

# The Economic Impact of Telecommunications in Senegal

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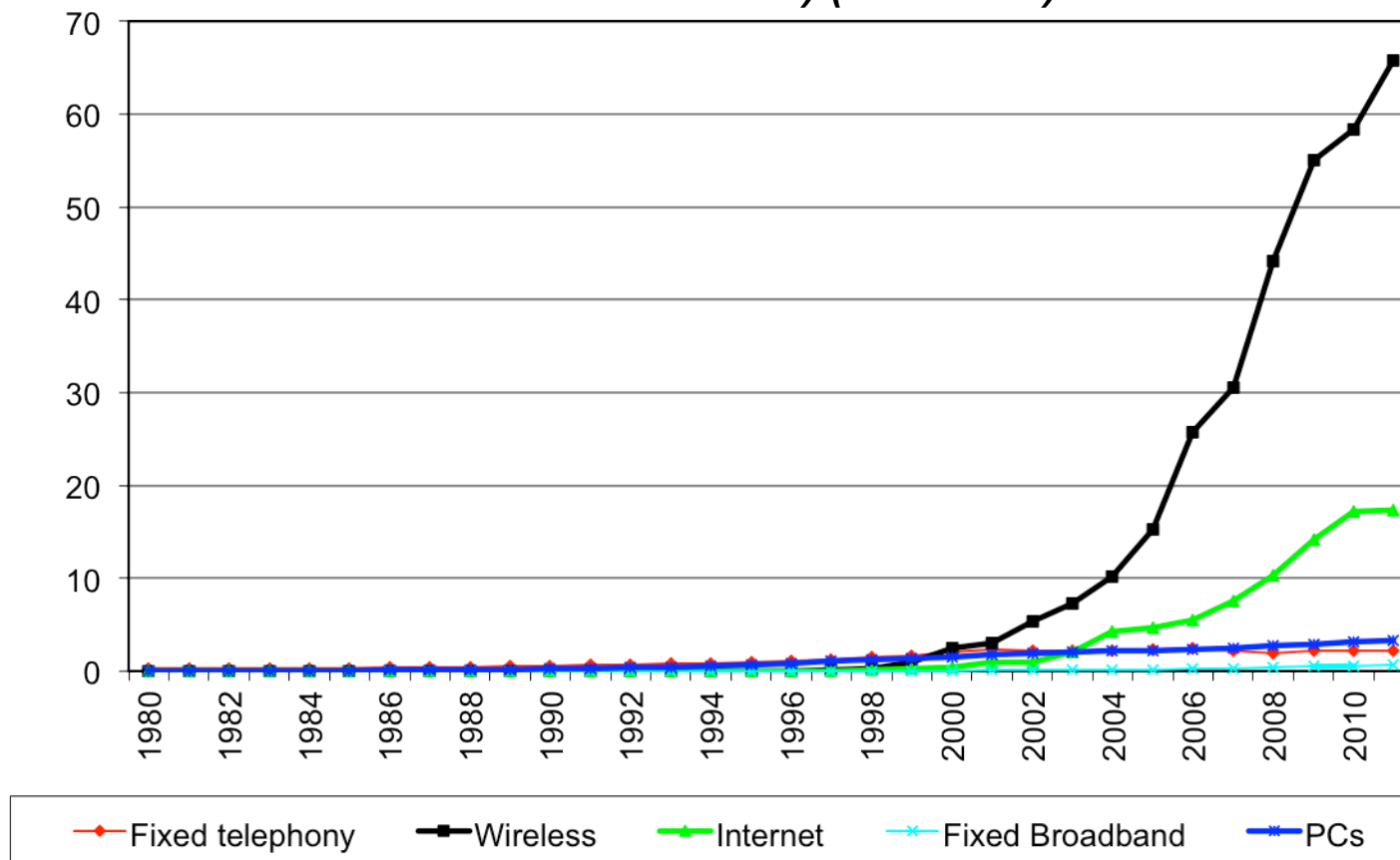
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# **This presentation examines the economic impact of telecommunications in an emerging country: Senegal**

- Assesses the relative economic effects of wireless and broadband communications
- Rather than looking at the micro-economic impact on a given sector or group of firms, it applies econometric techniques to understand the link between communications and macro-economic indicators
- Rather than looking at cross-sectional sample of countries, it focuses on a single economy
- Rather than looking at mature economies, it focuses on an emerging country

## Our starting point is the significant transformation incurred in Senegal's telecommunications adoption

**SENEGAL: ICT ADOPTION (PERCENT PENETRATION) (1980-2011)**



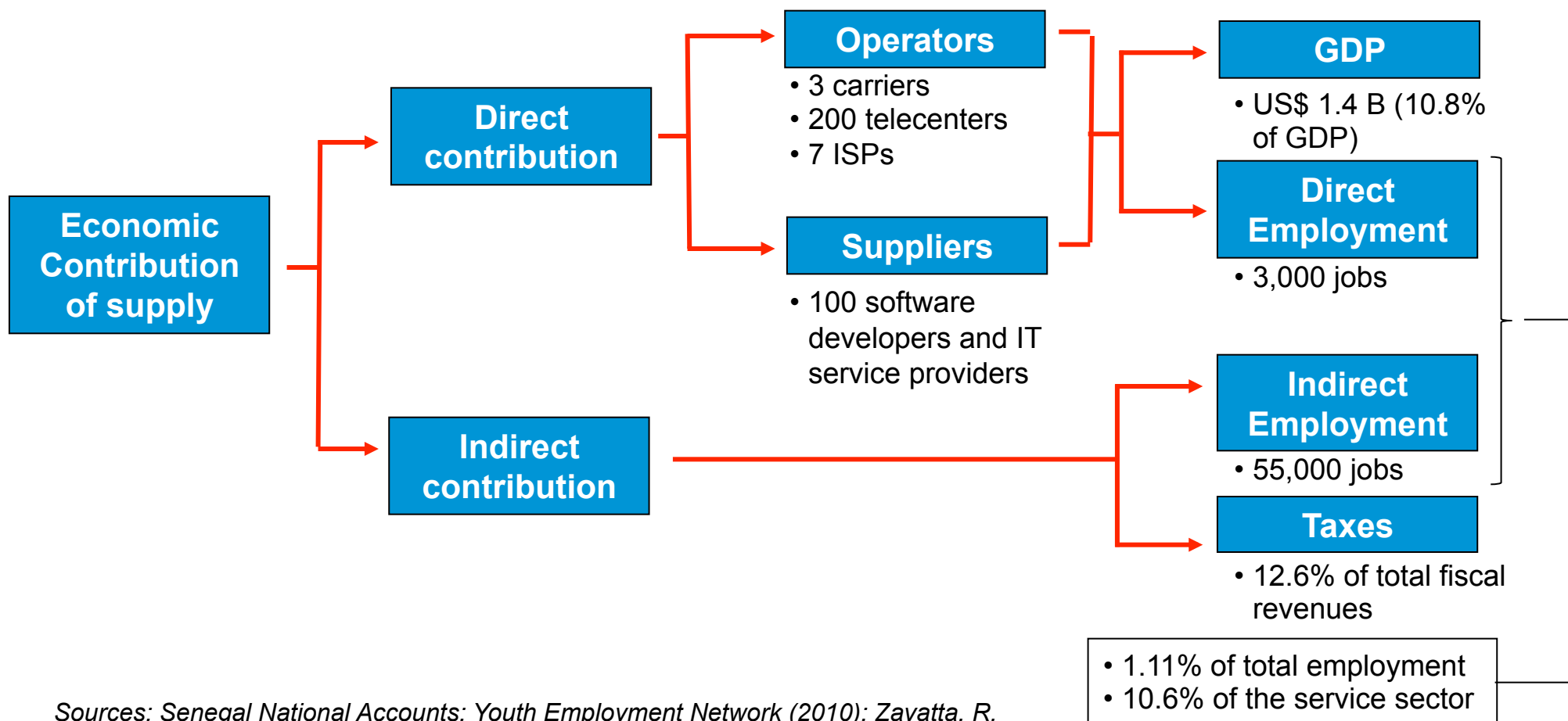
Sources: ITU, Euromonitor

## We will demonstrate that telecommunications has a significant contribution to Senegal's economic growth

1. Direct Economic Impact: Telecommunications account for over 10% of Senegal's GDP
2. Indirect Economic Impact of Wireless: mobile telephony contributes to 13.6% of economic growth
3. Indirect Economic Impact of Broadband: no significant effect so far, but large potential ahead
4. Policy implication: by maximizing telecommunications development, economic impact will become even bigger

# Telecommunications is a critical sector of the Senegalese economy

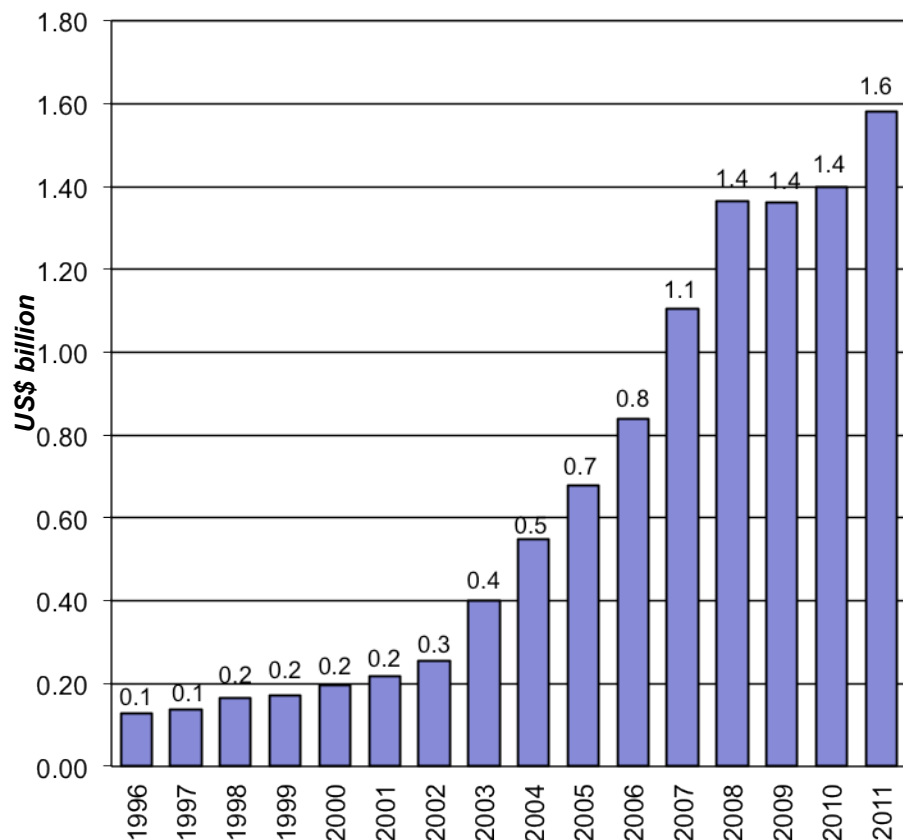
## ***DIRECT ECONOMIC CONTRIBUTION OF THE SENEGALESE TELECOMMUNICATIONS INDUSTRY***



Sources: Senegal National Accounts; Youth Employment Network (2010); Zavatta, R. (2008); IMF; World bank (2011)

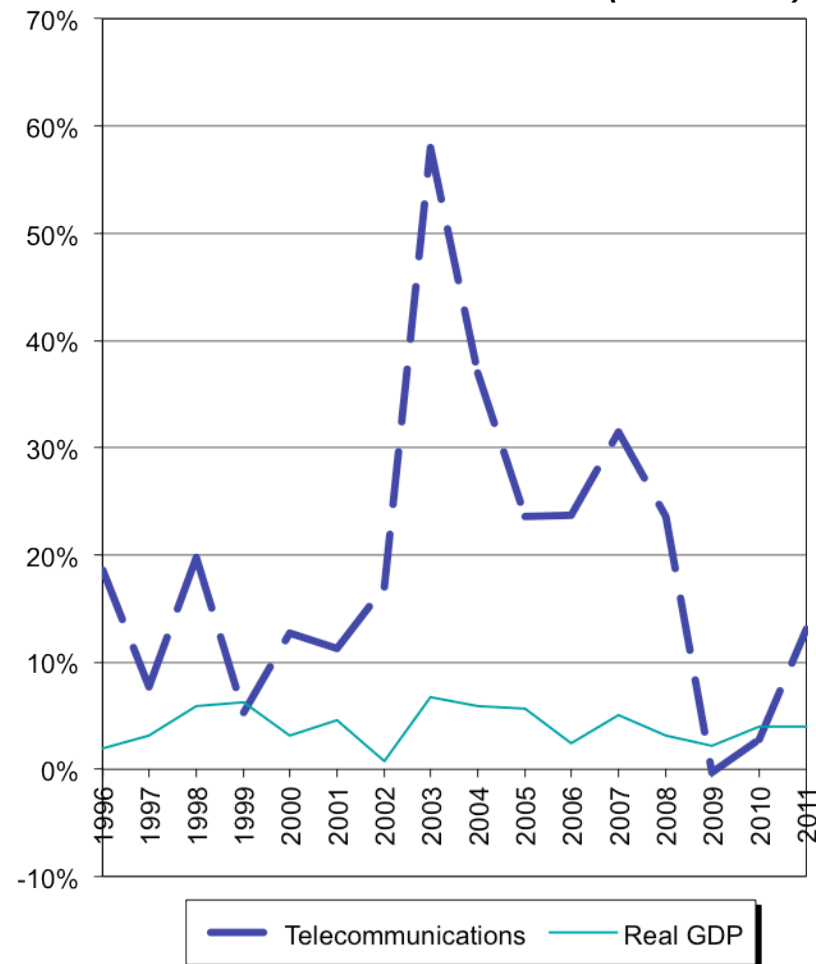
# The importance of telecommunications in Senegal has been increasing over time

**SENEGAL: TELECOMMUNICATIONS SERVICE REVENUES (US\$ billion) (1996-2011)**



Sources: ITU, Euromonitor; The Economist

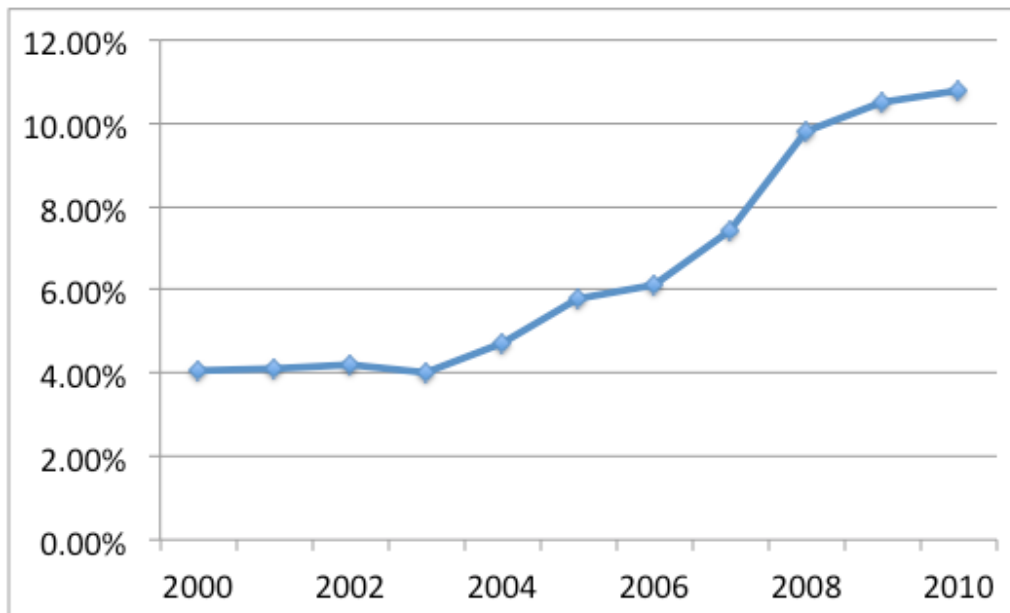
**SENEGAL: ANNUAL CHANGE IN REAL GDP AND TELECOM MARKET (1996-2011)**



Sources: ITU, World Bank; IMF, ISI; TAS Analysis

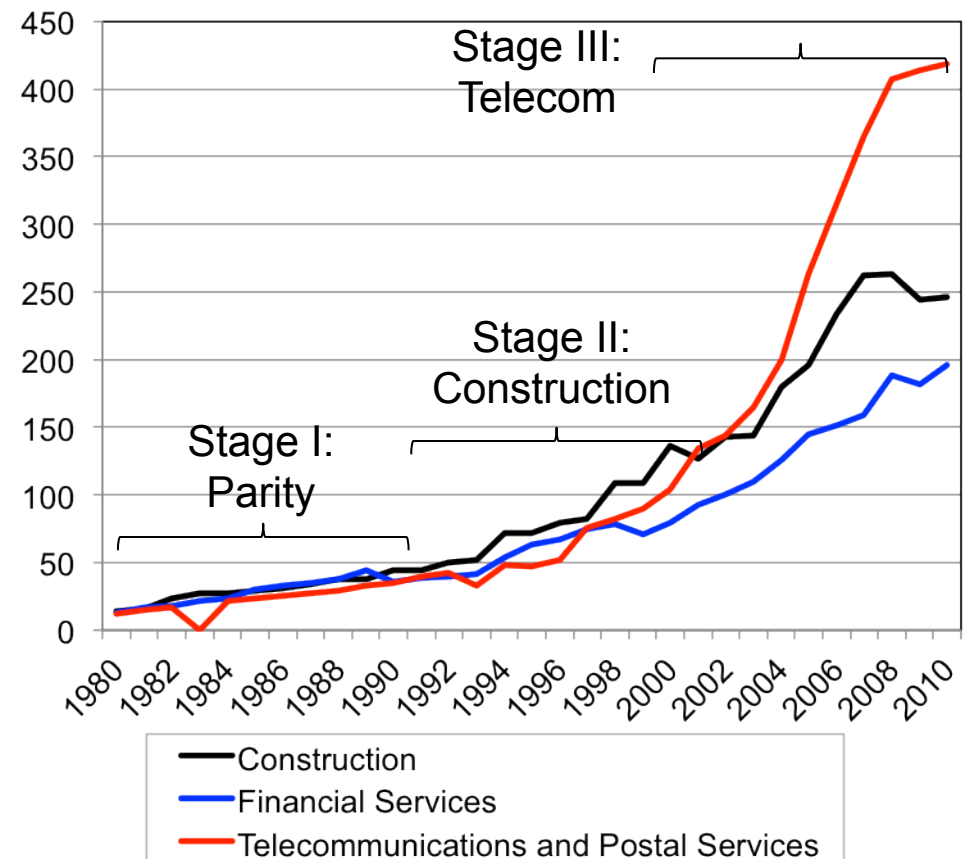
This has resulted in an increasing share of GDP, and a contribution bigger than sectors, such as construction and financial services

**SENEGAL: TELECOMMUNICATIONS AS A PERCENTAGE OF GDP (2000-2010)**



Sources: IMF; World Bank

**SENEGAL: GDP BY INDUSTRY (1980-2010) (in CFA '000'000'000)**



Source: Senegal National Accounts

# Beyond the direct economic contribution, wireless has a positive indirect contribution to economic growth

- Performance of markets:

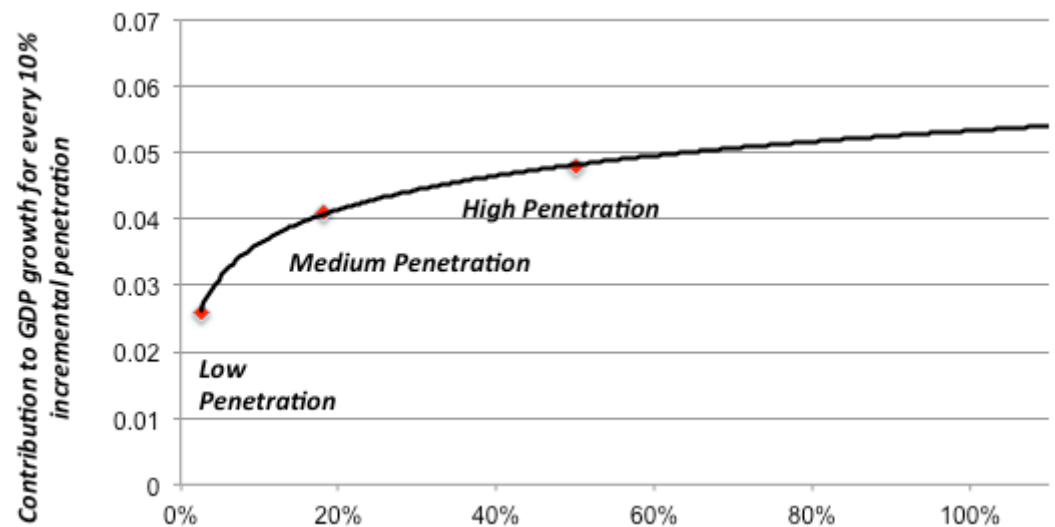
- In the grain market in Niger, prices fell over 4.5%, while profits increased as well due to improvement in market organization (Aker, 2008)
- In the fishery market of Kerala (India), prices decreased substantially, waste was eliminated and the fishing sector became demand-driven (Jensen, 2007)
- The banana farmers in Uganda benefited from significantly reduced the cost of crop marketing (Muto, 2008)

- Employment:

- Employment tends to increase substantially when a locality receives wireless network coverage (Klonner and Nolen, 2010)
- Wireless coverage is linked to increased female labor participation in Malawi (Batzillis et al., 2010)

The impact of wireless on the economy increases with penetration, according to a return to scale effect

## WIRELESS CONTRIBUTION TO GROWTH VERSUS PENETRATION



Source: Gruber and Koutroumpis (2011)



## A structural model describing market operations was developed to assess the economic impact of telecommunications in Senegal

Functions	Model	Equation
Aggregate Production Function	Endogenous growth from existing capital and labor together with ICT metrics	$GDP_{it} = a_1 K_{it} + a_2 L_{it} + a_3 Mob\_Pen_{it} + \varepsilon_{1it}$
Demand Function	Demand for telecommunications services depending on price and adoption patterns	$Mob\_Pen_{it} = b_1 MobPr_{it} + b_2 GDPC_{it} + b_3 HHI_{it} + \varepsilon_{2it}$
Supply Function	Supply and competition of telecommunications taking into account the regulatory and infrastructure ICT investment	$Mob\_Rev_{it} = c_1 MobPr_{it} + c_2 GDPC_{it} + c_3 HHI_{it} + \varepsilon_{3it}$
Output Function	Revenues and outputs of the telecoms market as proxy for industry sustainability	$\Delta Mob\_Pen_{it} = d_1 Mob\_Rev_{it} + \varepsilon_{4it}$

# Based on this model, mobile telephony has been found to have a significant effect on the Senegalese economy

Capital contribution (60%) and labor (40%) is the expected outcome

Price and competition are key drivers of penetration, while income does not due to volatility

Pricing and economic growth are expected drivers of industry revenues

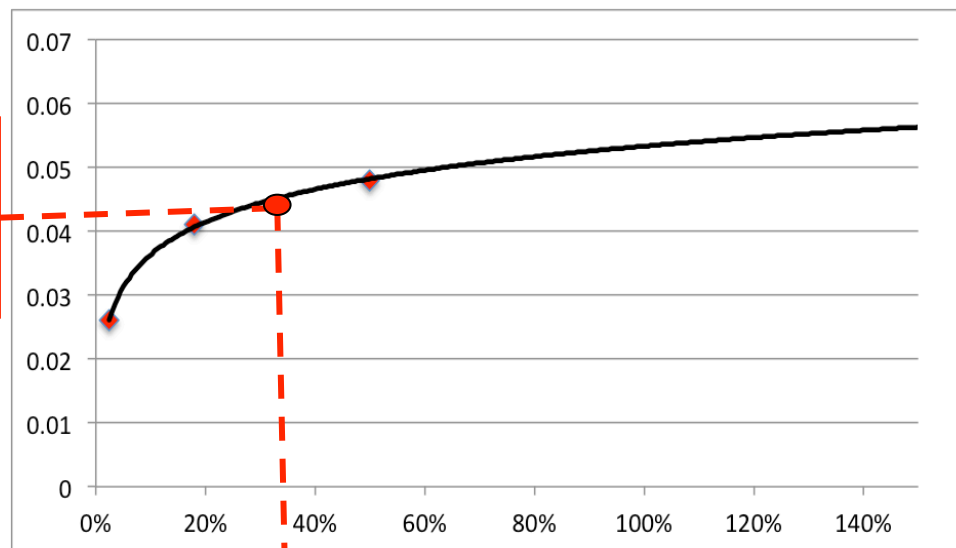
Revenues have a significant impact on the performance of the industry

Variables	Mobile Model
<b>Growth (<math>GDP_{it}</math>)</b>	
Labour force ( $L_{it}$ )	0.416***
Fixed Capital Stock ( $K_{it}$ )	0.615***
Mob Penetration ( $Mob\_Pen_{it}$ )	0.044*
Constant	-
<b>Demand (<math>Mob\_Pen_{it}</math>)</b>	
GDPC ( $GDPC_{it}$ )	0.165
Mob. Price ( $MobPr_{it}$ )	-5.238***
Market Conc ( $HHI_{it}$ )	-3.590***
Constant	10.588***
<b>Supply (<math>Mob\_Rev_{it}</math>)</b>	
Mob Price ( $MobPr_{it}$ )	-3.122***
GDPC ( $GDPC_{it}$ )	0.929***
Market Conc ( $HHI_{it}$ )	0.123
Constant	-3.360***
<b>Output (<math>\Delta Mob\_Pen_{it}</math>)</b>	
Mob Revenue ( $Mob\_Rev_{it}$ )	0.867***
Constant	7.150***
Year Effects	YES
Quarter Effects	YES
$R^2$	(1)
Growth	0.99
Demand	0.98
Supply	0.98
Output	0.30

For every 1% increase of Mobile penetration, the annual average contribution to the GDP is equal to 0.044%

## This result indicates a high contribution of wireless to Senegal's economic growth

The estimate of mobile economic impact for Senegal fits the exponential growth impact curve developed for a global sample of countries



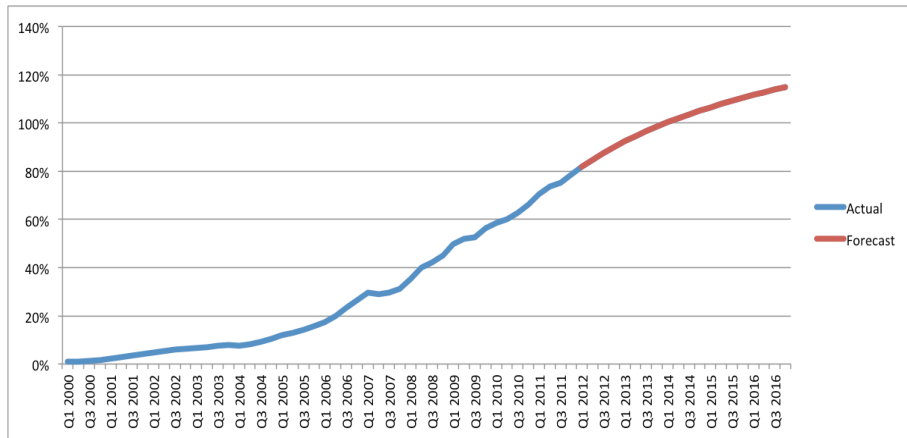
Model  
estimated  
effect:  
0.044%

Median Mobile  
Penetration during  
period studied: 35%

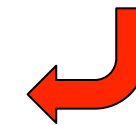
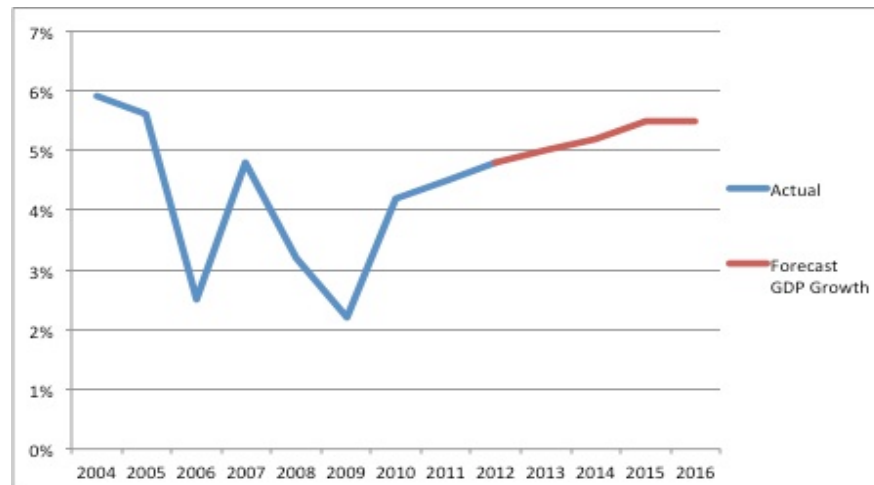
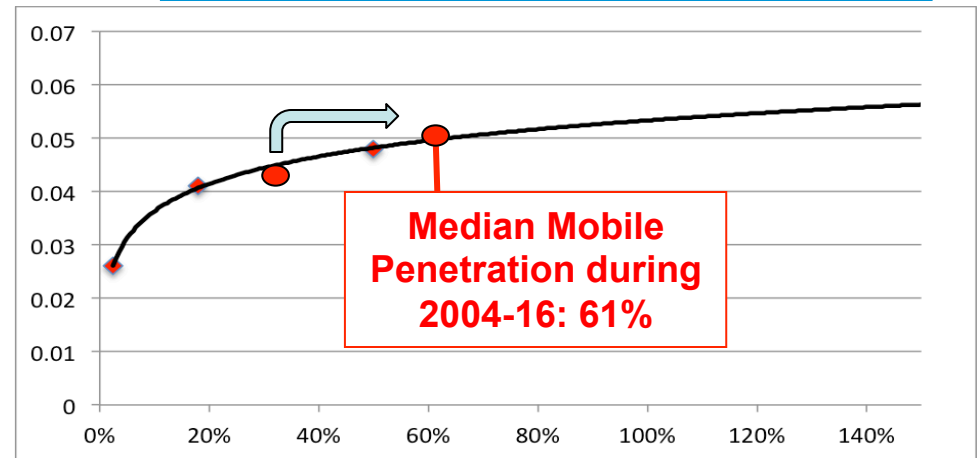
- The Senegalese economy between 2004 and 2011 grew 4.1%
- If the annual contribution on GDP of mobile phones is 0.55% of GDP...
- ...mobile telephony were responsible for 13.6% of Senegal's economic growth
- Three reasons why this effect is so large:
  - Catch up effect resulting from mobile filling up the demand gap left by lack of fixed lines
  - Mobility adds another dimension to economic effect
  - Consumers are using mobile phones to access data services, gaining some broadband value-added

# Based on this result, we can estimate the future contribution of mobile telephony to the growth of Senegalese GDP

Mobile penetration in Senegal will reach 115% by 2016



The increase in penetration will result in a shift in the mobile contribution



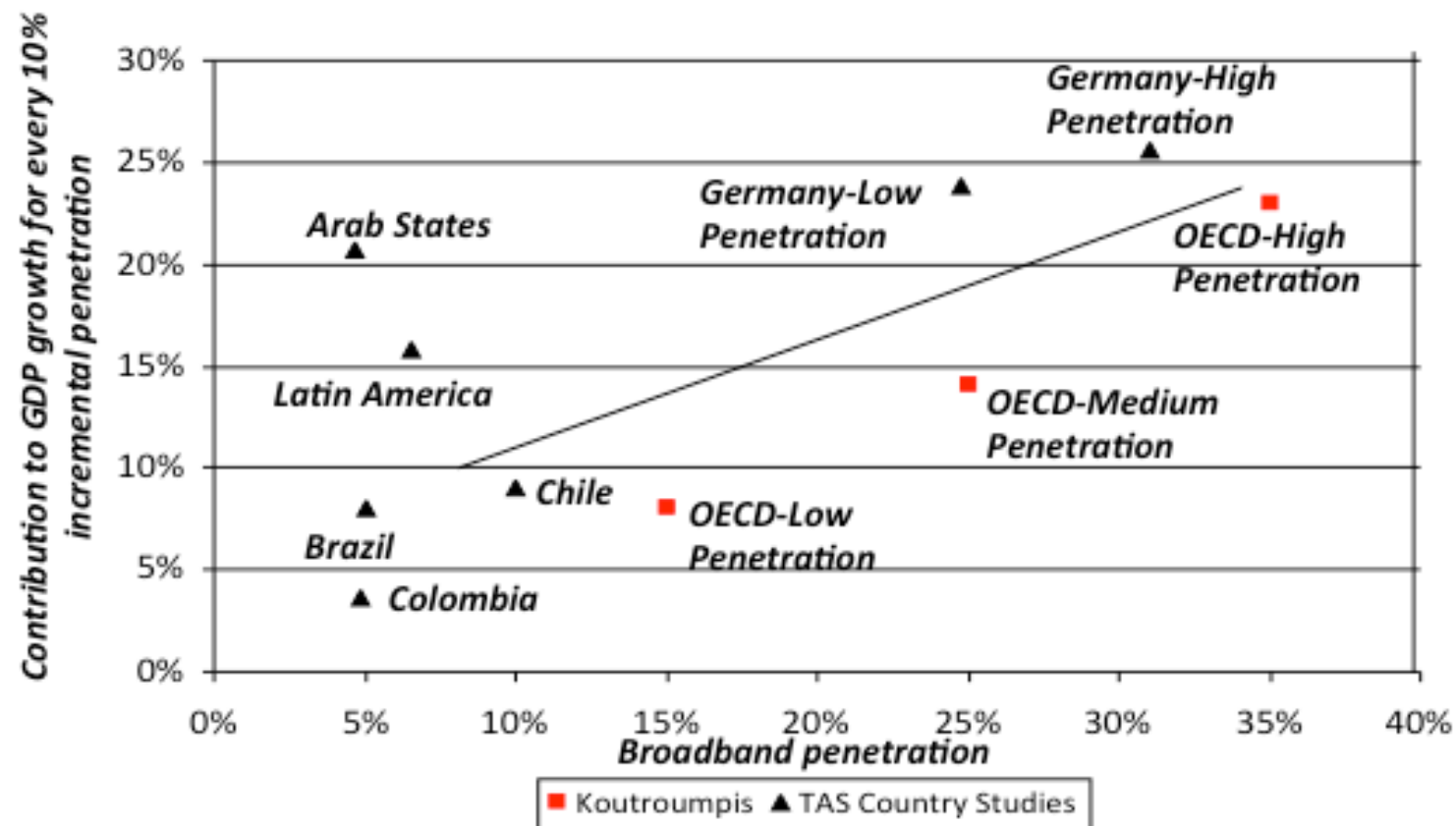
Mobile will account for 13.7% of all growth in the Senegalese economy

## Research on the economic effects of broadband have identified effects similar to those of mobile telephony

EFFECT	DESCRIPTION	EMPLOYMENT EXAMPLES
<b>Productivity</b>	<ul style="list-style-type: none"> <li>Improvement of productivity as a result of the adoption of more efficient business processes enabled by broadband</li> </ul>	<ul style="list-style-type: none"> <li>Marketing of excess inventories</li> <li>Optimization of supply chains</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>Acceleration of innovation resulting from the introduction of new broadband-enabled applications and services</li> </ul>	<ul style="list-style-type: none"> <li>New applications and services (telemedicine, Internet search, e-commerce, online education, VOD and social networking)</li> <li>New forms of commerce and financial intermediation</li> </ul>
<b>Value chain recomposition</b>	<ul style="list-style-type: none"> <li>Attract employment from other regions as a result of the ability to process information and provide services remotely</li> </ul>	<ul style="list-style-type: none"> <li>Outsourcing of services</li> <li>Virtual call centers</li> <li>Core economic development clusters</li> </ul>

## Broadband economic contribution is also driven by a “return to scale” effect: the impact increases with penetration

### BROADBAND CONTRIBUTION TO GROWTH VERSUS PENETRATION



Source: Katz (2012)

## However, the results of a similar structural model built for broadband in Senegal indicate no significant economic effects

Capital contribution (55%) and labor (40%) is the expected outcome

Income and pricing affect broadband penetration, while education appears not to be the case; urbanization is a significant driver

Income affects revenues, but not pricing since there is no competition in the period under study

Revenues do not have a significant impact on the performance of the industry

Variables	Broadband Model
<b>Growth (<math>GDP_{it}</math>)</b>	
Labour force ( $L_{it}$ )	0.402***
Fixed Capital Stock ( $K_{it}$ )	0.552***
Broadband Penetration ( $BB\_Pen_{it}$ )	-0.003
Constant	-
<b>Demand (<math>BB\_Pen_{it}</math>)</b>	
GDPC ( $GDPC_{it}$ )	0.832**
BB. Price ( $BBPr_{it}$ )	-0.794***
Education ( $Edu_{it}$ )	0.082
Urbanization ( $URB_{it}$ )	25.402***
Constant	-87.929***
<b>Supply (<math>BB\_Rev_{it}</math>)</b>	
BB Price ( $BBPr_{it}$ )	0.161
GDPC ( $GDPC_{it}$ )	3.273***
Constant	-7.223***
<b>Output (<math>ABB\_Pen_{it}</math>)</b>	
BB Revenue ( $BB\_Rev_{it}$ )	0.572
Constant	7.554
Year Effects	YES
Quarter Effects	YES
$R^2$	(1)
Growth	0.99
Demand	0.99
Supply	0.35
Output	0.16

Coefficient of broadband penetration is close to zero and with no statistical significance

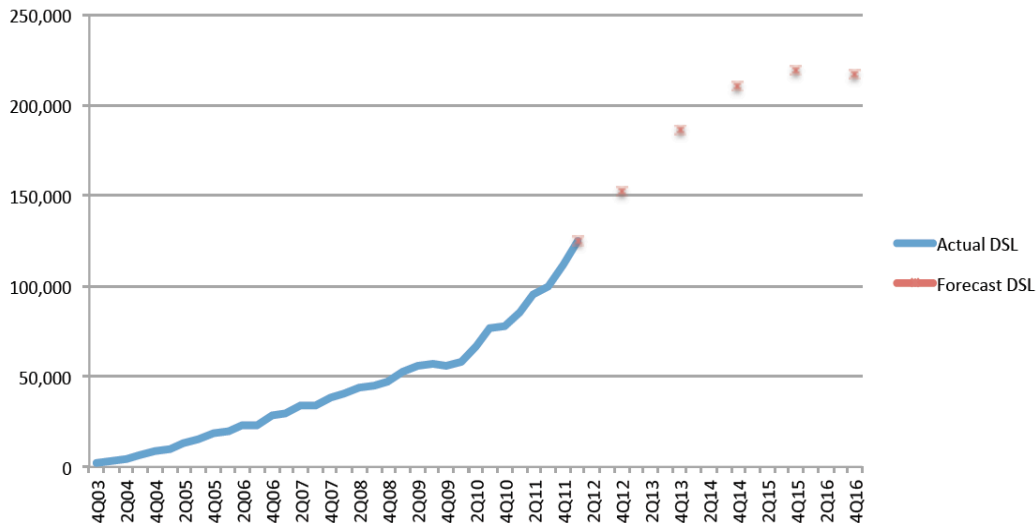


WHY?

- Low broadband penetration
- Still high prices
- Limited consumer interest due to minimal applications and local content

# Growth trends in fixed and mobile broadband will partly remedy this situation

**SENEGAL: DSL DEPLOYMENT  
FORECAST (2003-2016)**

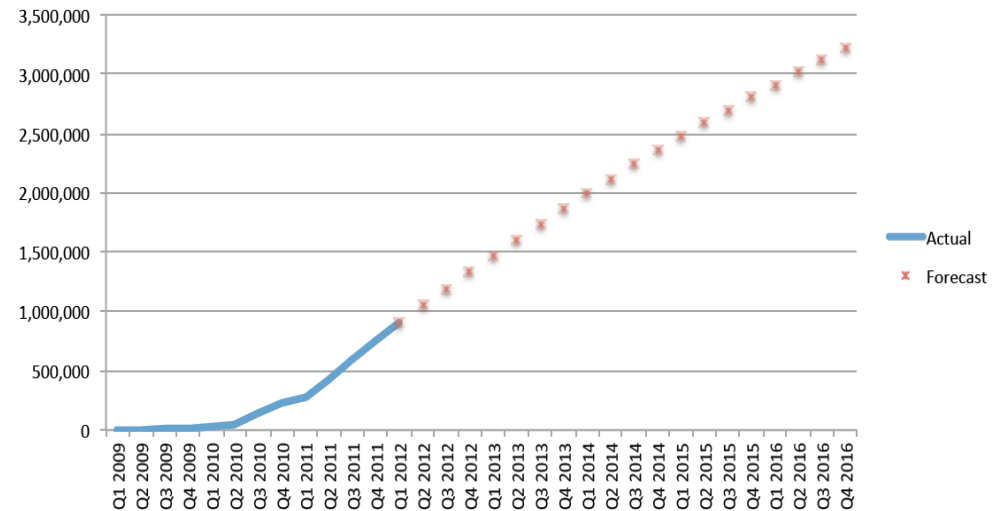


Source: Informa Telecoms and Media



DSL lines are expected to exceed  
200,000 subscribers by 2016

**SENEGAL: MOBILE BROADBAND  
DEPLOYMENT FORECAST (2003-2016)**



Source: Wireless Intelligence



Mobile broadband network  
coverage will reach 95% by 2016



## Policy remains a critical lever to maximize the economic impact of telecommunications in Senegal

### *Policy initiatives*

- Competition policy
- Regulatory independence
- Demand side policies



### *Sector performance*

- Adoption of services
- Pricing
- Product innovation
- Sector sustainability



### *Socio-Economic Development*

- GDP growth
- Job creation
- Poverty reduction
- Social inclusion

## Conclusion 1: Government policy has a significant influence in driving the performance of the ICT sector

- The performance of the ICT sector is statistically linked to 1) the adoption of pro-competitive policies, 2) guaranteed by regulatory independence and 3) guided by an overarching vision for the ICT sector
- Countries with the highest level of performance of ICT sector exhibit a **common set of policy features**:
  - Competition in all telecommunications industry segments
  - Broadband universal service, driven by a fair allocation of contribution across industry players
  - Privatized telecommunications incumbent
  - VoIP allowed with regulation in place
  - No restrictions to foreign ownership
  - Pro-active National Plan to promote ICT industries (software, services, applications)
- Not all telecommunications competition models are equally powerful in stimulating investment and innovation
  - There appears to be an **optimal level of competitive intensity** beyond which, the incentive to invest and deploy wireless broadband services diminishes
  - That optimal level for deployment of wireless broadband is driven by a **certain amount of market concentration** and a moderate level of competitive intensity

## Conclusion 2: Competition policy and regulation needs to be complemented with active government sector involvement

- **Proactive government planning that articulates an overarching target vision** is also a critical driver of sector performance
  - Korea: Starting in 1995, the government began preparing five year plans with objectives ranging from broadband universalization, to becoming a global IT leader
  - Japan: e-Japan Strategy (2001)
  - Sweden: “Information Society for All” bill, establishing, Broadband Support Program (2001-7). National Broadband Plan
  - Estonia: Principles of Estonian Information Policy (1998); Estonian Information Society Strategy 2013, (2006)
- In addition to ICT national planning, a related best practice has to do with **discipline in follow-up**
  - Korea: each plan is assessed in terms of its results at the end of the planning horizon and the results of the assessment are fed back in the formulation of the next iteration
  - China: Institutional centralization was reinforced with government sponsored planning. Senior leadership performance reviews are tied tangibly to achieving detailed annual planning targets specifying network capacity expansion, coverage, and penetration – and quality standards
- In some cases, governments extend their sector intervention by **actively shaping the industry structure** (Brazil, Korea, Japan)

## Conclusion 3: Leading information societies implement several demand-side policies aimed at promoting ICT adoption

- **Aggregating demand from all government entities requiring broadband services** (e.g. administration, public schools, hospitals, etc.) and assigning them the primary role of anchor tenants that ensure that investment in broadband networks can rapidly achieve a breakeven point (Korea, Netherlands)
- **Development of e-government services:** for example, electronic submission of tax returns, an e-procurement service for SMEs selling goods and services to the government, platforms for tele-commuting, the development of platforms that allow the interaction between the government and enterprises for e-business transactions (Korea, Estonia, Colombia)
- Implementation of **digital literacy programs comprising subsidies for acquiring PCs, and online education programs** targeted to the elderly and disabled (Korea)
- Introduce **tax incentives designed to stimulate investment** by companies in ICT assets and software (Sweden, Japan)
- Encourage **SMEs to voluntarily implement IT** to reform business management and improve productivity by providing training, collecting and disseminating best practices and supporting collaboration with local communities (Japan)

## Conclusion 4: Executive branch leadership and articulation of regulatory and industrial policies

- The development of a telecom sector and the **creation of an export-oriented IT services and software industries** are linked through industrial policies
  - Korea: common approach to ICT sector development, whereby incubation of an export-oriented industry is linked to funding adoption of its products in the domestic market
  - Japan: the MIC set up in 2007 the ICT International Competitiveness Enhancement Program aimed at promoting Japanese products and developing world markets through a collaboration of industry, academia and government.
  - Estonia: in order to develop a domestic technology cluster, the government is sponsoring the Competence Centre in Electronics-, Info- and Communication Technologies (ELIKO) in 2004
  - China: By consolidating the Ministry of Electronic Industries (MEI) into the new Ministry of Information Industries (MII), Chinese policy makers aimed at cultivating state-owned champions in the telecom equipment space
- **Executive Branch leadership** in the promotion and oversight of ICT policy appears to be linked to high performance sectors (Korea "ICT Czar"; Brazil National Broadband Plan is being developed by the Secretariat of Strategic Affairs of the President of the Republic and directly approved by the President; China: Strong leadership from the top has been a key feature in China's ICT sector development)

## In sum, best practices are key to maximize the policy impact on Senegal's telecommunication sector and its economic contribution

