16 years after they were introduced, contrasted significantly with the low penetration rate of fixed-line services several decades after they were introduced across 25 African countries (Fig. 9). Unlike fixed-line, which had long suffered from underinvestment, investment in mobile infrastructure rose quickly: from \$1.2 billion in 2000, to 10.9 billion in 2008 (International Telecommunications Union, 2014).

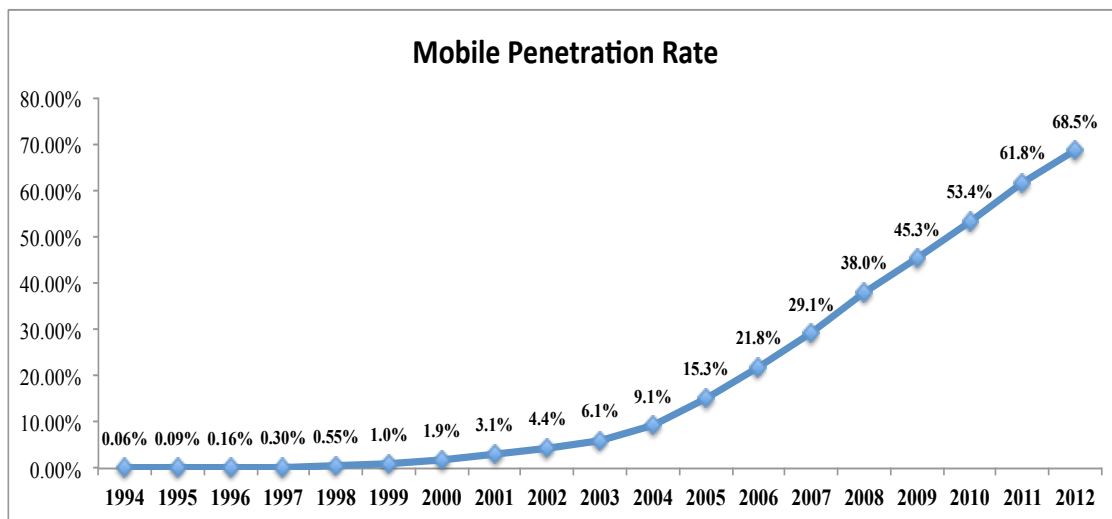


Figure 13: Mobile penetration rate across 45 countries in Africa (source: International Telecommunication Union, 2014)

Although telecommunications services grew at a phenomenal rate throughout the African continent, adoption rates were not homogeneous across countries (Fig. 9 & Fig. 10). In 2010: a) The adoption of mobile services per 100 people remained at just 17 in Democratic Republic Congo (DRC), where digital mobile services were introduced in 1998; b) Mobile services covered less than

one-third of the population in Madagascar and Burkina Faso, where they had been introduced in 1996; and c) Mobile services were widely adopted (around 90 percent of the population) in Benin and Cote d'Ivoire, where service was first introduced in 1995.

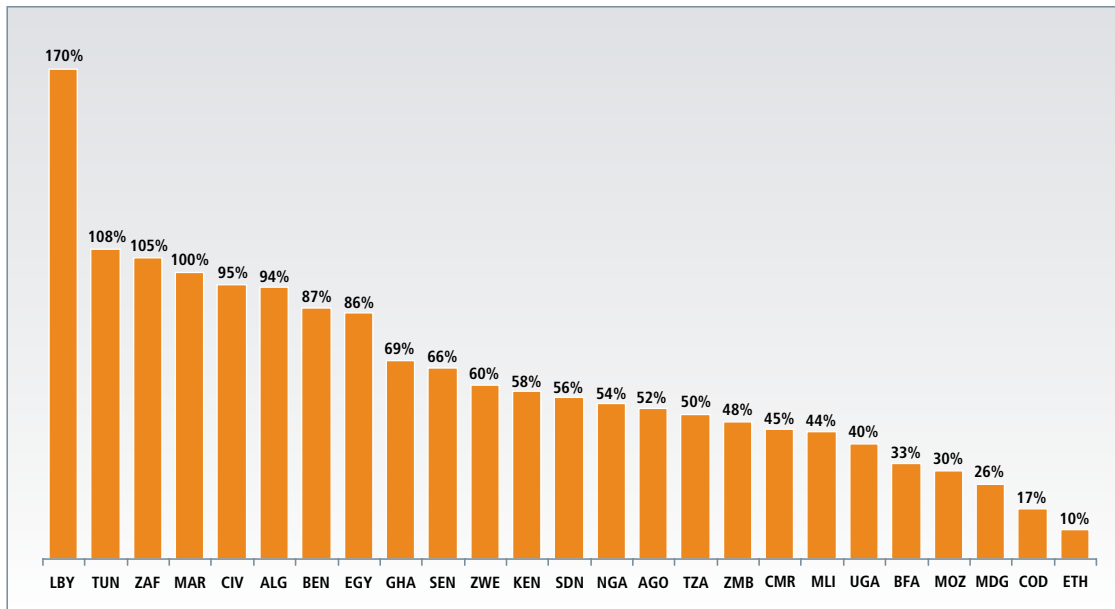


Figure 14: Mobile penetration rate heterogeneity across selected 25 countries in Africa in 2010 (Source: Groupe Speciale Mobile Association, 2011)

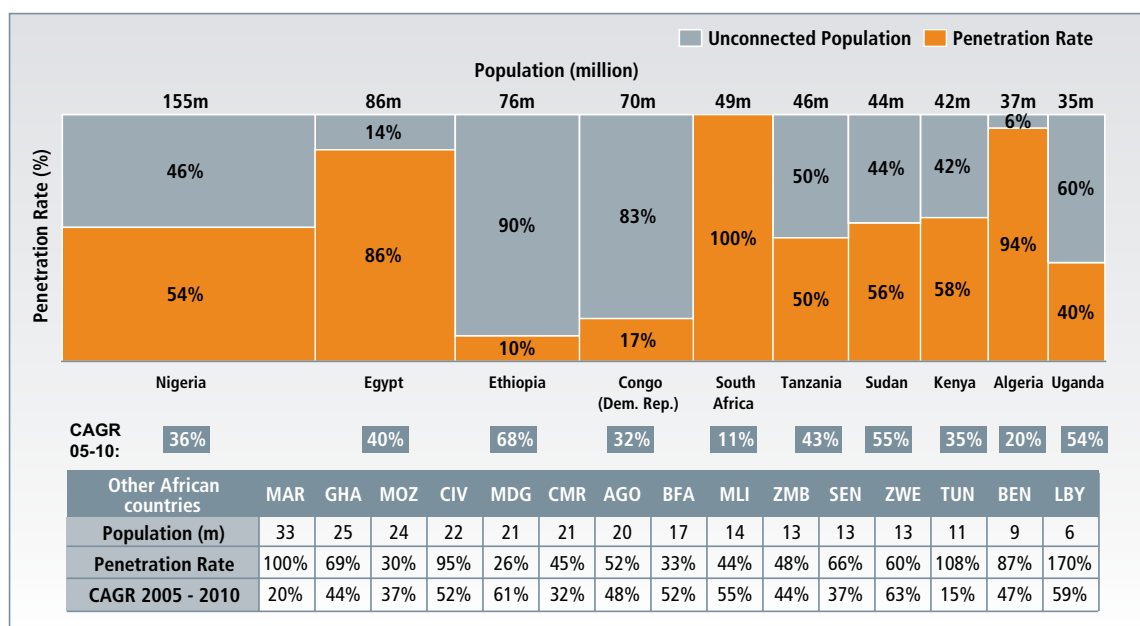


Figure 15: Mobile penetration rate and mobile growth rate heterogeneity across selected number of African countries in 2010 (Source: Groupe Speciale Mobile Association, 2011)

Furthermore, the rate of growth of subscribers and investment per capita (measured as capital investment divided by a country's population) varied significantly among countries (Fig. 7 & Fig. 11). For instance, in 1995, mobile services were introduced in both Malawi and Benin, countries with a similar population size. However by 2005, Malawi had close to 90 percent growth in annual number of subscribers, as compared to 30 percent in Benin. Some research sought to explain this country-level heterogeneity through delays in adopting telecommunication reform policies, mainly in terms of privatization or the establishment of an independent regulatory body. Other findings pointed to different levels of competition in each country as the reason for the heterogeneity.

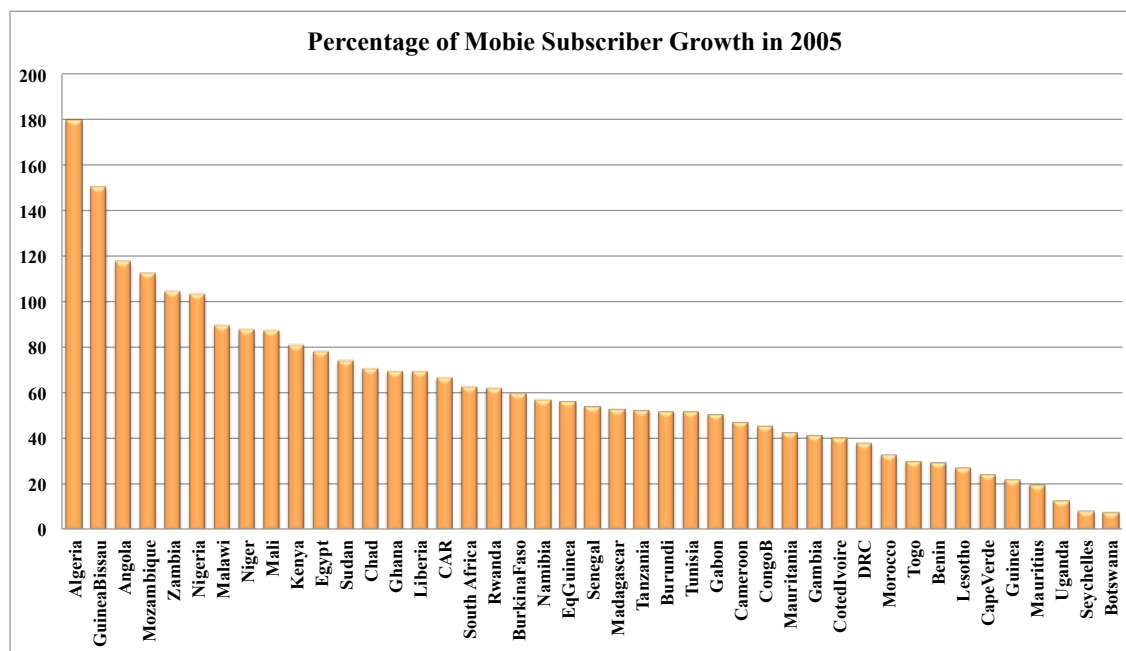


Figure 16: Percentage of mobile subscriber growth in 2005 across selected countries in Africa (International Telecommunication Union, 2014)

As outlined in the second chapter of this thesis, entry decisions by firms or decisions to delay entry until uncertainties in the market are reduced are correlated with host country institutions and firms' management backgrounds, among other factors. Further, the previous chapter suggested that once firms enter a country, they might adopt a strategy to focus on base-of-the-pyramid (BoP) customers rather than potential customers with higher incomes. These strategies of entrant firms could significantly affect the growth of the telecommunication industry, as the next section will demonstrate.

Prior research provided ample evidence that privatization of SOEs and the amount of competition influence the growth of an industry; the research in this chapter confirms these results and shows that the type of firms that enter through privatization and competition further influence the development of an industry in a

given country. The author's reading of existing literature suggests that there have not been prior attempts to explain the heterogeneity in industry growth across different countries through different firm types—namely SOEs, MNEs, and local entrepreneurial firms.

Literature Review and Hypothesis Development

Past research provided a framework for analysis of the effect of policy reforms (namely privatization and competition) on the diffusion of technology. Diffusion of a new technology over time typically follows an S-curve, and is commonly explained by an epidemic model or, in certain cases, by a probit model (Geroski, 2000).⁶⁷

Extant literature suggested that growth, price, employment, and investment in an industry could also be affected through policy reforms that affected firms' ownership and/or market competition; a change in a firm's ownership, particularly for state-owned enterprises, affects its productive efficiency, as does competition in the environment in which it operates (Megginson & Netter, 2001; Shleifer, 1998; Vickers & Yarrow, 1995). This research posited that the objective of politicians who control SOEs was not profit maximization but rather to maximize social welfare. Thus, in some cases,

⁶⁷ The epidemic model assumes that diffusion of technology is a process of spreading information about a technology through an internal and/or external source, rather than a process of persuading potential adopters. An overview of epidemic models is presented in Appendix A. A leading alternative to the epidemic model is a probit model, in which differences in adoption of a technology could be attributed to an unobservable characteristic of potential adopters, which could be explained by goals, needs, and abilities of potential adopters (Davies, 1979). Values above a certain threshold for the unobservable characteristics result in decision to adopt, which could be modeled through a probit analysis.

governments subsidized loss-making SOEs (Vickers & Yarrow, 1995). Vickers and Yarrow (1995) indicated that politicians who control SOEs lacked a strong incentive to control managers and reduce costs since they could not capture the effect of cost saving directly. Furthermore, past studies showed that while benevolent politicians who control SOEs maximize the social welfare, most politicians choose to place higher weight on their personal interests, such as redistribution of a firm's resources to favor special groups, and providing excessive wage and employment in the public sector (Shleifer & Vishny, 1994).

The literature is not unanimous on the improvement of SOEs' performance after their control rights are transferred to the private sector through privatization. While there is argument over post-privatization improvements in performance and efficiency (cf. Shirley, 2002), as well as concerns over the rise of service costs and layoffs in newly privatized SOEs (Cook & Kirkpartick, 1988), there is strong evidence that privatization increases efficiency in production and allocation of resources in SOEs (cf. D'Souza & Megginson, 1999; Megginson, Nash, & Randenborgh, 1994). Similarly, privatization in the mobile telecommunication industry improved firms' efficiency in the presence of an independent regulatory body (Wallsten, 2001), and generally improved allocation of labor and capital performance of privatized SOEs (Li & Xu, 2004). Certain literature asserted that private management also reduced employment beyond profit-maximizing or loss-making levels when compared with SOEs (Shleifer & Vishney, 1994), and that excessive employment was easier under public management than private management (Shleifer & Vishney, 1994). Thus, privatization may reduce employment in the industry (Li & Xu, 2004). Li and Xu

(2004) found no evidence that the price of services increased after privatization of SOEs.

As explained in the previous section, I posit that once most countries in a region adopt privatization reform, its effect is likely to lose significance over time.

Hypothesis 1: Privatization is likely to produce a significantly positive impact on the mobile telecommunication industry.

Evidence suggests that competition in the market positively affects private firms' performance through multiple channels. Nickell (1996) argued that in a competitive environment, inefficient firms are forced out of the market and the threat of bankruptcy pressures existing firms towards more efficient performance. Competition is less likely to pressure SOEs' performance since they do not often operate on a budget constraint. Meyer and Vickers (1997) noted that competition makes managerial efforts more observable, and provides additional incentive for managers to improve performance and protect their firms' reputations. Competition makes it possible for regulatory bodies to compare the performance of firms with their competitors, and implement regulations in a more effective and transparent way (e.g., Nalebuff & Stiglitz, 1983). Further, the literature demonstrated that competition had a positive performance on firms' allocation of labor and capital performance (Li & Xu, 2004; Wallsten, 2001), and a positive effect on adoption of mobile services (Gruber & Verboven, 2001; Koski & Kretschmer, 2005).

Hypothesis 2: Competition is likely to produce a significantly positive impact on the mobile telecommunication industry.

Previous research proposed that policy reforms (e.g., privatization and introducing market competition) partly explain the heterogeneity among countries in telecommunication industry growth. However, the literature did not differentiate in core technical know-how of the industry among entrant firms and how it impacts the strategies adopted by the entrants to reach BoP market consumers. The first chapter of this thesis asserted that local entrepreneurial-founded enterprises (EFEs) were attracted to the telecommunication industry since African countries opened their markets. Few of the local entrepreneurs that possessed relevant pre-entry industry experience and forged equity partnership with MNEs (which were classified in first chapter as EFEs with Heritage) could acquire and assimilate the key tacit organizational know-how of the industry from their partnering MNEs in the first stage. Likewise, other EFEs without pre-entry experience as well as SOEs are not able to possess the tacit organizational know-how of the industry.

Since the industry know-how of MNEs was largely based on business models for customers in advanced economies, EFEs with Heritage had to adapt the acquired business model to serve BoP customers through a set of costly experimentations. Subscribers with higher income levels contribute to larger average revenue per user (ARPU) for mobile operators than BoP subscribers. Firms that target BoP subscribers adopt strategies to attract a larger pool of BoP customers, thereby compensating for smaller ARPU with larger quantities. If

successful, these adaptations would enable EFEs with Heritage to adopt a strategy to profitably focus on the BoP market in countries they enter.

Hypothesis 3: Entry of firms with EFEs with Heritage background in a country is likely to have a significant increase on mobile telecommunication industry growth compared to entry of EFEs.

Data, Methods and Results

The hypotheses developed in the previous section have been tested on data collected from mobile operators in 53 African countries from 1990 to 2012—similar to what was explained in the first chapter of this thesis. This dataset is combined with International Telecommunications Data (2014), a dataset that includes country-level data on the telecommunication sectors of all African countries on an annual basis from 1994 to 2012. This information is augmented by country-level demographics data from World Bank Development Indicators and World Bank Governance Indicators.

To examine the first and second hypotheses, I conducted a panel regression with fixed effects similar to prior research that tested similar hypotheses (cf. Li & Xu, 2004; Wallsten, 2001). I used four telecommunication industry growth measures as dependent variables: mobile penetration rate, cost of call, total employment, and subscriber growth. *Mobile penetration rate* is defined as the number of mobile subscribers per 100 people. *Cost of call* is defined as the price of a one-minute call from mobile to mobile in fixed USD value. *Log telecom employees* is defined as a logarithm of the total employees in

the telecommunication sector, which includes cellular mobile. These dependent variables have been widely used to measure telecommunication industry performance (cf. Gabreab, 2002; Li & Xu, 2004). *Subscriber growth* is defined as log of subscribers at a current time period (t) minus log of subscribers at a previous time period (t-1). This measure is constructed in accordance with past literature (cf. Evans, 1987; Dunne, Roberts & Samuelson, 1989) and in this regression, in line with that literature, I control for size at a previous stage and number of years passed.

The explanatory variables of interest for the first and second hypotheses are indicators for privatization of SOEs and level of competition. I used a dummy variable *Any Firm with SOE Background*, which takes value of one if a firm with an SOE background has been present in a given country and year and zero otherwise. I used a dummy, *SOE privatized*, which takes value of one if SOE is privatized in a given country and year and zero otherwise.⁶⁸ Therefore, the coefficient for *Any Firm with SOE Background* captures the general effect of the presence of an SOE in a given country and year, and *SOE privatized* captures the additional effect of privatization among the SOEs. To explain the effect of *market competition*, I defined a variable equal to the total number of firms in the market. I also break the competition into two parts. I used a dummy, *Competition: Two Firms in the Market*, which is defined as one if there are two firms in a given country and year (i.e., state of duopoly) and zero otherwise. I used a dummy,

⁶⁸ To make sure the results did not change when considering partial or full privatization, I introduced a dummy for both. Therefore, I introduced a dummy, *SOE Partial Privatization*, defined as one when the state controlled over 50 percent shares after privatization and zero otherwise. I introduced a dummy, *SOE Full Privatization*, defined as one when the state controlled less than 50 percent shares after privatization and zero otherwise. Breaking SOE Privatization into partial and full privatization did not change the results introduced in this chapter significantly.

Competition: Three Firms in the Market, which is defined as one if there are three or more firms in a given country and year (i.e., state of full competition) and zero otherwise.

The main explanatory variables for the third hypothesis are based on ownership of firms that enter a given country. In accordance with the method used in the first chapter of this thesis, I use four categories for ownership: EFE with Heritage, EFE, MNE, and SOE. *Total Firms with EFE with Heritage background* is defined as total firms with EFE with Heritage background in a given country and year. *Total Firms with EFE background* is defined as total firms with EFE background in a given country and year. *Total Firms with MNE background* is defined as total firms with MNE background in a given country and year. Since the research in this chapter accounts for the total number of firms (compared with a dummy), the explanatory variables could reflect the incremental effect if more than one firm with a specific background is present in a given country and year.⁶⁹

To control for country effect and industry effect, I used a range of control variables in the fixed effect regression model above. Prior research suggested that telecommunication industry growth measures including *mobile penetration rate* are affected by *population growth*, which is used as a standardized score in this chapter, and *percentage of urban population* (cf. Koski & Kretschmer, 2005; Liikanen, et al., 2004). Prior research suggested that size of *gross domestic product (GDP)* and income level measured by GDP per capita affect employment

⁶⁹ This chapter examined the effect when the total number of firms EFE with Heritage background is replaced with a dummy defined as one if at least one EFE with Heritage is present in a given country and year and zero otherwise. The results of this chapter did not significantly change in most cases. Similarly, this research replaced total number of firms with MNE and EFE background.

and investment per capita (cf. Li & Xu, 2004). However, since GDP per capita is highly correlated when included with *population growth* and *GDP*, I only chose the latter two variables as country-level controls in this study.⁷⁰

As discussed in the previous section of this chapter, the quality of the body significantly affects the success of SOE privatization and introducing competition in the market (cf. Wallsten, 2001). I used a measure for *regulatory quality* from World Bank's Governance Indicators that captures "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development in a given country and year."⁷¹ To control for financial stability of a country, I used an annual rate of *inflation rate* of consumer prices from World Bank's Development Indicators in compliance with prior relevant literature mentioned in the first chapter of this thesis. To control for political stability in a country, I used a dummy, *country engaged in armed conflict*, from Uppsala University and Peace Research Institute, that takes a value of one if a country was engaged in armed conflict with over 25 casualties and zero otherwise (Themner & Wallenstein, 2014). Furthermore, to control for the size of the BoP market in a country, I used an additional control: *Total Population Living Below \$4 per day* is a standardized score of total population living on an income of lower than \$4 per day in a given country and year. This country control was used on regressions on performance analysis of firms in the first chapter of this thesis. A summary of variables used in this chapter and their inter-correlation matrix is presented in Table 8 and Table 9.

⁷⁰ Including GDP per capita instead of GDP does not significantly change the results presented in this chapter.

⁷¹ World Bank Governance Indicators Database 2014, variable definitions.

Table 9: List of dependent variables, explanatory variables and control variables along their description and summary of variable statistics

Dependent Variables	Description	Mean	S.D.	Min	Max
Mobile Penetration rate	Number of mobile subscribers per 100 populations.	0.26	0.33	0.00	1.79
Cost of Call	Cost of one-minute call from mobile to mobile in fixed USD.	0.18	0.11	0.00	0.68
Log Telecom Employees	Total employment in telecommunication sector.	7.81	1.30	4.69	11.59
Subscriber Growth	Log of subscribers at current time period (t) minus log of subscribers at previous time period (t-1).	0.50	0.47	-0.09	3.93
Explanatory Variables					
Any Firm with SOE background	Dummy variable equals 1 if a firm with SOE background is present in a given country-year, 0 otherwise.	0.48	0.50	0	1
SOE Privatized	Dummy variable equals 1 if SOE is privatized in a given country-year, zero otherwise.	0.83	0.37	0	1
Market Competition	Equals total number of firms in a given country-year.	2.55	1.28	1	10
Competition: Two Firms in the Market	Dummy equals one if total number of firms in a given country-year is two i.e. duopoly condition.	2.55	1.28	1	10
Competition: Three Firms in the Market	Dummy equals one if total number of firms in a given country-year is three i.e. perfect competition.	2.55	1.28	1	10
Total Firms with EFE Heritage background	Dummy variable equals 1 if a firm with EFE with Heritage background is present in a given country-year, 0 otherwise.	0.44	0.50	0	1
Total Firms with EFE background	Dummy variable equals 1 if a firm with EFE background is present in a given country-year, 0 otherwise.	0.36	0.48	0	1
Total Firms with MNE background	Dummy variable equals 1 if a firm with MNE background is present in a given country-year, 0 otherwise.	0.67	0.47	0	1
Industry / Country level controls					
Std. Population growth	Standardized score of population growth in a given country-year	0	1	-5.08	8.06
Percentage of Urban Population	Percentage of country's population in urban areas in a given year	39.03	15.58	8.25	86.37
Log GDP	GDP in fixed USD in a given country in a given year	22.67	1.42	19.92	26.45
Std. Inflation	Standardized score of inflation of consumer prices in a given country-year	0	1	-0.41	18.82
Regulatory Quality	Variable that captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development in a given country-year.	-0.54	0.58	-2.16	0.98
Country Engaged in Armed Conflict	Country is engaged in a given year in an armed conflict with over 25 casualties.	0.06	0.24	0.00	1.00
Total Population Living Below \$4 / day	Standardized score Total population living on income of lower than \$4/day in a given country-year	0	1	-0.92	4.05
Log Mobile Cellular Subscribers	Total mobile cellular subscribers in a given country-year	13.13	2.65	3.00	18.54

Table 10: Descriptive statistics and variable inter-correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Mobile Penetration Rate	0.18																		
2. Cost of Call	0.004	-0.24																	
3. Log Telecom Employees	-0.38	-0.10	-0.01																
4. Subscriber Growth	0.03	-0.0002	0.47	-0.003															
5. Any Firm with SOE background	0.17	0.09	0.41	-0.05	0.46														
6. SOE Privatized	0.44	0.04	0.14	-0.15	-0.12	0.19													
7. Market Competition	-0.06	0.08	-0.01	0.03	-0.07	0.12	-0.08												
8. Competition: Two Firms in the Market	0.43	0.06	0.13	-0.12	-0.02	0.16	0.80	-0.48											
9. Competition: Three Firms in the Market	0.03	-0.01	-0.07	-0.04	-0.26	-0.19	0.43	-0.09	0.39										
10. Total Firms with EFE Heritage background	0.14	0.07	-0.13	-0.06	-0.16	0.08	0.53	-0.04	0.39	0.01									
11. Total Firms with EFE background	0.39	0.02	0.06	-0.12	-0.41	0.04	0.63	0.02	0.48	0.01	0.02								
12. Total Firms with MNE background	-0.29	-0.20	-0.04	0.09	-0.05	0.02	0.17	-0.11	0.15	0.27	-0.02	0.09							
13. Std. Population growth	0.31	0.20	0.07	-0.13	0.25	0.02	-0.01	0.07	-0.03	-0.23	0.01	-0.03	-0.48						
14. Percentage of Urban Population	0.10	-0.10	0.89	-0.07	0.44	0.46	0.21	0.02	0.18	-0.02	-0.09	0.10	-0.11	0.17					
15. Log GDP	-0.11	-0.29	0.05	0.004	0.05	0.01	-0.09	-0.09	-0.06	-0.07	-0.04	-0.07	0.10	-0.13	0.08				
16. Std. Inflation	0.26	0.16	0.24	-0.06	0.01	0.14	0.13	0.10	0.12	-0.02	-0.18	0.30	-0.20	0.30	0.27	-0.31			
17. Regulatory Quality	-0.12	-0.27	0.45	0.07	0.14	0.21	0.24	-0.13	0.14	0.06	0.11	0.10	0.28	-0.31	0.43	0.10	-0.20		
18. Country Engaged in Armed Conflict	-0.001	0.08	-0.13	-0.07	0.02	0.02	0.02	0.01	0.03	-0.09	0.23	-0.09	0.06	-0.03	-0.07	0.12	-0.20	-0.04	
19. Total Population Living Below \$4 / day	0.61	0.12	0.34	-0.29	0.11	0.46	0.62	0.16	0.49	0.20	0.14	0.48	-0.04	0.13	0.44	-0.14	0.23	0.23	0.01
20. Log Mobile Cellular Subscribers																			

Models 1 and 2 in Tables 10, 11, and 12 present results that support the first and second hypotheses in this chapter. The explanatory variable *SOE privatized* is positive and significant in Models 1 and 2 in Table 10, which shows the effect of privatization in the mobile industry. The explanatory variable *Market Competition* is positive and significant in model 1 in Table 10, which confirms the positive effect of competition on mobile subscribers growth. Model 2 in Table 10 suggests a positive effect of duopoly and full competition on subscriber growth. These results are consistent with prior literature (Li & Xu, 2004).

The explanatory variable *SOE privatized* is insignificant in models 1 and 2 in Table 11, which implies that *cost of call* was not significantly increased after privatization. The explanatory variable *Market Competition* is insignificant in models 1 and 2 in Table 11, which confirms that competition does not increase the *cost of call*. Again, results are in accordance with past research (Li & Xu, 2004).

The explanatory variable *SOE privatized* is negative and significant in models 1 and 2 in Table 12, which suggests that *Telecom Employees* was significantly reduced after privatization. The explanatory variable *Market Competition* is insignificant in models 1 and 2 in Table 12, which supports the idea that competition does not have a significant effect on *Telecom Employees*, in accordance with existing literature (Li & Xu, 2004).

Table 11: The effect of firms' background on mobile subscriber growth in 53 African countries they entered.

	Model 1 Subscriber Growth	Model 2 Subscriber Growth	Model 3 Subscriber Growth
<i>Any Firm with SOE background</i>	-0.144 (0.174)	-0.075 (0.158)	0.004 (0.135)
<i>SOE Privatized</i>	0.392** (0.143)	0.334** (0.117)	0.376** (0.116)
<i>Market Competition</i>	0.166** (0.055)		
<i>Competition: Two Firms in the Market</i>		0.579*** (0.118)	0.427** (0.124)
<i>Competition: Three Firms in the Market</i>		0.818*** (0.137)	0.536** (0.154)
<i>Total Firms with EFE with Heritage background</i>			0.287** (0.107)
<i>Total Firms with EFE background</i>			-0.041 (0.046)
<i>Total Firms with MNE background</i>			0.175* (0.066)
<i>Industry / Country Controls</i>			
<i>Log [Mobile Subscribers (t-1)]</i>	-0.203*** (0.033)	-0.236*** (0.026)	-0.263*** (0.027)
<i>No of years since a country opened its market (t-1)</i>	0.244* (0.096)	0.176* (0.075)	0.225** (0.079)
<i>Mobile Penetration Rate</i>	-0.003** (0.001)	-0.003* (0.001)	-0.002 (0.001)
<i>Std. Population Growth (t-1)</i>	0.042 (0.032)	0.052 (0.032)	0.042 (0.030)
<i>Percentage of Urban Population</i>	0.015 (0.023)	0.018 (0.021)	0.010 (0.020)
<i>Log [GDP (t-1)]</i>	0.101 (0.133)	0.217 (0.157)	0.271+ (0.140)
<i>Std. Inflation (t-1)</i>	-0.004 (0.008)	0.006 (0.008)	0.009 (0.007)
<i>Regulatory Quality (t-1)</i>	0.213+ (0.116)	0.219+ (0.126)	0.241* (0.120)
<i>Std. Total population living below \$4 / day (t-1)</i>	-0.021 (0.086)	0.051 (0.083)	0.031 (0.083)
<i>Country Engaged in Armed Conflict (t-1)</i>	0.065 (0.069)	0.064 (0.078)	0.074 (0.074)
<i>Country fixed</i>	Yes	Yes	Yes
<i>Observations</i>	754	754	754

Table 12: The effect of firms' background on price of mobile services in 53

African countries they entered.

	Model 1 Price of Call	Model 2 Price of Call	Model 3 Price of Call
<i>Any Firm with SOE background</i>	0.056 [*] (0.022)	0.049 [*] (0.020)	0.048 [*] (0.022)
<i>SOE Privatized</i>	0.006 (0.018)	0.008 (0.019)	0.007 (0.018)
<i>Market Competition</i>	0.003 (0.007)		
<i>Competition: Two Firms in the Market</i>		-0.017 (0.015)	-0.009 (0.017)
<i>Competition: Three Firms in the Market</i>		-0.001 (0.023)	0.006 (0.028)
<i>Total Firms with EFE with Heritage background</i>			-0.018 (0.015)
<i>Total Firms with EFE background</i>			0.006 (0.010)
<i>Total Firms with MNE background</i>			0.002 (0.012)
<i>Industry / Country Controls</i>			
<i>Std. Population Growth</i>	-0.002 (0.012)	-0.002 (0.012)	-0.001 (0.012)
<i>Percentage of Urban Population</i>	0.000 (0.004)	0.001 (0.004)	0.001 (0.004)
<i>Log (GDP)</i>	0.052 (0.044)	0.057 (0.041)	0.053 (0.045)
<i>Std. Inflation</i>	-0.124 ^{***} (0.023)	-0.133 ^{***} (0.024)	-0.135 ^{***} (0.024)
<i>Regulatory Quality</i>	-0.046 ⁺ (0.027)	-0.049 ⁺ (0.028)	-0.056 ⁺ (0.028)
<i>Std. Total population living below \$4 / day</i>	0.010 ⁺ (0.005)	0.012 [*] (0.005)	0.010 (0.006)
<i>Country Engaged in Armed Conflict</i>	0.012 (0.023)	0.011 (0.024)	0.009 (0.025)
<i>Country fixed effect</i>	Yes	Yes	Yes
<i>Observations</i>	562	562	562

Table 13: The effect of firms' background on employment in telecommunications industry in 53 African countries they entered.

	Model 1 Log Telecom Employee	Model 2 Log Telecom Employee	Model 3 Log Telecom Employee
<i>Any Firm with SOE background</i>	-0.046 (0.167)	-0.053 (0.196)	0.005 (0.221)
<i>SOE Privatized</i>	-0.334* (0.132)	-0.355* (0.134)	-0.293* (0.112)
<i>Market Competition</i>	0.043 (0.039)		
<i>Competition: Two Firms in the Market</i>		0.047 (0.051)	-0.003 (0.084)
<i>Competition: Three Firms in the Market</i>		0.138 (0.084)	0.056 (0.156)
<i>Total Firms with EFE with Heritage background</i>			0.193 ⁺ (0.108)
<i>Total Firms with EFE background</i>			0.027 (0.080)
<i>Total Firms with MNE background</i>			-0.056 (0.068)
<i>Industry / Country Controls</i>			
<i>Std. Population Growth</i>	0.009 (0.049)	0.013 (0.050)	0.010 (0.049)
<i>Percentage of Urban Population</i>	-0.003 (0.018)	-0.003 (0.016)	-0.008 (0.015)
<i>Log (GDP)</i>	0.541*** (0.149)	0.545** (0.162)	0.595*** (0.133)
<i>Std. Inflation</i>	0.003 (0.006)	0.004 (0.006)	0.002 (0.004)
<i>Regulatory Quality</i>	0.061 (0.109)	0.067 (0.109)	0.152 (0.091)
<i>Std. Total population living below \$4 / day</i>	-0.141* (0.055)	-0.136** (0.045)	-0.132** (0.044)
<i>Country Engaged in Armed Conflict</i>	0.035 (0.072)	0.030 (0.070)	0.049 (0.067)
<i>Country fixed effect</i>	Yes	Yes	Yes
<i>Observations</i>	611	611	611

Model 3 in Tables 10, 11, and 12 presents the main results of this research regarding the effect of entrant firms' background on measures of industry growth. Model 3 in Table 10 suggests that entry of *Total number of firms with EFE with Heritage background* has a significantly stronger impact on *subscriber growth*, while the same effect is insignificant for firms with EFE background. In model 3 of Table 11, the coefficient for *Total number of firms with EFE with Heritage background* is insignificant, which suggests that firms with EFE with Heritage background did not substantially increase the price. The same coefficient is also positive and insignificant for firms with EFE background. Although this result is not inconsistent with the third hypothesis, the result in model 3 of Table 11 does not strictly support the third hypothesis. The coefficient for *Total number of firms with EFE with Heritage* is the only coefficient with negative value compared with other firm types. Model 3 in Table 12 suggests a positive and significant effect for *Total Firms with EFE with Heritage Background* compared with other EFEs and MNEs.⁷²

Model 3 in Tables 3, 11, and 12 suggests a positive coefficient for *Total firms with MNE background*. As explained in the first chapter of this thesis, the performance of local entrepreneurs and MNEs could not be directly compared because they focus on different market segments—at least during the early stages of industry development.

⁷² The research in this chapter conducted tests to examine whether the effect of entrant firms' background is influenced by the size of the BoP population in host countries. Therefore an interaction of size of BoP market with two types of entrant firms' background, EFE with Heritage and MNE, was added to model 3 in Tables 3, 4, and 5. Consistent with the theoretical argument of the third hypothesis, the overall results of the new models suggest that entry of firms with EFE with Heritage background as part of competition in countries with larger BoP market size have a significantly greater impact on industry growth measures.

Discussion

The telecommunication industry has experienced a tremendous growth in Africa since 1994, when the first digital mobile operator was established on the continent. However, African countries demonstrated substantial heterogeneity in this growth—e.g., on mobile subscriber growth, cost of call, investment per capita, and employment. This heterogeneity was partly explained in previous literature through change of ownership of SOEs and market competition. The research in this chapter suggests that part of this heterogeneity could be explained by different firm ownerships that entered African countries to compete with SOE incumbents: MNEs, EFEs with Heritage, and EFEs. In other words, previous research found that change of ownership (from state to private) and introducing competition improves the country-level measures of industrial growth. This study reinforces the idea that the number of firms that enter through competition matters, but also posits that ‘who’ enters through competition is important as well.

While initial results support the hypothesis, there are limitations that these results could have. The decision for privatization may be influenced by the anticipated post-privatization profits. Prior literature suggested that because privatization improved performance of SOEs and introduced potential economic gain after the reform, the decision for privatization could be endogenous to expected post-reform economic gain (Li & Xu, 2004). Li and Xu (2004) used a composite measure for host country political economy as an instrument and found no significant change in the results.

Furthermore, the quality of SOE management influences the SOE performance and therefore the industry's growth. However, since management quality could not be quantitatively measured, it remains as part of the error term in the main regression. The quality of management could also positively influence the decision for privatization. Therefore, privatization could be endogenous to industrial growth variables. A potential instrument could be ethnic fractionalization inside the host country. Past literature asserted that higher ethnic fractionalization could adversely influence firm performance since individuals are likely to attribute well-being to members of their own group (cf. Alesina & Ferrera, 2004). Ethnic fractionalization does not influence industrial growth from channels other than those outlined above.

The entry decision of EFEs with Heritage and MNEs may be influenced by the type of firms that operate in the target market prior to their entry. If an EFE with Heritage or MNE is already operating in the market, another EFE with Heritage or MNE may be less likely to enter that market to avoid stiff competition. Therefore the entry decision of MNEs and EFEs with Heritage may be endogenous. One possible instrument that can be used in this case is a factor that influenced the entry decision, such as the price of a commodity (e.g., steel or cement). The price of these commodities affects capital investment of mobile firms in telecommunication towers in a given year and subsequent years. However, the price of steel or cement does not affect the entry decision from channels other than capital investment in telecommunication towers.

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Appendix: Review of models of new product or technology adoption

The epidemic model with external influence assumes information about a new technology is spread through population, denoted by m , from a central source. The information reaches a fixed percentage, denoted by p , of total population at each time period and each individual adopts a technology as soon as he/she hears about it. The total potential adopters at a given time, denoted by $N(t)$, is generally in the form of equation (1).

$$\frac{dN(t)}{dt} = p[m - N(t)] \quad \Rightarrow \quad N(t) = m(1 - e^{-pt}) \quad (1)$$

The epidemic model with internal influence assumes information about a new technology is driven by interaction coefficient, denoted by q , between current adopters and potential adopters i.e. each individual adopts a new technology as soon as he/she hears about it from someone who has already adopted. The total potential adopters at a given time, denoted by $N(t)$, is generally in the form of a logistical equation (2). A seminal research by Griliches (1957), suggested a logistical S-curve to explain heterogeneous diffusion of hybrid corn among different states in United States. Following Griliches (1957), the literature conducted analysis to explore whether cross-country differences in adoption rate of mobile industry could be explained by the effect of set of policy reforms namely, opening market to digital mobile operators, establishment of independent regulatory and allowing for competition (c.f. Gruber and Verboven, 2001; Koski and Kretschmer, 2005).

$$\frac{dN(t)}{dt} = qN(t)[m - N(t)] \quad \Rightarrow \quad N(t) = \frac{1}{\frac{1}{m} + ce^{-qt}} \quad (2)$$

The epidemic model with mixed influence assumes information spread both through an internal source and external source. Bass (1969) offered a model which has since been widely used for epidemic mixed model analysis. During early years of diffusion, Bass model is perceived to predict adoption more accurately than internal or external influence model (cf. Dos Santos and Peffers, 1998). Using same notation as above, potential adopters at a given time is generally in the form of equation (3). Following a Bass, (1969), past research performed analysis on adoption rate differences among different countries in telecommunication industry (e.g. Kiiski and Pohjola, 2002).

$$\frac{dN(t)}{dt} = p[m - N(t)] + \frac{q}{m} N(t)[m - N(t)] \quad (3)$$

Concluding Remarks

Africa has substantive BoP markets and faces a variety of socio-economic challenges that have limited economic development in most sectors. Surprisingly, mobile telecommunications have been widely adopted in this continent. This observation was the trigger for this thesis, which aims to investigate the nature and drivers of development in the industry, which rapidly became central to economic growth in the region.

Key sources of uncertainty in the development of the industry stem from the difficult access to critical knowledge generated in the developed world, as well as the need to radically adapt this knowledge and experience to be able to create and capture value in BoP markets. Research suggests that adaptations of advanced-economy business models to challenging base of the pyramid (BoP) market conditions involve experimentation. This thesis presented a set of conditions that facilitate developing country entrepreneurs to learn about business models and the incentive of local and multinational firms to carry out experiments for BoP adaptations, using the evolution of the mobile telecommunications industry across Africa as the empirical setting. This thesis can be seen as contributing to research on BoP markets as well as internationalization. Extant research on BoP markets has highlighted various challenges involved in adapting to BoP market conditions (e.g. London and Hart, 2004; Prahalad, 2004; Chesbrough et al., 2006), but has been largely silent on the mechanisms through which developed and developing country firms build capabilities for BoP markets or their incentives to do so. Prior studies on internationalization have primarily considered operational challenges inherent in

developing countries due to weaknesses in their institutions (e.g. Delios & Henisz, 2003; Henisz, 2000; Holburn & Zelner, 2010), but largely left unexplored the decision to internalize across regional BoP markets.

The thesis posits a two-step process of capability development: the first step involved learning through their partnerships with MNEs, and the second step involved experimenting to make adaptations to existing business models for BoP market conditions. Among regional firms, we find that those with relevant and meaningful pre-entry experience, which were characterized as EFEs with Heritage, had exemplary performance, presumably because such experience enabled them to more effectively learn about mobile telecommunications and, therefore, carry out experiments for BoP adaptations with greater success. This thesis thus indicates that the variation in pre-entry experiences of regional firms as a key source of their heterogeneity (cf. Agarwal *et al.*, 2004; Helfat & Lieberman, 2002; Klepper & Simons, 1997).

The findings of this thesis also suggest that capabilities derived through successful BoP experimentations contribute to ownership advantages, which can be further exploited to enter in multiple regional countries with substantial BoP markets. In the African telecommunications industry, we find EFEs with Heritage had significantly higher rate of internationalization than other regional firms or MNEs. Such ownership advantages and further internationalization across the South were the critical catalysts for the growth of the industry.

We also show that, compared to EFEs with Heritage, MNEs have less incentives to invest in developing BoP markets. Therefore, during the early stage in the evolution of the industry, they were focused exclusively on catering to the

needs of high-income consumer segments due to their pre-existing strategic orientation, providing the critical need and opportunity for the EFEs with heritage to enter new and attractive markets for them.

Our key findings regarding experimentations in and internationalization across mobile telecommunications markets of Africa share striking similarities with anecdotal evidence from the evolution of other industries.. For example, the pioneering microcredit firm, Grameen Bank, carried out several lending experiments to develop a self-sustaining financial model for those living in poverty, and once a successful microcredit model emerged in Bangladesh, Grameen replicated its model in numerous countries. Moreover, he was able to do that ahead of any multinational banks that subsequently entered this interesting market. (Yunus & Jolis, 2003).

Because industry knowledge about modern industries has tacit elements, the first-step learning by regional firms requires mechanisms that allow such knowledge to be transferred from foreign firms to local firms. The second-step experimentation can potentially reveal successful adaptations, which can limit the returns of the discoverer. Therefore, the development of BoP markets can be potentially limited, both by regional entrepreneurs' lack of opportunities to learn about modern industries and by the positive externalities that may be associated with the discoveries of successful adaptations that are further copied by other entrants, dissipating the returns (Hausman and Rodrik 2003).

In this regard, some conditions may have aided the development of the African telecommunications industry. First, most African countries prohibited full foreign ownership in mobile telecommunications. MNEs that chose enter needed

to forge joint ventures, thereby creating potential opportunities for their local partners to learn from their MNE partners. Second, at the early stage in the evolution of the industry, various development agencies were willing to become investors, essentially sharing the risks of experimentations. Third, scale economies and regulated entry may have incentivized pioneers to actively experiment and rapidly internationalize across BoP markets. Future studies can readily modify our general theoretical framework to explore the pattern of industrialization when such conditions are absent.

Although telecommunication industry experienced a tremendous growth in Africa during 1990s, African countries demonstrated substantial heterogeneity in telecommunication industry growth, namely on mobile subscriber growth, cost of call, investment per capita, and employment. This heterogeneity was partly explained in the previous literature through change of ownership of SOEs and market competition. While the previous literature suggests change of ownership from state owned to private and introducing competition improves the country level measures of industrial growth, this research suggests that, not only the number of firms that enter through competition matter, but also 'who' enters through competition is significantly important. Our findings suggest that a few regional, entrepreneur-led firms with exemplary performance entered into multiple African countries, catalyzing the growth of the industry in the countries they enter and across the African continent Overall, the thesis shows how these entrepreneurial firms with a particular heritage are at the core and explain most of the development of the mobile industry in sub-Saharan Africa. This is an important lesson for economic development in BoP markets across the world.