

**ANNUAL CONFERENCE ON REGIONAL INTEGRATION IN  
AFRICA (ACRIA 5)**

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**BASIC INFRASTRUCTURES, GROWTH  
AND CONVERGENCE IN WAEMU**

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# Outline

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1. MOTIVATIONS
2. RESEARCH QUESTIONS
3. OBJECTIVES
4. BASIC INFRASTRUCTURES IN WAEMU
5. METHODOLOGY
6. RESULTS
7. CONCLUSION AND POLICY IMPLICATIONS

# 1. Motivation of the study

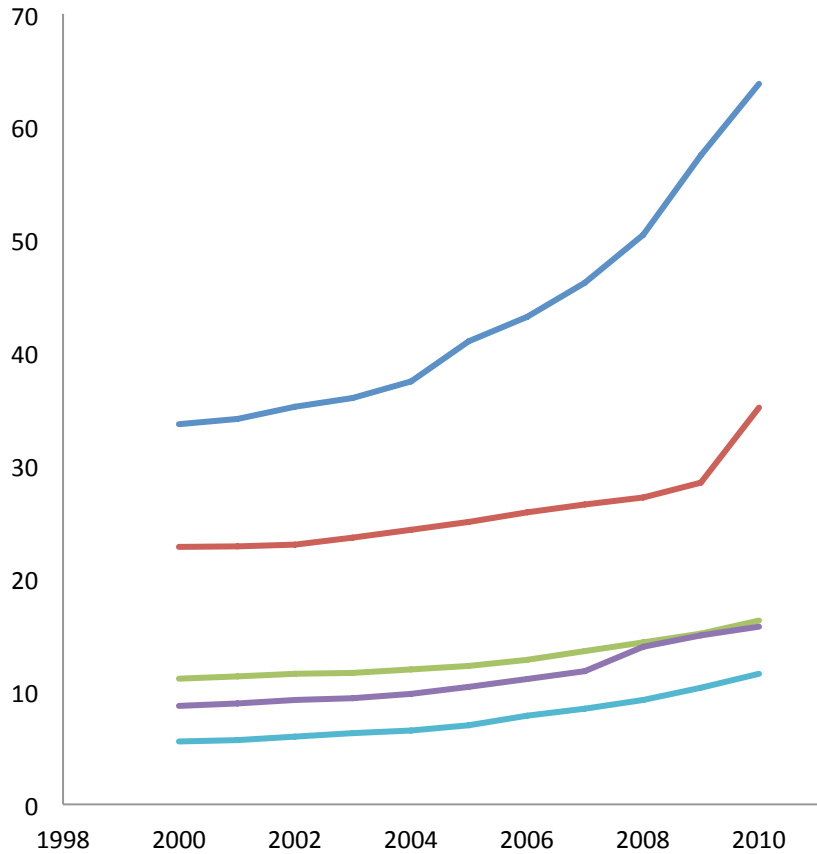
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□ **Infrastructure** development is a key driver for progress across the African continent and a critical enabler for **productivity** and sustainable economic **growth** (Commission for Africa, 2008).

□ **Infrastructure** investment is crucial to both **structural transformation** and **economic integration** (Commission for Africa, 2008).

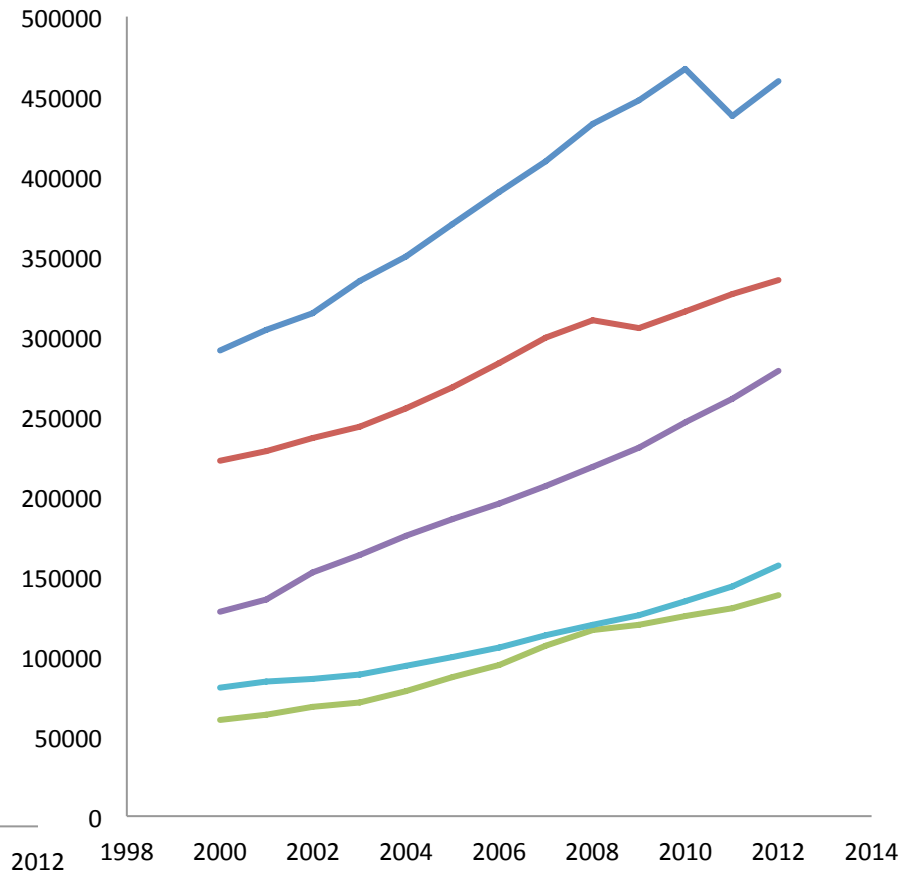
# 1. Motivation of the study

## Africa Infrastructure Development Index, Region Scores, 2000-2010



— North Africa  
— Southern Africa  
— Central Africa  
— West Africa  
— East Africa

## Evolution of real GDP in African regions

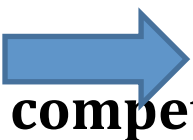


— North Africa  
— Southern Africa  
— Central Africa  
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# 1. Motivation of the study (Cont'd)

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- ❑ Sub-Saharan Africa has the lowest productivity of any region in the world and this is largely attributable to serious **infrastructural shortcomings** across all the subsectors: energy, water, sanitation, transportation and communication technologies.
- ❑ Inadequate infrastructure is cited as one of the most serious **constraint to doing business** (Doing business, 2013).
- ❑ Weak physical infrastructures in Sub-Saharan Africa is impeding the region's progress towards improved living standards poverty reduction, international trade and socially inclusive GDP growth.



**Close linkage between infrastructure and the region's competitiveness.**

# 1. Motivation of the study (Cont'd)

## REGIONAL ECONOMIC PROGRAM OF WAEMU 2012-2016

Axis	Cost (million F CFA)	%
<u>Axis 1</u> : Social Cohesion, governance and economic integration	58,212	1%
<b><u>Axis 2</u>: Economic Infrastructures Development</b>	<b>4,988,754</b>	<b>87%</b>
<u>Axis 3</u> : Construction of an Integrated Production System	635,102	11%
<u>Axis 4</u> : Human resources Development	77,980	1%
<u>Axis 5</u> : Resources Mobilization	3,000	-
<b>Global Cost</b>	<b>5,763,048</b>	<b>100%</b>

Source: WAEMU, 2012

## 2. Research Questions

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- ❑ However, infrastructure development can reinforce disparities through agglomeration of activities and populations at relatively advanced countries (Venables, 2000).
- ❑ So there is a controversy about the role of infrastructure in the process of economic integration.
- ❑ Do infrastructure investments contribute to the convergence or the disparities between countries of WAEMU?
- ❑ How to improve the contribution of infrastructures to growth of GDP per capita in the WAEMU?

### 3. Objectives of the study

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The **overall objective** is to analyze the relationship between infrastructure services, growth and convergence in the WAEMU.

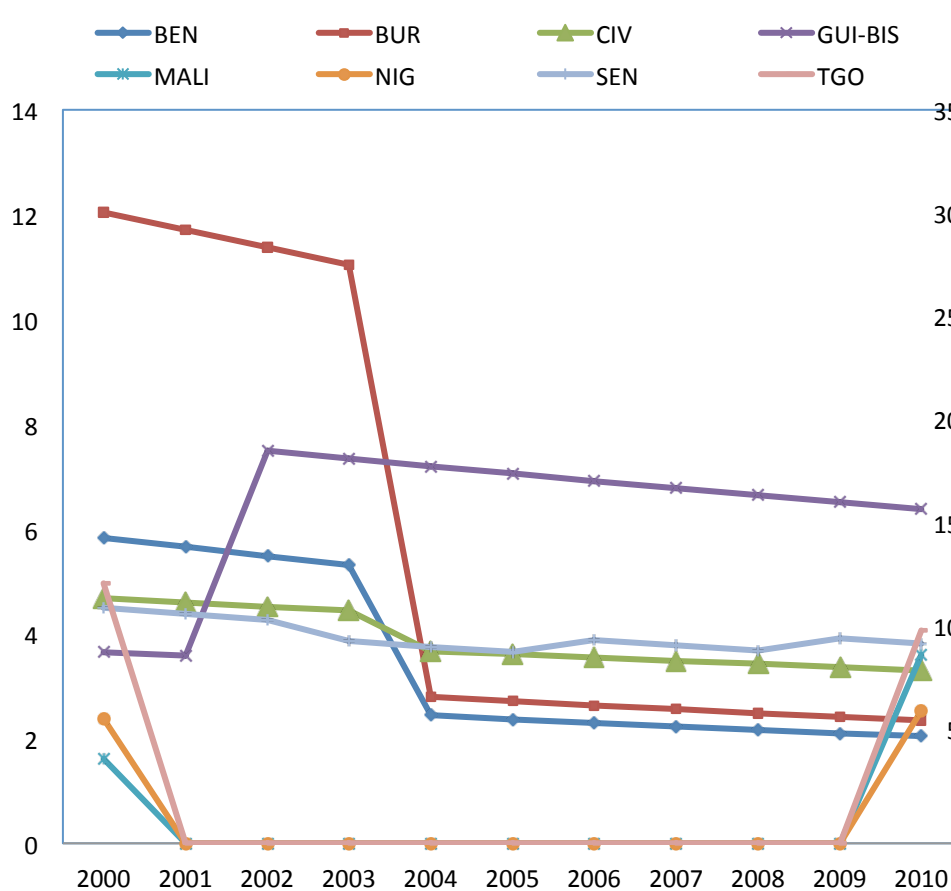
**Specific objectives** are:

- ❖ To Identify growth factors within the WAEMU;
- ❖ To Analyze the dynamics of convergence between countries;
- ❖ To Assess the impact of infrastructure services on growth and convergence in the Union.

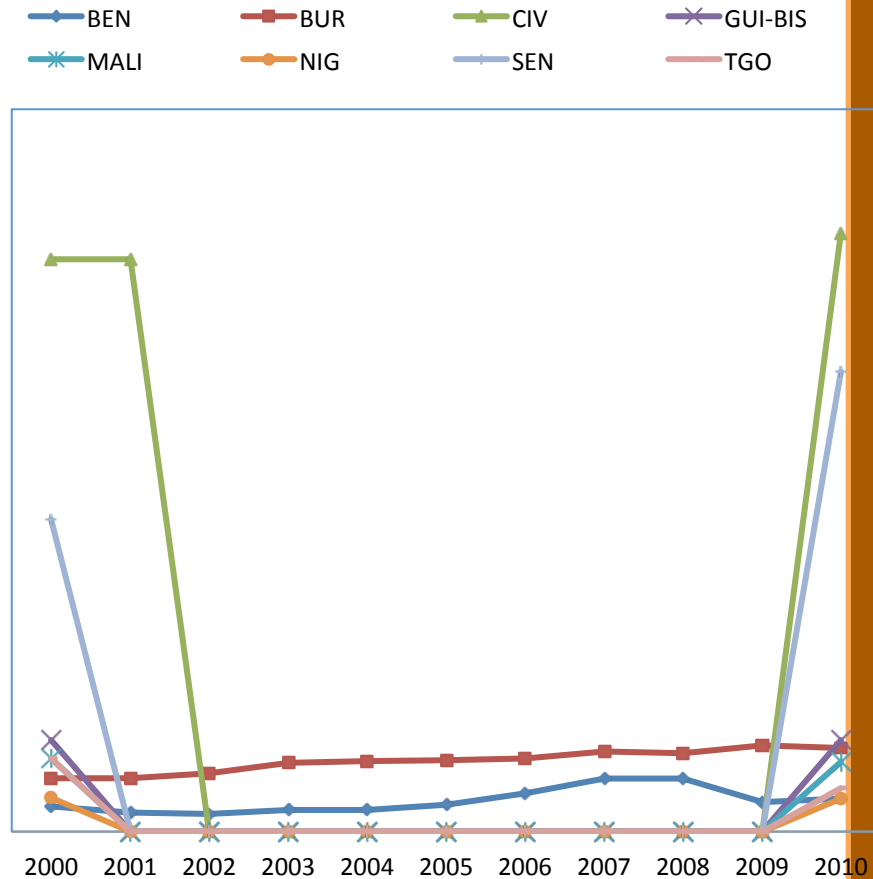


# 4. Evolution of Basic Infrastructures in WAEMU

## Total Road Paved (km/10,000 inhbt)



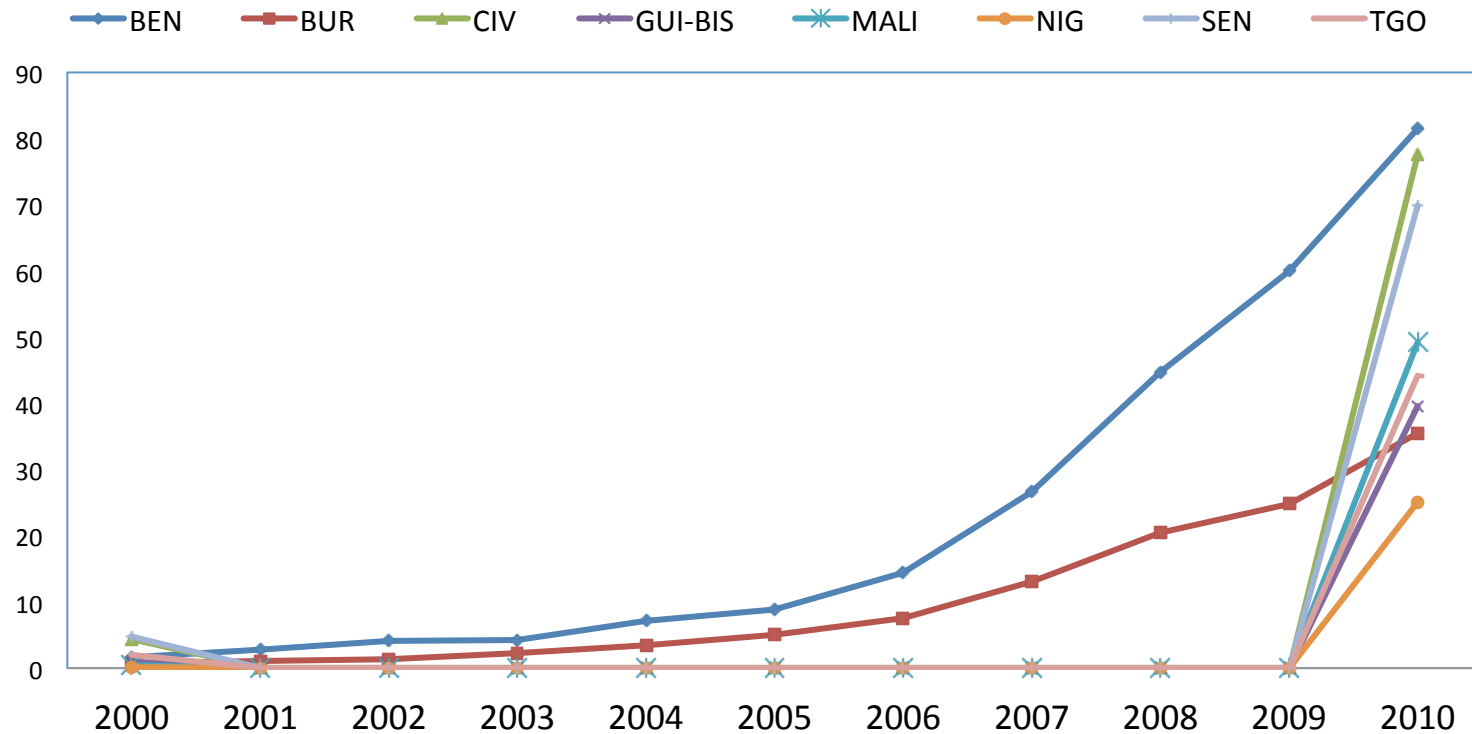
## Access to Electricity (Kwh/inhbt)



- The growth of infrastructure investments are well below the population growth

# 4. Evolution of Basic Infrastructures in WAEMU

**Total phone subscriptions (mobile and fixed-line) /  
100 hbts**



- Expansion of ICT sector since the mid-2000s

## 5. Methodology

### □ Sigma Convergence (Statistic Analysis)

$$\sigma_t = \left[ \frac{1}{n} \sum_1^n (y_{it} - \bar{y}_{.t})^2 \right]^{1/2} \quad (1)$$

$$y = \log( \text{PIB} / \text{capita} )$$

### □ Beta Convergence (Econometric Analysis)

$$[\log(X_{it} / X_{it-n})] / n = \alpha + \beta \log(X_{it-n}) + \gamma \log(Z_{it}) \quad (2)$$

$Z_{it}$  = variables structurelles caractéristiques des différents pays de l'UEMOA

# 5. Methodology (cont'd)

## □ The empirical model of convergence

$$G(X_{it}) = \alpha + \beta \log(X_{i0}) + \gamma_1 G_{it-1} + \gamma_2 Pop_{it} + \gamma_3 Esp_{it} + \gamma_4 Edu_{it} + \gamma_5 Road_{it} + \gamma_6 Energy_{it} + \gamma_7 ICT_{it} + \gamma_8 Inv_{it} + \mu_i + \varepsilon_{it}$$

## □ Description of variables

variables	Description	Expected sign
Git-1	Growth of GDP per capita (Lagged)	+
Pop	Population Growth	-
Esp	Life expectancy	+
Edu	Primary and Secondary Education (%)	+
Road	Total roads paved (km/10.000 inhbts)	+
Energy	Access to electricity (Kwh/inhbt)	+
ICT	Total phone subscriptions	+
Inv	Gross capital Formation	+

# 5. Methodology (cont'd)

## Estimation Method

### ▶ Arellano-Bond GMM estimator

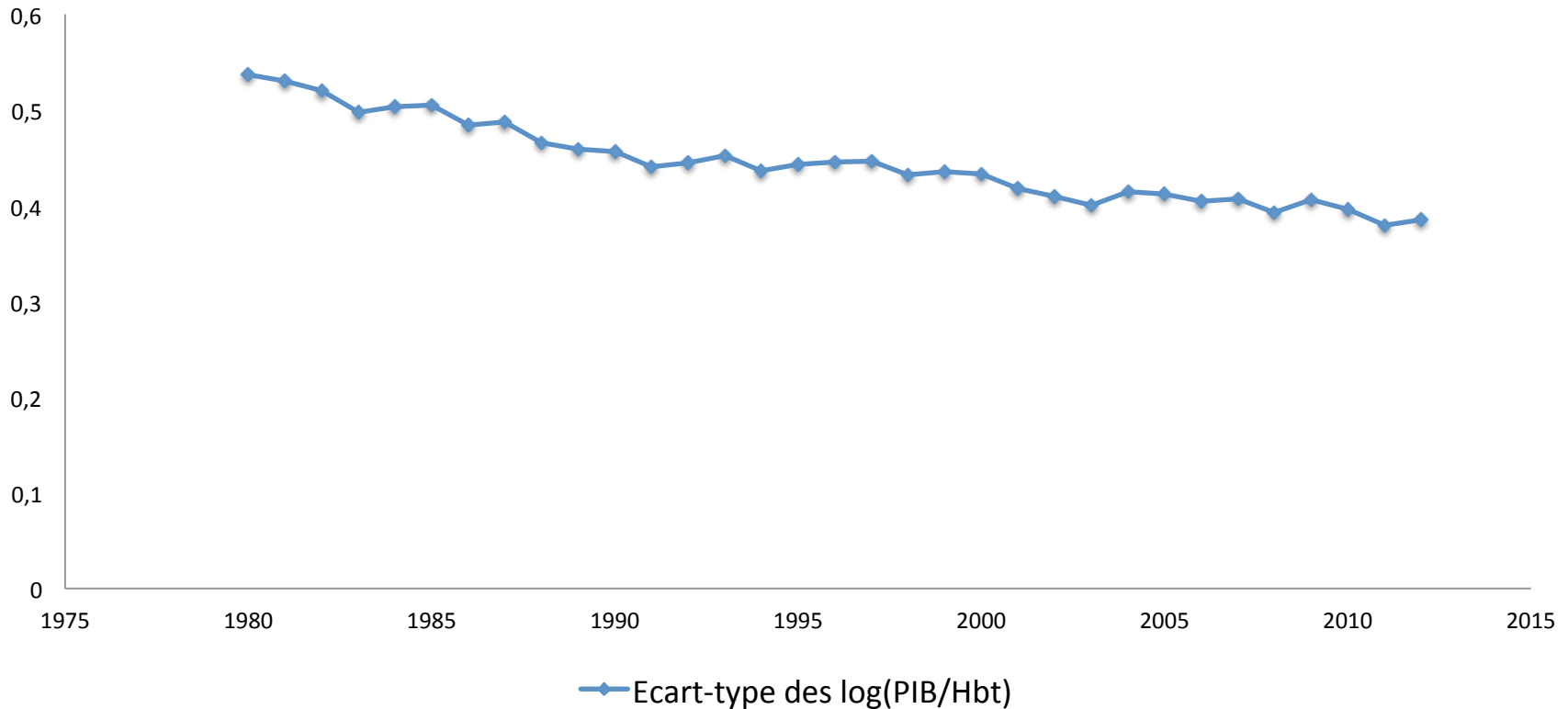
#### Significance

- ✓ Standard estimators are inconsistent because the lagged dependent variable is correlated by construction with the unobserved panel effects.
- ✓ Arellano and Bond GMM Estimator provides solutions to endogeneity bias. This method consists in removing the panel-level effect by first-differencing and using instruments to form moment conditions.

# 6. Results

## 6.1. Result of sigma convergence

Evolution of Standard Error of log (PIB/capita) in Waemu



*A trend towards convergence in Waemu countries is clearly observed*

## 6. Results (Cont'd)

### 6.2. Determinants of growth and conditional convergence in Waemu countries

	Dependent variable ( $G_t$ ) : Growth rate of GDP per capita		
	Coef.	Std. Err.	P-value
<b>Log (pib<sub>t0</sub>)</b>	-.0601351***	.0067859	0.000
$G_{t-1}$	.3413356***	.0174823	0.000
Log (Lif. Exp)	.0637631***	.0098955	0.000
<b>Log (Road)</b>	.0027284***	.0003998	0.000
Log (Energy)	-.0004631	.000549	0.399
<b>Log (ICT)</b>	.0000446**	.0000206	0.031
Edu (primary)	.000024	.0000465	0.605
Edu (secondary)	.0002336***	.0000734	0.001
Pop growth	-.0093897***	.0012232	0.000
Log (Investment)	.0073644***	.0010867	0.000

## 7. Conclusion and Policy implications

- ❖ Beta or conditional convergence in WAEMU countries is confirmed
- ❖ Better access to road infrastructure and information and communication technologies has a significant effect on the growth of per capita income.



The improvement of road infrastructure and a better access to information and communication technologies are critical for regional intensification of trade, structural transformation and sustainable and inclusive growth.



## 7. Conclusion and Policy implications (cont'd)

❖ The improvement in other indicators, namely access to **education**, **Health** (life expectancy) and **Investment** in physical capital generate significant increase in the growth rate of GDP per capita in WAEMU countries.

➔ Economic and social infrastructures should be improved otherwise impede progress towards a sustainable growth in the region.

➔ However, physical infrastructures are only part of the solution. Indeed, infrastructure services should also improve in terms of quality and price. These intangible dimensions of infrastructure could be improved only through effective regulation at both national and regional levels.

***MANY THANKS***  
***FOR YOUR ATTENTION***