Public Finance and Public Management in Africa
Ghana Institute of Management and Public Administration,
Accra, Ghana
22-24 October, 2018

EFFICIENCY OF PUBLIC HEALTH STRUCTURES IN FRAGILE COUNTRIES RICH IN NATURAL RESOURCES: THE CASE OF CHAD

Guy Dabi GAB-LEYBA
PhD Student in Development Economy at CERDI/University of Clermont-Auvergne

Azoukalne MOUKENET
Monitoring and Evaluation Specialist at Malaria Consortium, Chad

Claire MAINGUY
Lecturer in Economy HDR, BETA-CNRS/Université de Strasbourg

Plan

I. Introduction (1/5)

❑ The beginning of oil exploitation in 2003 has lead to an unprecedented increase in public expenditures, which rose from CFA 200,4 billion (13.4% of GDP) in 2000 to CFA 1,517 billion (32% of GDP) in 2013. (DEP, 2014).

❑ Law No. 001/PR/1999 directs natural resources including oils revenues to social sectors known as priority (health and education) (Gary et Reisch , 2004 et Massuyeau et Dorbeau-Falchier , 2005).

❑ Unilateral amendment of the law in 2006 >> withdrawal of the World Bank and addition of new priority sectors (security, army, ...) (International Crisis Group, 2009)

I. Introduction (2/5)

| Table 2: Health expenditures in Chad 2000 - 2013				
	2000-2001	2004-2005	2010-2011	2012-2013
Health expenditures in % of GDP	6.18	4.81	3.06	3.21
Health expenditures in % of total public expenditures	13.28	14.71	5.85	6.85
Public expenditure (in current dollars)	95,484 361	256,212 524	349,737 366	473,350 956
Source: WDI/World Bank				

Decrease in social expenditures in countries rich in natural resources (Cockx and Francken 2014, 2016)

I. Introduction (3/5)

Development indicators in Chad and Subsaharan Africa				
Development indicators	Chad		Subsaharan Africa	
	2010	2014	2010	2014
Life expectancy (years old)	49.6	51.4	56.9	59.4
Infant mortality (per 1000 live births)	191	133		
Human Development Index (2012 -2015)	0.392	0.415		0.523
Maternal mortality (per 100,000 live births)	1,099	860	657.5	616.46
Source: WDI/World Bank UNDP, 2006, 2015 EDS-MICS, 2014-2015 HDR, 2015				

In fact policy related to invesment in social sectors begin in 2009 (FMI, 2015)

Trend of maternal mortality rate and public health expenditures in % of GDP 2000-2005
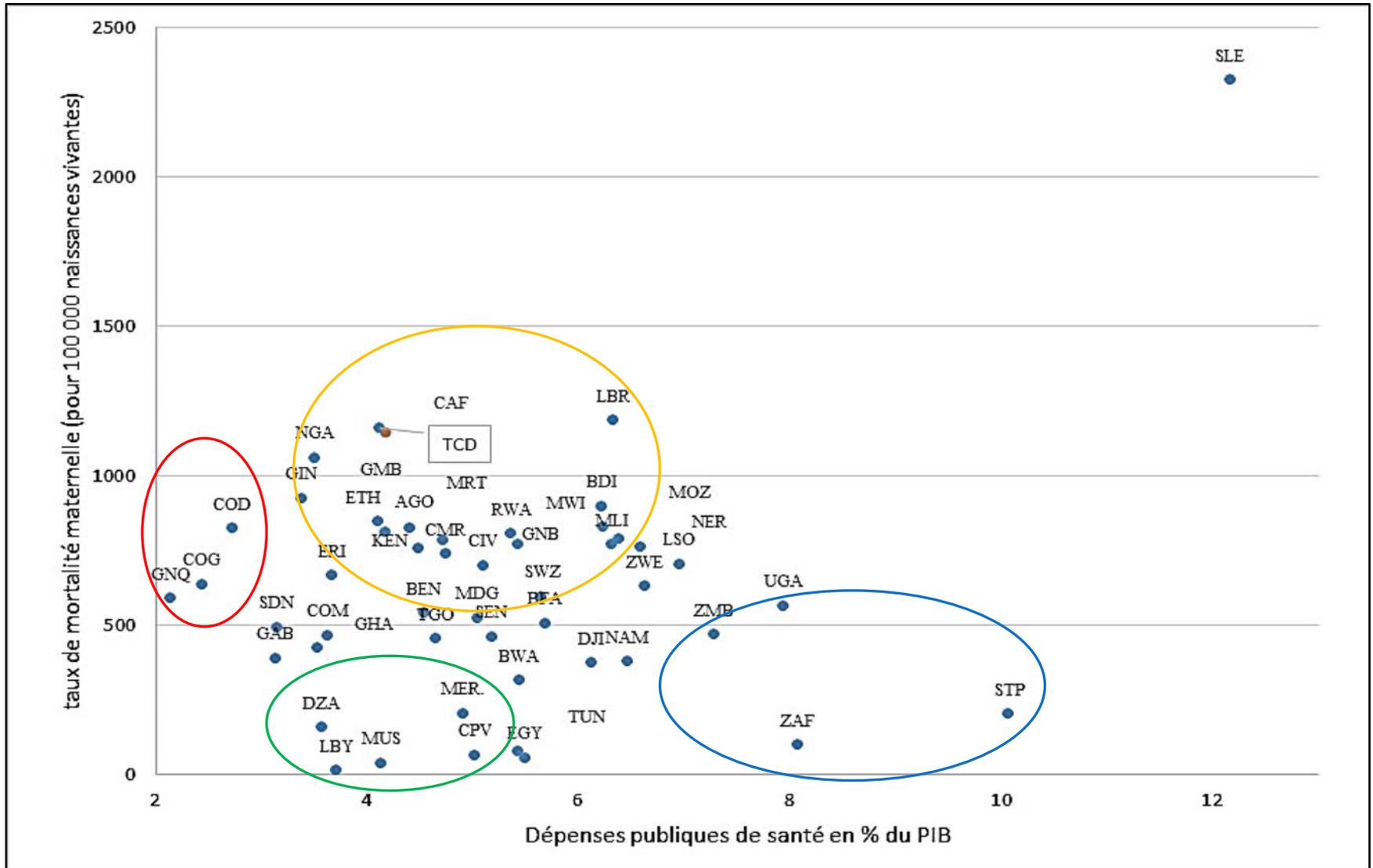
Source: WDI/World Bank

Trend of maternal mortality rate and public health expenditures in % of GDP in 2011-2014

Source: WDI/World Bank

II. Features of chadian health system (1/2)

Ressources
- HR
- Logistic
- Pharmacies

Finance
- Fees for services
- Government
- Bilateral

M&E

Service providers
- National hosp.
- Districts and Provincial hospitals
- Base providers of health services

MoH

Central level
Policy design
Plan
Strategy

Intermediary level
Dissemination Local plans
Local strategy
M&E

Peripheral level
Implementation
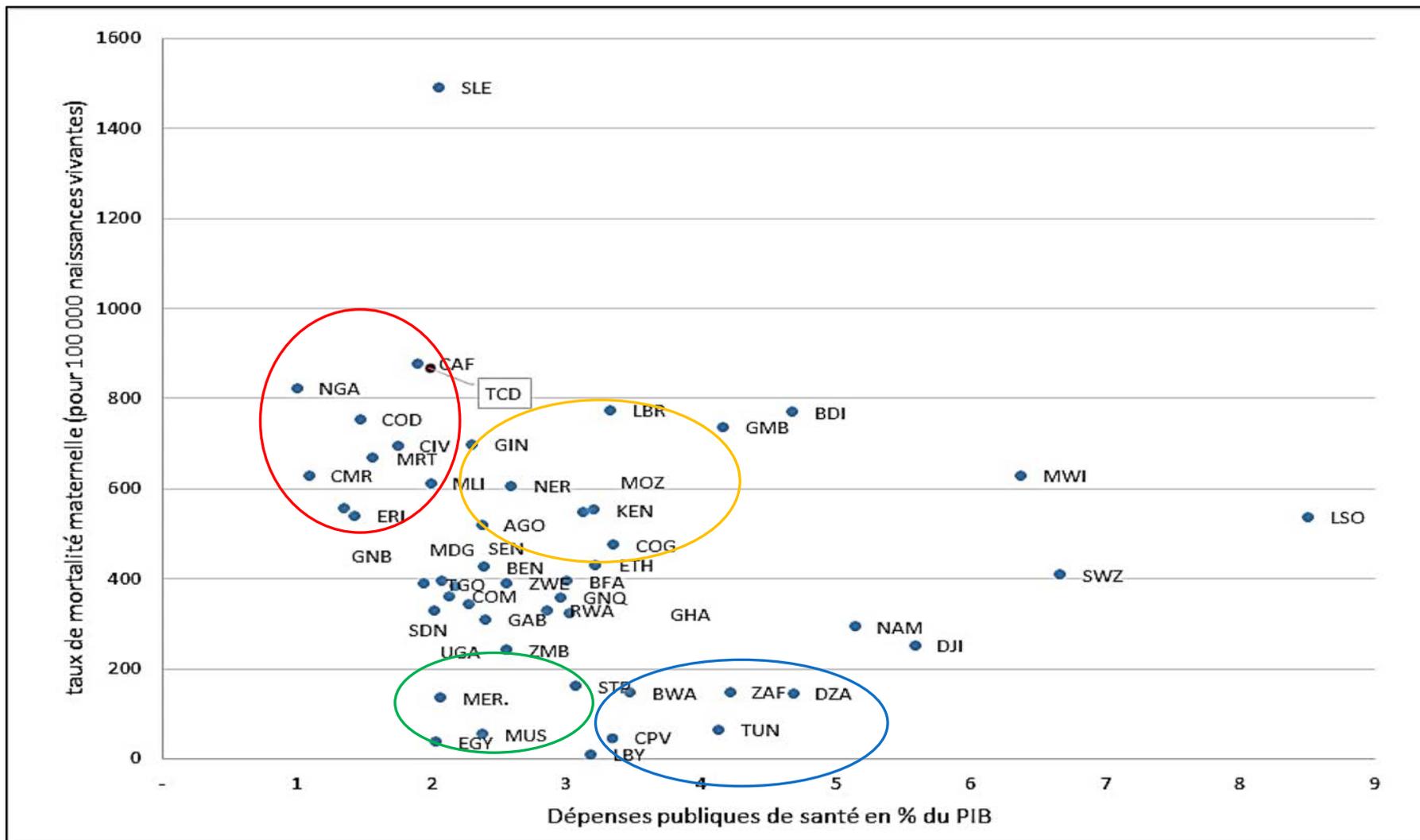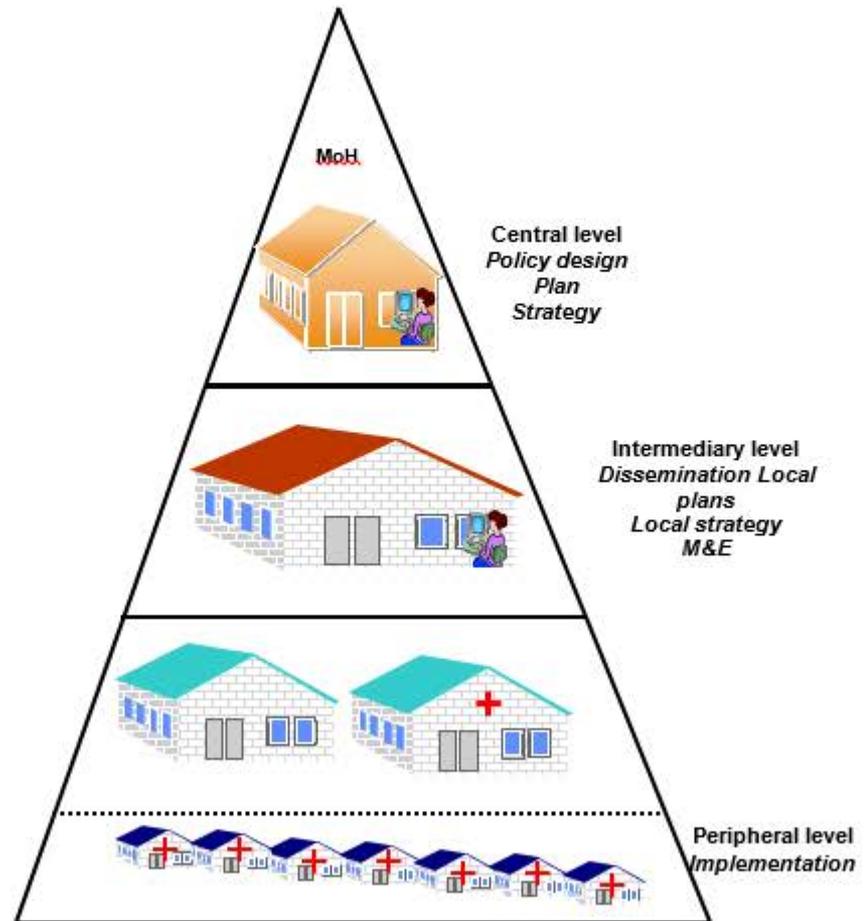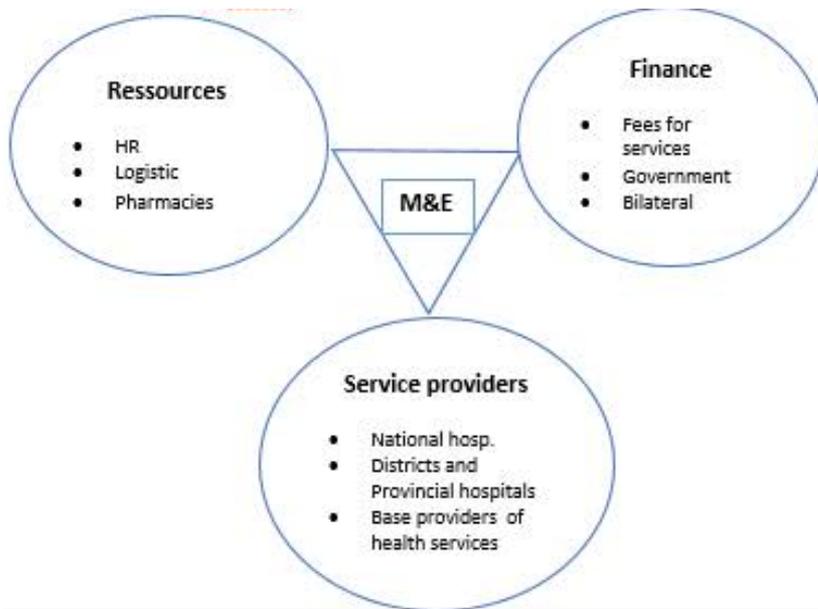
Source: National health policy, MoH

# II. Features of chadian health system (2/2)

Figure 1: Main actors and fund flows in Chad in 2013
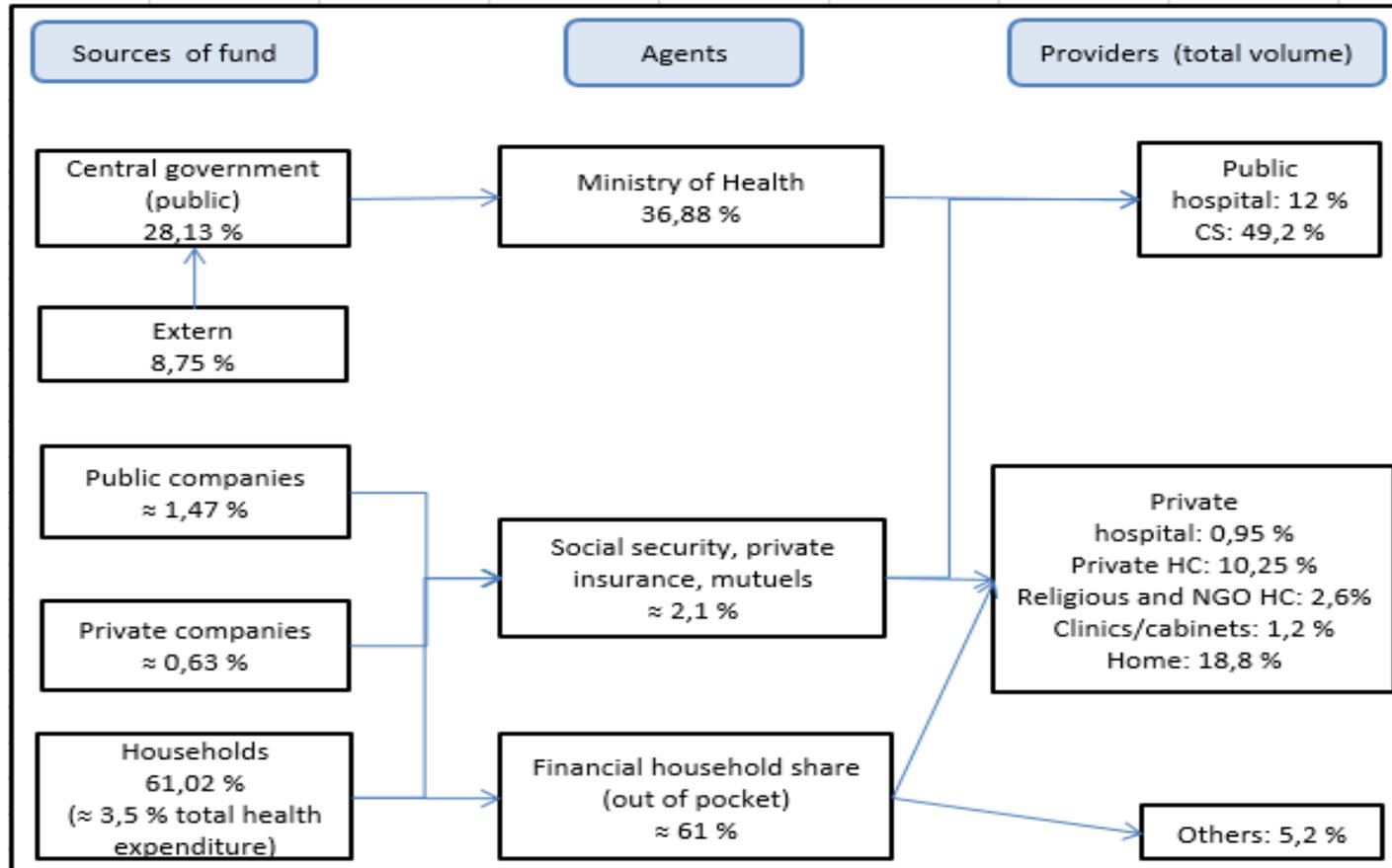
Source: Azoukalne & Avocksouma, 2016

Table 1: Comparison between DEA and SFA methods

Data Envelopment Analysis	Stochastic Frontier Analysis
Non parametric method	Parametric method
Mathematical programming to determine the production frontier	Maximum likelihood estimation method
It is not necessary to specify a functional form	The functional form must be specified
Does not distinguish "white noise" which is considered as part of efficiency	Distinguish between noise and efficiency
Allows to associate many dependent and explanatory variables; the boundary is determined in relation to the extreme variables.	Multiple explanatory variables for one dependent variable

Source: Scippacercola and D'Ambra (2014)

Method used: m-order efficiency score

This model defines, for certain level of inputs X, the maximum expected level of production among a fixed number m of health centers using an amount of inputs lower than X. The estimator is written as follows:

$$\wp(m)^x = E[\max(y^1, \ldots, y^m | X \leq x \tag{1}$$

$$\int_0^\infty \left[1 - fF_C(\tfrac{x}{y})^m \right] dy \tag{2}$$

This expected maximum production function represents the expected maximum production within a fixed
number of "m" health centers, which use fewer inputs. The estimator is therefore given by the following
equation:

$$\wp(m)^x = \int_0^\infty \left[1 - fF_C(\tfrac{x}{y})^m \right] dy \tag{3}$$

Where F represents the empirical distribution function

Method used: truncation model (Simar and Wilson, 2007) for determinant of efficiency score

This model aims to explain the efficiency scores (less than unity) by a set of explanatory variables or environmental variables. The specification is as follow:

$$\delta_k = \beta Z_k + \varepsilon_k$$

$$st. \delta_k \geq 1 \qquad (4)$$

Data and sources:

- Monthly data from the Health Statistics Division of the Ministry of Public Health are extracted and annualized.

- Data from the 2011and 2012 health statistics yearbooks (MoH)

- Data from the 2011 Consumption and Informal Sector Survey in Chad (ECOSIT 3)

- National survey on rural household food security (FAO, 2013)

Output variables:	Input variables:
•**Num_ass_del** that corresponds to the total number of deliveries performed by qualified health personal, in this case nurses or midwives (occur in the Health Centers and in the homes of patients). •*Num_adul_cons* corresponds to the total number of consultations performed by health center staff •*Num_child_vis* represents the total number of children's medical examinations.	▪Nursing per inhabitants Ratio (*Nur_inh_rat*) ▪Midwifery on Women of Child bearing (*Mid_Child_bear_rat*) ▪Time taken by a resident to visit a health center (*Dist_HC*)

Table 2: variables used in the 1st step

Variables	Observations	Mean	Std-deviation	Minimum	Maximum
Num_ass_del	1 498	115,9	139,2	0	1 202
Num_adul_cons	1 500	3 575,6	4 409,8	0	50 677
Num_child_vis	1 499	972,4	1 785,6	0	21 881
Nur_inh_rat	1 682	7 242,2	3 788,7	827	17 827
Mid_Child_bear_rat	1 682	32 401,6	28 235,1	768	122 651
Dist_HC	1 682	91,0	19,0	33	120

Source: statistical yearbooks of health (2011,2012), ECOSIT III, 2011

> **Data : determinants efficiency score**

- share of household health expenditure as a percentage of total expenditure (*Hou_heal_exp*)
  incidence rate of poverty by region (*Inc_pauv*)

- incidence rate of malaria (*Mal_inc_rat*)

- prevalence rate of malnutrition (*Pre_mal_rat*)

- the literacy rate (*Lit_rat*).

Data : determinants efficiency score

Table 3: variables used in the second step

Variables	Observations	Mean e	Standard deviation	Minimum	Maximum
Efficiency score model 1	1116	0,46	0,22	0,28	1,71
Efficiency score model 2	1397	0,46	0,22	0,29	2,19
Efficiency score model 3	1484	0,45	0,21	0,28	2,10
Efficiency score model 4	1155	0,40	0,15	0,28	1,27
Hou_heal_exp	1682	3,34	0,94	1,80	5,20
Inc_rat_pov	1678	48,15	14,08	11,00	70,90
Malaria_inc_rat	1682	47,08	26,07	-	114,00
Pre_malnu_rat	1595	21,88	14,87	4,00	61,00
Lit_rat	1682	25,43	13,65	7,20	53,50

Source: ECOSIT 3, ENSA, 2013

III.   Résultats (1/2)

Figure :1 efficiency score by regions
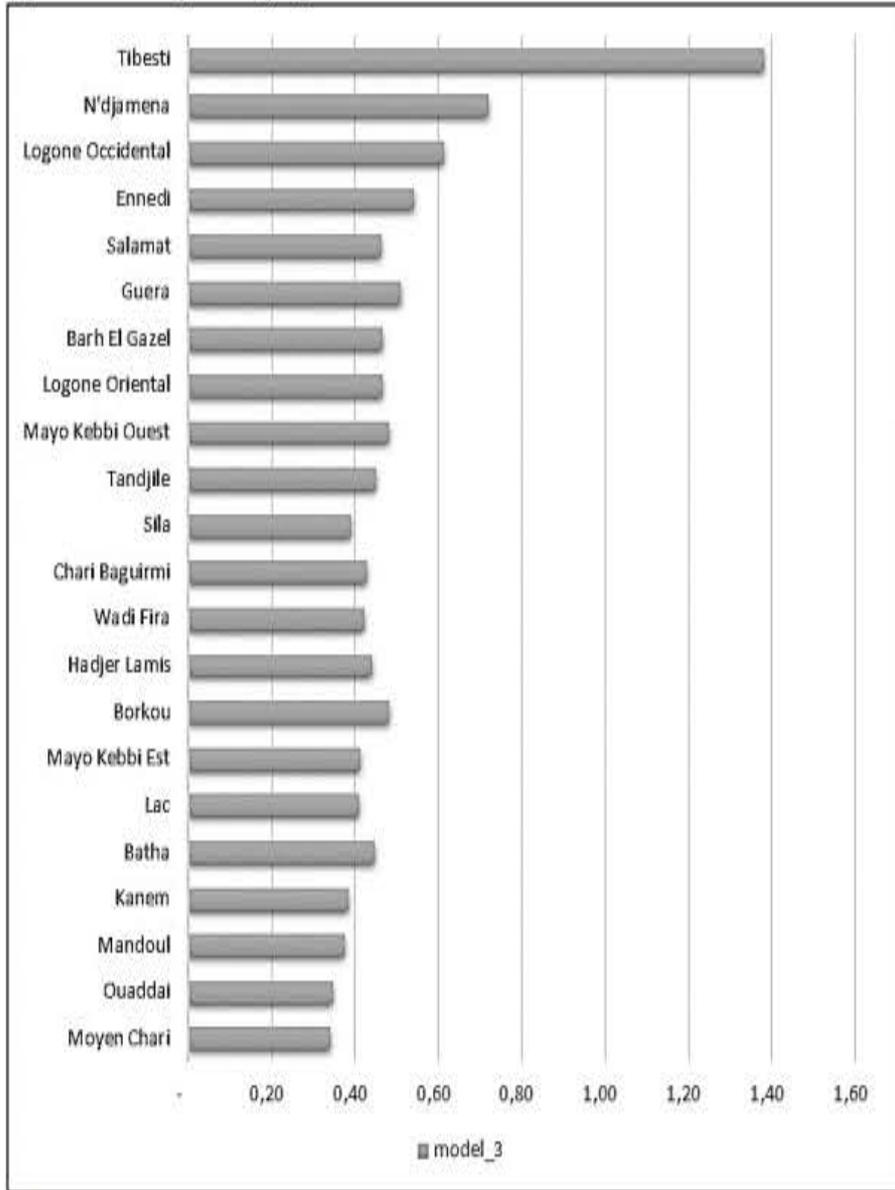
Source: authors' calculations

III.   Résultats (2/2)

Table 4: Determinants of the efficiency of health centers

	Model 1	Model 2	Model 3	Model 4
Hou_heal_exp	0.0949**	0.108***	0.0790***	0.0455**
	(3.09)	(4.70)	(4.16)	(3.04)
Hou_heal_exp_square	-0.00877*	-0.0101**	-0.00614*	-0.00166
	(-2.12)	(-3.28)	(-2.40)	(-0.82)
Inc_rat_pov	0.000242	0.000911**	0.000909***	0.000934***
	(0.63)	(3.12)	(3.75)	(5.13)
Malaria_inc_rat	-0.00106***	-0.00144***	-0.00145***	-0.00146***
	(-5.18)	(-8.38)	(-10.02)	(-14.09)
Pre_malnu_rat	-0.000379	-0.000451*	-0.000398*	-0.000185
	(-1.38)	(-1.97)	(-2.21)	(-1.30)
Lit_rat	0.000197	0.000570*	0.000769***	0.00110***
	(0.63)	(2.33)	(3.64)	(7.11)
_cons	0.229***	0.197***	0.216***	0.233***
	(4.57)	(5.16)	(7.02)	(9.52)
/				
sigma	0.0882***	0.0800***	0.0691***	0.0462***
	(44.05)	(51.11)	(50.67)	(48.10)
N	1002	1315	1372	1094

Source: authors' calculations

III. Conclusion (1/2)

❑The weak performance of public spending in developing countries and few papers have attempted to measure efficiency of health structures => explore the efficiency of social expenditures;

❑This paper aims to contribute to this area of research by highlighting the determinants of the efficiency of health centers;

❑Over the 2011-2012 period, rising share of health household spending, poverty rate and literacy rate reduce the efficiency of health centers. In contrast, increasing the incidence of malaria as well as malnutrition, improves the efficiency of health centers.

III. Conclusion (2/2)

❑These imply that policy makers should put in place a more equitable system of resource allocation to health centers while improving the quality of health services

❑The use of regional averages as inputs and as exogenous variables constitute the limit of this paper

Thanks for your attention