

# **Competition and Mobile Penetration in Sub-Saharan Africa**

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# Competition and Mobile Penetration in Sub-Saharan Africa

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## Abstract

- *This paper examines the impact of competition on mobile penetration (MPEN) in 35 Sub-Saharan African (SSA) countries between 2000 and 2006*
  - During this period, MPEN increased from 3.54 to 21.48 people per 100 inhabitants (for the countries under investigation)
- Using panel data regression analysis, We estimate the impact of **existence** and **intensity** of competition on the mobile telephone growth
  - **Different equations** with **different measures** of competition that reflect either the introduction or intensity of competition on the sector were employed
  - **Sectoral characteristics** (FPEN, MPR, IR) and **macroeconomic indicators** (per capita income-PCI, urban population) were controlled
- For the most part, the econometric results are consistent with existing literatures
  - Existence/introduction of mobile competition shows a positive & significant effect on MPEN
  - Intense of competition/less concentrated market positively affect mobile expansion
  - Each mobile entry is significantly & positively associated with MPEN, but Initial entries have greater impact on MPEN than further market entries.
- FPEN, & PCI also positively affect mobile penetration

## Purpose of the Paper

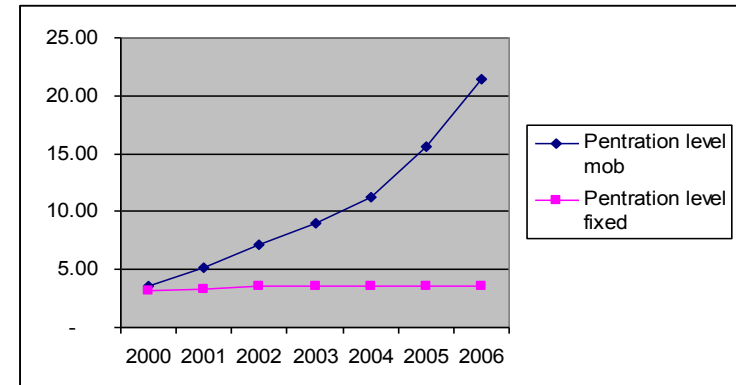
- To investigate the impact of both existence and intensity of competition on mobile penetration in the SSA

# Methodology

- Descriptive Analysis
  - Overview the trend of MPEN and Market Structure in SSA over the period 2000-2006
- Econometric Model
  - To estimate the impact of competition – we specify fixed effect panel data model
    - $$\ln\text{MPEN}_{it} = \delta_i + B_0 + B_1 \ln Y_{it} + B_2 \ln \text{UR}_{it} + B_3 \ln \text{MPR}_{it} + B_4 \ln \text{FPEN}_{it} + B_5 R_{it} + \underline{B_6 \text{Compit}} + \varepsilon_{it} \quad (1)$$
  - To have a closer look on the impact of different No. of mobile operators in the market. Based on equation 1, we constructed the following two equations;
    - In equation 2, we include all control variables & a set of entry dummies;
      - $$\ln\text{MPEN}_{it} = \delta_i + B_0 + B_1 \ln Y_{it} + B_2 \ln \text{UR}_{it} + B_3 \ln \text{MPR}_{it} + B_4 \ln \text{FPEN}_{it} + B_5 R_{it} + \underline{B_6 \text{DumEntry2}_{it} + B_7 \text{DumEntry3}_{it} + B_8 \text{DumEntry4}_{it} + B_9 \text{DumEntry5}_{it}} + \varepsilon_{it} \quad (2)$$
    - *In equation 3, we replace a set of entry dummies with the quadratic form of no. of mobile operators*
      - $$\ln\text{MPEN}_{it} = \delta_i + B_0 + B_1 \ln Y_{it} + B_2 \ln \text{UR}_{it} + B_3 \ln \text{MPR}_{it} + B_4 \ln \text{FPEN}_{it} + B_5 R_{it} + \underline{B_6 \text{opno} + B_7 \text{sqopno}} + \varepsilon_{it} \quad (3)$$

## Discussion and Findings (MPEN)

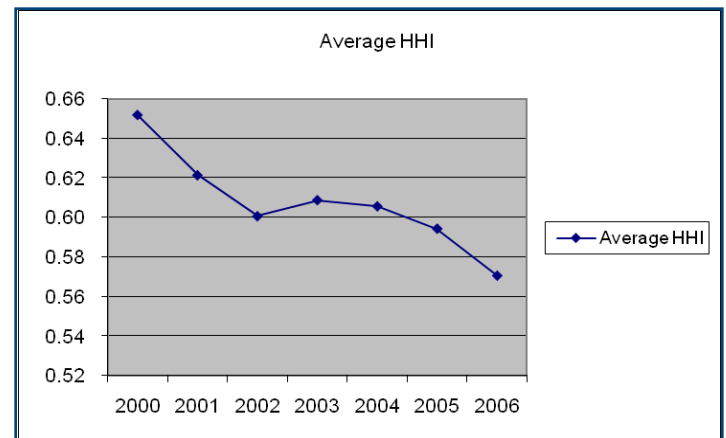
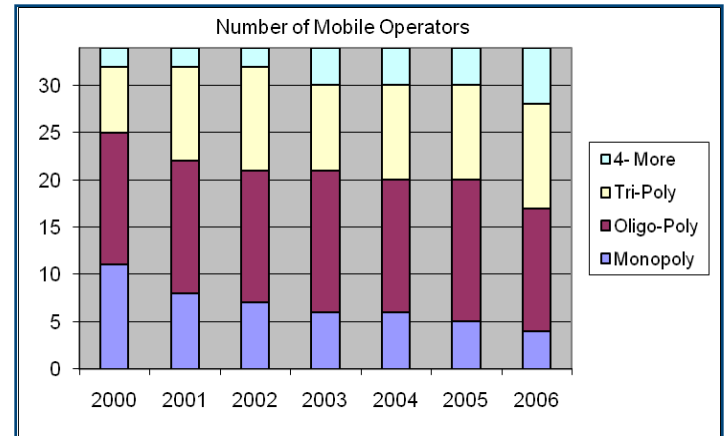
- MPEN surpassed FPEN in the year 2000, increasing at AAGR of 35.30 %, while FPEN increased by 1.90%
  - The highest growth recorded in Nigeria, Niger, Sudan respectively. The lowest - in Seychelles, Zimbabwe & Botswana
  - Consequently in 2006 MPEN reached around 21.48 per 100 inhabitants which is around six fold of FPEN.
- Despite this remarkable growth,
  - MPEN is still very low as compared to the rest of the world's average - 66.16 in 2006.
  - Considerable variation across countries was observed & increased in each year under investigation.



Lowest MPN in 2006		Highest MPN in 2006	
Ethiopia	1.09	Seychelles	86.52
Eritrea	1.36	South Africa	83.33
Burundi	2.55	Gabon	63.86
Central Afr. Rep.	2.69	Mauritius	61.50
Niger	3.35	Botswana	46.78

## Discussion and Findings (Market Structure)

- Market structure has been significantly changed
  - Monopoly mobile operator decreased to 5 in 2006 from 11 in 2000
  - Oligopoly market structure largely dominates the market but No. of countries that have 3 & 4 or more operators have also increased
- HHI was also decreasing.
  - On average, HHI decreased 1.7% per annum in the period 2000-2006. In 2006, the lowest HHI is recorded in Nigeria (0.29), Benin (0.30) & Tanzania (0.38).
  - A negative correlation between HHI & MPEN has been observed for all the period under consideration. For instance, the Corr. Coff. b/n average MPEN & average HHI for the period 2000-2006 was -0.71



## Discussion and Findings (Estimation)

- Before estimating the econometric model, we test Endogeneity, Autocorrelation & Heteroscedasticity
  - We test endogeneity problem for MPR, FPEN, GDP per capita in the model using Durbin-Wu-Hausman Test
    - The test results show that only GDP per capita may pose endogeneity problem in the case where year of mobile competition is used as a measure of competition
    - Therefore, we used the two stage least squares (2SLS) instrumental variables method as an estimation technique
  - We also test panel level Heteroscedasticity and Autocorrelation using Likelihood Ratio Test and Wooldridge (2002) test respectively
    - The test result shows that our data is suffered from both autocorrelation & heteroscedasticity
    - Therefore, we estimate our econometric model using Panel Corrected Standard Errors (PCSE) approach assuming heteroscedasticity & AR(1) autocorrelation of errors within panels.

## Discussion and Findings (Results 1)

- Mobile competition is positively & significantly affects MPEN. The coefficients of the different measures of competition are all positively significant at 1% level of significance.
  - A move from a single to one or more mobile operators results in 1.20 additional lines/100 inhabitants
  - One year of mobile competition results in approximately 0.19 additional lines/ 100 inhabitants
  - Each mobile competitor is associated with an increase of almost 0.57 additional lines per 100 inhabitants.
  - Similarly a 1% decrease in HHI is associated with 1.48% increase in the MPEN level.

	Measuring the impact of introduction (existence) of competition		Measuring the intensity of competition	
	Specification 1 (Dummy for presence of 2/more Operators)	Specification 2 (No of years With more than one operator)	Specification 3 (No. of Opeartors)	Specification 4 (HHI)
Ln GDP	1.105*** (0.196)	2.078*** (0.379)	1.284*** (0.189)	1.203*** (0.210)
Ln Urban Pop	-0.362 (0.312)	6.189*** (1.762)	-0.563** (0.267)	-0.494** (0.236)
<b>Comp</b>	<b>1.195*** (0.141)</b>	<b>0.189*** (0.039)</b>	<b>0.566*** (0.095)</b>	<b>-1.483*** (0.168)</b>
Ln MPR	0.299*** (0.068)	0.043 (0.098)	0.194** (0.091)	0.237*** (0.077)
Ln FPEN	0.290*** (0.091)	0.884*** (0.269)	0.316*** (0.109)	0.248* (0.130)
Dummy: regulator	0.314** (0.142)	-0.324 (0.229)	0.134 (0.112)	0.283** (0.112)
R <sup>2</sup> Countries Observations	.74 35 222	.76 (within) 33 209	.66 35 222	.65 35 221

## Discussion and Findings (Results 2)

- Closer investigation on the impact of different number of operators in the market shows that
  - Each mobile entry significantly & positively associated with MPEN.
  - Initial entries have greater impact on MPEN than further market entries
- Contrary to intuition: MPR positively & significantly associated with the level of MPEN: might be because of
  - SS side rather than DD side constraints
  - Limitation of a price variable to incorporate quality of service (QoS)
  - Increasingly complex tariff structures of mobile telecom services - price discrimination (including multipart pricing, peak and off peak pricings)
- FPEN on the other hand is positively & significantly associated with MPEN, implying positive network externality
- Per capita income is significantly & positively associated with MPEN
- Percentage of urban population is negatively associated with MPEN indicating that mobile has been a good alternative for rural areas coverage in SSA

## Limitation

- Though HHI is by far better measure/proxy of intensity of competition than those that are used in the previous literatures, yet it is not a perfect measure of intensity of competition. Mainly because high HHI/high concentration doesn't always indicate high exercise of market power and limited actual competition.
- Because of lack of detailed and comprehensive data on pricing plans of operators (for the countries and period under investigation), we used only peak hour mobile local call price, this limits to make strong conclusions on the impact of price on MPEN

## Practical Implications

- Based on the findings of this study, in order to **sustain the remarkable mobile telephone growth and narrow the prevailing MPEN gap** with the rest of the world, Regulators and competition authorities need to;
  - Identify and address **not only regulatory/policy barriers to entry but also anticompetitive conduct of firms aiming at maintaining and increasing market positions**, such as;
    - anticompetitive cross subsidization,
    - use of information obtained from competitors to limit competition,
    - denial of technical information, essential facilities and other commercially relevant information for rival operators.
  - Work on **reducing costs of customers to switch to alternative suppliers**
    - updating consumers with information on prices or service quality data or obliging operators to provide consumers these information with a least cost.
    - Enforcing mobile number portability

## Key Contributions

- Extends the previous literatures specifically for case of SSA
  - Despite claims that competition played an important part in a remarkable mobile telephone growth observed in the African region, there has been little or no empirical work to measure and estimate its impact.
- Estimate not only the impact of a mere **existence** of competition but also **intensity** of competition on MPEN.
  - Earlier empirical works do not adequately distinguish between these two dimensions of competition, and particularly the latter dimension has not been deeply analysed.
    - In many African countries that have introduced competition, a single mobile operator (mostly the incumbent) control a huge market share even after the new entrant (s) stayed in the market for many years
    - Therefore, using more informative measure – HHI, we tried to estimate the impact of intensity of competition on mobile penetration. This allow us to put forward policy recommendations that can go beyond mere presence or absence of multiple operators.



# Thank You!

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