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Impact of international income, prices and monetary shocks on real exchange rate in eight African economies: An empirical study

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ABSTRACT

This study characterizes imported inflation in eight African countries through the effect of income and consumer prices index in OECD countries shocks, world price of oil shock and Federal funds effective rate shock on real exchange rate between 1970 and 2007, using a SVAR Model. We develop theoretical and empirical models and the results suggest that real exchange rate is exposed to these shocks. In this context, the countries exposed must reform their economies in order to be less dependent to the exports of raw materials and the imports of goods and services. The production of domestic goods and services conducts to the substitution of imports by these goods in period of inflation in industrialized countries and decreases imported inflation.

Keywords: Imported inflation, real exchange rate, African countries, international shocks, SVAR model.

JEL Classification: C70, C22, C51, E31, F44, F62, G01, O11

1. Introduction

African countries export raw materials toward industrialized economies and import finished products for the consumption (Madeley, 2003). Household consumption in these countries is essentially composed by the imports of goods and services. In this context, they are exposed to the imported inflation, and the monetary and tax policies are not adapted to fight against inflation.

Furthermore, the following external real and financial flows impact economic growth in Africa: exports and imports (Ayhan Kose & Riezman, 2001; Dutta & Ahmed, 2004; Thurlow, 2007; Mbabazi *et al*. 2008; Nancy, 2008; Fernandez Puente *et al*. 2009), international tourism (Nancy & Joubert, 2003; Eugenio-Martin *et al*. 2004; Mitchell & Ashley, 2007; Fayissa *et al*. 2009; Olayinka Idowu, 2009), migrant transfers (Jongwanich, 2007; Ajayi *et al*. 2009; Garcia-Fuentes & Kenedy, 2009; Fayissa & Nsiah, 2010), external debt (Kwasi Fosou, 1996; Iyoha, 1999; Clements *et al*. 2003; Pattilo *et al*. 2011), foreign aid (Burnside & Dollar, 2000; Almeida & Fernandes, 2008; Schiff & Wang, 2008; Herzer & Morrissey, 2010), foreign direct investment and other external financial flows (Carkovic & Levine, 2005; Ayanwale, 2007; Sukar *et al*. 2007; Magnus Frimpong & Fosu Oteng-Abayie, 2008). In these conditions, openness conducts these countries to be exposed to the international income, prices and monetary shocks.

Thus, the objective of this paper is to study imported inflation in eight African countries through the effect of international income, prices and monetary shocks on their real exchange rates in order to make economic policies' recommendations.

The paper is organized has following: theoretical model is subject of section 2, and the section 3 presents the empirical model.

2. Theoretical model

We formalize a model of imported inflation in eight African countries through the effect of international income, prices and monetary shocks on domestic real exchange rate, with the following hypothesizes:

H1: the world is composed of two countries: a developing country (B) and an advanced economy (A) (Assoumou Ella & Bastidon Gilles, 2013);

H2: there is a significant relationship between external real and financial flows enumerated in introduction and income in (B) (Magnus Frimpong & Fosu Oteng-Abayie, 2008; Fayissa *et al*. 2009; Fernandez Puente *et al*. 2009; Fayissa & Nsiah, 2010; Herzer & Morrissey, 2010; Pattilo *et al*. 2011);

H3: shocks in (A) impact external real and financial flows in (B) (Thomas & Grosse, 2001; Naudé & Saayman, 2005; Aslan *et al*. 2009; Dabla-Norris *et al*. 2010; Berman & Martin, 2012);

Using H1 and H2, the relationship between income in (B) and foreign variables (external real and financial flows enumerated in introduction) can be written in this form:

$$Y_t = X_t^{\alpha_0} \qquad (1)$$

Y represents the income, *X* matrix of foreign variables, α_0 the elasticity of *Y* with respect to *X* and *t*, the time.

Using H3, foreign variables in (B) can be written in this form:

$$X_t = e\dot{Y}_t^{\varphi_0} * \dot{p}_t^{\rho_0} * \dot{r}^{\tau_0} * p_{pt}^{\sigma_0}, \ \varphi_0 \in [0; +\infty] \ \rho_0 \in [-\infty; +\infty], \quad \tau_0 \in [-\infty; +\infty] \quad (2)$$

$\dot{Y}$ represents the income in (A), $\dot{p}$ the inflation in (A), $\dot{r}$ central Bank' director interest rate in (A), p_p world price of oil, φ_0 the elasticity of *X* with respect to $\dot{Y}$, ρ_0 the elasticity of *X* with respect to $\dot{p}$, τ_0 the elasticity of *X* with respect to $\dot{r}$ and σ_0 the elasticity of *X* with respect to p_p. We multiply *X* by *e* (the nominal exchange rate) for the conversion in money of (B).

In replacing equation (2) in (1), we have:

$$Y_t = e\dot{Y}_t^{\varphi_1} * \dot{p}_t^{\rho_1} * \dot{r}^{\tau_1} * \ p_{pt}^{\sigma_1} \quad (3)$$

With $\varphi_1 = \varphi_0 * \alpha_0, \ \rho_1 = \rho_0 * \alpha_0, \tau_1 = \tau_0 * \alpha_0$ and $\sigma_1 = \sigma_0 * \alpha_0$.

Knowing that $e_r = e * (\frac{\dot{p}}{p})$, with e_r and *p*, real exchange rate and inflation in (B) ($e = e_r * (\frac{p}{\dot{p}})$), we apply the logarithm on equation (3) and we have:

$$log(e_r) = log(Y) - \varphi_1 \, log(\dot{Y}) + (1 - \rho_1) \, log(\dot{p}) - \tau_1 \, log(\dot{r}) - \sigma_1 \, log(p_p) - log(p) \quad (4)$$

Exposure of (B) to the international shocks decreases real exchange rate. In this context, (B) is exposed to the imported inflation. According to equation (4), an increase in domestic income impacts positively real exchange rate, and an increase in domestic inflation affects negatively this variable. In these conditions, (B) must reform his economy in order to be less dependent to the exports of raw materials and the imports of goods and services. The production of domestic goods and services conducts to the substitution of imports by these goods in period of inflation in (A) and decreases imported inflation. In this context, the monetary and tax policies in (B) are adapted to fight against inflation.

3. Empirical model

3.1 The variables

International shocks: *(i)* International income shocks are approximated by real GDP (OECD) and real GDP (OECD, per capita) shocks (Fernandez Puente, 2009; Assoumou Ella and Bastidon Gilles, 2013); *(ii)* International prices shocks by the harmonized inflation in OECD countries shock (Assoumou Ella, 2012; Assoumou Ella and Bastidon Gilles, 2013) and world price of oil shock; *(iii)* International monetary shocks by the Federal funds effective rate shocks (Gossé and Guillumin, 2010; Assoumou Ella, 2013). To approximate *Y* used in equation (4), we are the following variables that represent the usual determinants of economic growth in developing countries: *(i)* Education (*alph*),

approximated by the adult literacy rate; *(ii)* Health (*life*), approximated by life expectancy at birth; *(iii)* the consumer prices index (*inf*); *(iv)* Investment (*inv*): we only retain public expenditures where there is collinearity between total investments and public expenditures; *(v)* Public expenditures (*g*); *(vi)* Household consumption (*household*): we retain this variable if there is not collinearity with public expenditures.

The macroeconomic data are expressed in U.S. dollar and come from the World Bank database (African Development indicators) and the OECD (StatExtracts).

3.2 Model specification

We use a SVAR model to study the impact of external shocks on domestic economy (Gossé and Guilliaumin, 2010; Allegret *et al*. 2012; Assoumou Ella, 2012). First, it is assumed that any economy of the sample is described by a VAR model that has the following reduced-form, where $A(L)$ is a matrix polynomial in the lag operator *L*:

$$A(L)X_t = u_t \qquad (5)$$

$E(u_t) = 0, Var(u_t) = \sigma^2, X_t =$
$(\Delta e_r,\ \Delta pibocde\ or\ \Delta pibocdeh,\ \Delta baril\ or\ \Delta infocde,\ \Delta inf,\ \Delta alph,\ \Delta inv,\ \Delta vie,$
$\Delta g,\ \Delta menage)$,, with Δ the first order derivative, *er* real exchange rate, *pibocde* real GDP OECD, *pibocdeh* real GDP OECD per capita, *baril* world price of oil, *infocde* harmonized inflation in OECD countries.

Equation (5) can be rewritten in VMA form:

$$X_t = B(L)u_t \qquad (6)$$

With $u_t = S\varepsilon_t$, and $\varepsilon_t = (\varepsilon_t^{e_r},\ \varepsilon_t^{pibocde\ or\ pibocdeh},\ \varepsilon_t^{baril\ or\ infocde},\ \varepsilon_t^{inf},\ \varepsilon_t^{alph},$ $\varepsilon tinv, \varepsilon tvie,\ \varepsilon tg,\ \varepsilon tmenage)'$. εt are the orthogonal normalized innovation vectors that represent the structural shocks. So for instance $\varepsilon_t^{e_r}, \varepsilon_t^{pibocde\ or\ pibocdeh}$ and $\varepsilon_t^{baril\ or\ infocde}$ respectively represent the real exchange rate shock, the real GDP OECD or the real GDP OECD per capita shocks and the harmonized inflation in OECD countries or world price of oil shocks, satisfying $u_t = S\varepsilon_t$ and $E(\varepsilon\varepsilon') = I$, with *I* the identity matrix.

The consequence is that $SS' = \sum$. Using the orthogonal matrix *S*, the VMA model can be written with structural shocks:

$$X_t = C(L)\varepsilon_t \qquad (7)$$

Where $C(L) = B(L)S$.

The existing literature concludes that the identification of the VAR structural form needs to impose $n(n-1)/2$ constraints. We assume that the external variables are exogenous, relatively to domestic variables (Allégret and Sand-Zantman, 2010; Gimet, 2007; Sato *et al*. 2011). Thus, the contribution of international shocks to the variance of the endogenous variables is studied using the SVAR models with an exogenous hypothesis (Mackowiak, 2007). This specification improves the quality of the estimations (Sosa, 2008). In this context, the SVAR models can be rewritten in this form:

$$\sum_{s=0}^{p} \begin{bmatrix} A_{11}(S) & A_{12}(S) \\ A_{21}(S) & A_{22}(S) \end{bmatrix} \begin{bmatrix} y_{1(t-s)} \\ y_{2(t-s)} \end{bmatrix} = \begin{matrix} \varepsilon_1(t) \\ \varepsilon_2(t) \end{matrix}$$

Where $A_{12} = 0$ for any $S = 0,1, \ldots, \infty$, with $E[\varepsilon(t)/y_{t-s}, s > 0] = 0$ and $E[\varepsilon(t)\varepsilon(t)'/$ $yt-s,s>0=I$, with I the identity matrix. $y1(t-s)$, $y2(t-s)$, $\varepsilon1(t)$ and $\varepsilon2(t)$ respectively represent the vectors of external variables, domestic variables, structural external shocks and structural domestic shocks. It is assumed in conformity with Gossé and Guilliaumin (2010) that $A_{12}(S) = 0$ for any $S = 0,1, \ldots, \infty$. That is to say that the domestic structural shocks do not affect $y_{1(t-s)}$ in t or in $t - s$. It is also supposed that a short-term shock of any external variable does not affect any other external variables (Sato *et al*. 2011).

3.3 Results

3.3.1 Impact of real GDP OECD and real GDP OECD per capita socks on real exchange rate

Income shocks in OECD countries affect real exchange rate in four countries: Algeria, Malawi, Tunisia and Zambia. A negative income shock in OECD countries increases real exchange rate in the countries exposed, and conversely for a positive shock. This result is in conformity with the theoretical model (equation (4)). The impulse response functions of real exchange rate after a positive real OECD shock confirm the preceding result.

Algérie Malawi Tunisie Zambie

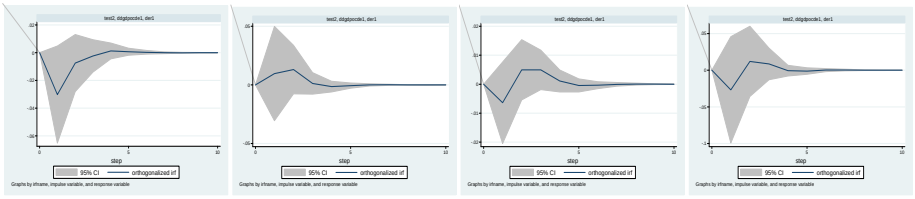

Figure 1. Impulse (*real GDP OECD*), response (e_r)

Real exchange rate in general decreases after a positive real GDP OECD shock the first year and the effect disappears after three years. Thus, the increase of income in OECD countries has a positive effect on domestic inflation and imported inflation in the countries exposed.

3.3.2 Impact of Federal funds effective rate shocks on real exchange rate

Four countries are exposed: South Africa, Cameroon, Centrafrique and Nigeria. An expensive monetary policy decreases real exchange rate in South Africa and in Nigeria, and increases this variable in the two other countries (conversely for a restrictive monetary policy). In short run, a decrease of interest rate increases inflation in USA and imported inflation in South Africa and in Nigeria. We represent the reaction of real exchange rate after a restrictive monetary policy in USA.

A restrictive monetary policy decreases inflation in USA, and therefore imported inflation in the countries exposed. Thus, the reaction of real exchange rate in the countries exposed is in general positive the first year and the effect disappears after four years.

Afri. Sud Cameroun R. Centratr. Nigéria

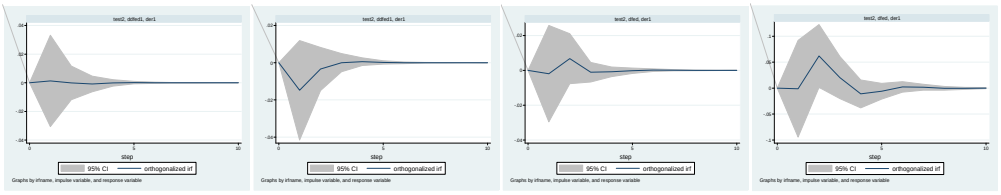

Figure 2. Impulse (*FED*), response (e_r)

3.3.3 Impact of harmonized inflation in OECD countries and world price of oil shocks on real exchange rate

In the case of consumer prices index shocks in OECD countries, only Malawi is exposed. On the other side, three countries are impacted concerning the world price of oil shocks: South Africa, Tunisia and Zambia. A decrease in world price of oil impacts negatively real exchange rate in Tunisia and Zambia, and positively in South Africa. In this context, an increase in oil price affects positively real exchange rate in Tunisia and Zambia because the international prices increase faster than the domestic prices in these countries. The result differs in South Africa because this country has a domestic industry and products goods and services. In these conditions, an increase in world price of oil has a big impact on domestic prices through his effect on the prices of domestic goods and the imported inflation. The figure below confirms this result.

Afri. Sud Tunisie Zambie

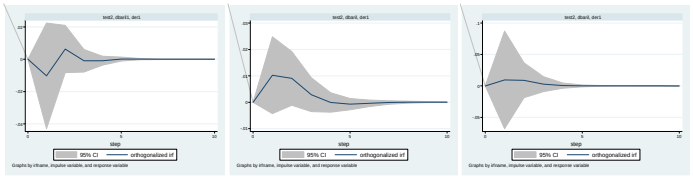

Figure 3. Impulse (*baril*), response (e_r)

The reaction of real exchange rate after a positive world price of oil shock is negative the first year in South Africa, and positive in Tunisia and Zambia, confirming the preceding result. In the second year, real exchange rate increases in South Africa because the consumers substitute imports by domestic goods. The reaction of this variable becomes negative the second year in Tunisia and Zambia because they can't substitute imports by domestic goods. In this context, they are exposed to the imported inflation.

4. Conclusions

The objective of this paper is to measure imported inflation in eight African countries through the effect of income and inflation shocks in OECD countries and world price of oil shock on real exchange rate in the countries of the sample. In fact, African countries export raw material toward industrialized economies and import finished goods that compose household consumption. In these conditions, we develop theoretical and empirical models that characterize the level of exposure of these countries to the imported inflation. The results confirm this exposure. Also, African countries must develop domestic industry in order to substitute imports with domestic goods and to decrease imported inflation.

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APPENDIX

There is the effect of a negative shock on exogenous variable to the endogenous variable, the effect of a positive shock (Cholesky value) and Student's t-distribution.

TABLE A-1. Exposure of real exchange rate to the international shocks (including real OECD GDP per capita)

	Afri. Sud		Algérie		Cameroun	
	0,06	0,051	0,111*	0,126*	-0,027	-0,018
gdpocde	-0,006	-0,005	-0,013	-0,014	0,002	0,001
	(1)	(0,84)	(1,89)	(1,85)	(-0,28)	(-0,18)
		-0,236		0,341		-0,116
infocde		0,029		-0,021		0,009
		(-0,79)		(1,29)		(-0,29)
	-0,913*	-0,918**	1,035	0,168	5,675*	5,521*
r	0,073	0,088	-0,099	-0,011	-0,498	-0,389
	(-1,91)	(-2,26)	(0,38)	(0,7)	(1,72)	(1,68)
	-0,931***		-0,023		-0,04	
baril	0,089		0,003		0,003	
	(-3,02)		(-0,7)		(-0,8)	
diamant						
				-0,321*		
gaz				0,026		
				(-1,88)		
	-0,195	-0,201				
or	0,033	0,026				
	(-0,78)	(-0,91)				
aluminium						
					0,319*	0,314*
forêt					-0,028	-0,023
					(1,84)	(1,85)
					0,063	0,08
indagr					-0,01	-0,014
					(0,29)	(0,42)
	0,002	0,001	0,027**	0,042***	0,028	0,04
alph	-0,000	-0,000	-0,003	-0,003	-0,001	-0,001
	(0,89)	(0,19)	(2,42)	(4,21)	(0,5)	(0,71)
	0,002	0,003	-0,022**	-0,02*	-0,046**	-0,054**
vie	-0,001	-0,001	0,001	0,001	0,002	0,003
	(0,9)	(0,17)	(-2,12)	(-1,67)	(-2,1)	(-2,37)
	-0,722***	-0,536***	-0,69***	-		
inv	0,067	0,064	0,059	0,605***		
	(-4,06)	(-3,23)	(-6,03)	0,061		
				(-4,17)		
	1,238***	0,925***	0,087*	2,879*	4,269***	4,307**
inf	-0,025	-0,047	-0,11	-0,107	-0,286	*
	(3,75)	(3,1)	(1,76)	(1,72)	(4,14)	-0,35
						(3,5)
			-	-0,63***	-1,163***	-
			0,807***	0,066	0,064	0,852**
g			0,071	(-4,22)	(-6,07)	*
			(-5,89)			0,072
						(-3,33)
menage						

TABLE A-1 (cont.)

	R. Centraf.		Malawi	
	0,047	0,032	0,216***	0,229***
gdpocde	-0,004	-0,002	-0,025	-0,028
	(0,48)	(0,35)	(4,1)	(4,54)
	-0,224			-0,651*
infocde	0,016			0,057
	(-0,55)			(-1,84)
	6,369*	6,156*	0,547	0,469
r	-0,428	-0,434	-0,073	-0,071
	(1,77)	(1,68)	(1,02)	(0,91)
		-0,152	-0,12	
baril		0,012	0,027	
		(-0,34)	(-0,33)	
	-1,232*	-1,235*		
diamant	0,054	0,056		
	(-1,91)	(-1,92)		
gaz				
or				
			0,148	0,11
aluminium			-0,018	-0,019
			(0,51)	(0,3)
forêt				
			-0,474***	-0,364**
indagr			0,038	0,029
			(-2,88)	(-2,22)
	0,029	0,022	0,033***	0,034***
alph	-0,001	-0,001	-0,003	-0,003
	(1,08)	(0,87)	(3,64)	(4,04)
	-0,028	-0,017	-0,007	-0,009
vie	0,002	0,002	0,001	0,001
	(-1,13)	(-0,78)	(-0,34)	(-0,41)
	-1,218**	-		
	0,065	1,157**		
inv	(-2,27)	0,071		
		(-2,31)		
	4,336**	4,283**	-0,444	-0,476
inf	-0,147	-0,165	0,218	0,198
	(2,2)	(2,24)	(-0,51)	(-0,59)
	-0,903*	-0,855*		
g	0,068	0,07		
	(-1,68)	(-1,64)		
			-1,131***	-1,001***
menage			0,134	0,15
			(-3,73)	(-3,36)

TABLE A-1 (cont.)

	Nigéria		Togo		Tunisie		Zambie	
gdpocde	0,006 -0,002 (0,24)	0,008 -0,002 (0,12)	-0,079 0,006 (-0,74)	-0,089 0,006 (-0,84)	0,241* -0,012 (1,73)	0,254* -0,013 (1,82)	0,089*** -0,02 (2,85)	0,096*** -0,021 (3,14)
infocde		0,004 -0,002 (0,4)	0,186 -0,012 (0,42)		-0,044 0,001 (-0,7)		-0,06 0,003 (-0,44)	
r	-2,922*** 0,701 (-2,9)	-2,816*** 0,751 (-2,9)	0,161 -0,043 (0,4)	0,49 -0,016 (0,11)	-2,403 0,176 (-0,81)	-2,327 0,166 (-0,38)	-1,644* 0,309 (-1,63)	-1,356* 0,328 (-1,73)
baril	0,074 -0,019 (0,63)			-0,11 0,003 (-0,24)		-1,275* 0,064 (-1,95)		-0,31** 0,067 (-2,06)
alph	-0,001 0,000 (-0,29)	-0,001 0,000 (-0,35)	0,003 -0,001 (0,59)	0,001 -0,001 (0,23)	0,009 -0,001 (0,76)	0,005 -0,001 (0,35)	0,001 -0,000 (0,58)	0,001 -0,000 (0,83)
vie	0,005 -0,003 (0,77)	0,005 -0,003 (0,8)	-0,011 0,001 (-0,63)	-0,009 0,001 (-0,5)	0,006 -0,001 (0,36)	0,015 -0,001 (0,75)	-0,014** 0,001 (-2,33)	-0,016** 0,001 (-2,19)
inv	0,108* -0,042 (1,79)	0,11* -0,05 (1,8)	0,872* -0,039 (1,69)	0,983* -0,04 (1,82)	-0,271 0,014 (-1)	-0,394 0,017 (-1,43)	-0,387*** 0,046 (-2,84)	-0,337** 0,05 (-2,18)
inf	0,124 -0,035 (0,26)	0,13 -0,04 (0,27)	3,233** -0,22 (2,06)	3,645** -0,239 (2,31)	0,402 -0,28 (0,28)	1,714 -0,044 (1,13)	4,585** -0,71 (2,5)	5,516*** -0,723 (2,81)
g	0,524*** -0,103 (2,72)	0,5*** -0,1 (2,8)	-0,502** 0,016 (-1,99)	-0,444* 0,014 (-1,69)	-0,037 0,008 (-0,34)	-0,061 -0,007 (-0,47)	-0,121 0,002 (-0,7)	-0,046 0,012 (-0,26)
menage	0,012 -0,003 (0,14)	0,01 -0,003 (0,15)					-0,621*** 0,132 (-4,04)	-0,56*** 0,132 (-3,24)

TABLE 2. Exposure of real exchange rate to the international shocks (including real OECD GDP)

	Afri. du Sud		Algérie		Cameroun	
	0,018	0,013	-0,076***	-0,076***	-0,009	-0,0009
gdpocde	-0,002	-0,002	0,009	0,009	0,001	0,001
	(0,61)	(0,45)	(-2,92)	(-2,79)	(-0,21)	(-0,1)
		-0,244		0,382		-0,119
infocde		0,028		-0,035		0,009
		(-0,83)		(1,27)		(-0,3)
	-0,858*	-0,872**	-0,432	-0,314	3,455*	3,337*
r	0,071	0,086	0,024	0,025	-0,485	-0,5
	(-1,84)	(-2,16)	(-0,14)	(-1,18)	(1,63)	(1,61)
	-0,893***		-0,196		-0,044	
baril	0,088		0,003		0,003	
	(-2,91)		(-0,65)		(-0,1)	
diamant						
				-0,02*		
gaz				0,003		
				(-1,62)		
	-0,191	-0,206				
or	0,035	0,027				
	(-0,78)	(-0,93)				
aluminium						
					0,315*	0,31*
forêt					-0,028	-0,027
					(1,81)	(1,79)
					0,046	0,049
indagr					-0,01	-0,014
					(0,21)	(0,47)
	-0,001	-0,001	0,031***	0,035***	0,032	0,042
alph	0,000	0,000	-0,003	-0,003	-0,001	-0,001
	(-0,59)	(-0,2)	(2,65)	(2,98)	(0,59)	(0,77)
	0,004	0,004	-0,018*	-0,02*	-0,045**	-0,051**
vie	-0,001	-0,001	0,001	0,001	0,002	0,003
	(0,24)	(0,26)	(-1,65)	(-1,61)	(-2,08)	(-2,3)
	-0,662***	-0,507***	-0,626***	-0,873***		
inv	0,067	0,064	0,062	0,07		
	(-3,84)	(-3,15)	(-4,43)	(-6,15)		
	1,113***	0,86***	2,001*	1,807*	2,624***	2,418***
inf	-0,018	-0,041	-0,097	-0,093	-0,288	-0,352
	(3,47)	(2,89)	(1,71)	(1,76)	(4,18)	(3,54)
			-0,313**	-0,316*	-1,193***	-0,873***
g			0,076	0,075	0,064	0,072
			(-2,48)	(-1,61)	(-6,5)	(-3,44)
menage						

TABLE 2. (cont.)

	R. Centrafr.		Malawi	
	0,013	0,006	0,112***	0,118***
gdpocde	-0,001	-0,001	-0,013	-0,014
	(0,28)	(0,14)	(4,61)	(5,06)
	-0,253			-0,666*
infocde	0,019			0,058
	(-0,64)			(-1,87)
	3,008*	3,009*	0,523	0,477
r	-0,399	-0,405	-0,068	-0,069
	(1,68)	(1,69)	(0,94)	(0,87)
		-0,197	-0,084	
baril		0,015	0,028	
		(-0,45)	(-0,23)	
	-1,111*	-1,128*		
diamant	0,053	0,054		
	(-1,68)	(-1,71)		
gaz				
or				
			0,217	0,083
aluminium			-0,019	-0,019
			(0,75)	(0,28)
forêt				
			-0,458***	-0,459**
indagr			0,037	0,029
			(-2,67)	(-2,09)
	-0,031	-0,023	0,028***	0,029***
alph	0,001	0,001	-0,003	-0,003
	(-1,23)	(-0,97)	(3,15)	(3,42)
	-0,022	-0,011	-0,005	-0,005
vie	0,002	0,001	0,001	0,001
	(-0,88)	(-0,49)	(-0,25)	(-0,23)
	-1,108**	-1,068**		
inv	0,062	0,068		
	(-2,08)	(-2,18)		
	2,093**	2,058**	-0,297	-0,453
inf	-0,157	-0,174	0,214	0,197
	(2,15)	(2,17)	(-0,35)	(-0,57)
	-0,849*	-0,766*		
g	0,067	0,069		
	(-1,62)	(-1,61)		
			-1,148***	-1,032***
menage			0,135	0,151
			(-3,86)	(-3,51)

TABLE 2. (cont.)

	Nigéria		Togo		Tunisie		Zambie	
gdpocde	0,009 -0,003 (0,35)	0,01 -0,003 (0,46)	-0,037 0,003 (-0,72)	-0,04 0,003 (-0,8)	0,134** -0,007 (2,03)	0,139** -0,007 (2,12)	0,041*** -0,009 (2,71)	0,045*** -0,01 (3)
infocde		0,008 -0,002 (0,07)	0,166 -0,011 (0,38)		0,004 -0,003 (0,1)		0,06 -0,001 (0,46)	
r	-2,637*** 0,7 (-2,6)	-2,74*** 0,728 (-2,81)	0,498 -0,055 (0,7)	0,462 -0,056 (0,11)	-1,314 0,174 (-0,78)	-1,906 0,161 (-0,31)	-1,393 0,316 (-1,1)	-1,391 0,342 (-1,46)
baril	0,04 -0,009 (0,3)			-0,084 0,002 (-0,19)		-1,2* 0,062 (-1,81)		-0,31** 0,069 (-2,08)
alph	-0,002 0,000 (-0,39)	-0,002 0,000 (-0,36)	0,003 -0,001 (0,55)	0,003 -0,001 (0,19)	0,007 -0,001 (0,6)	0,007 -0,001 (0,3)	0,001 -0,000 (0,9)	0,002 -0,000 (1,19)
vie	0,006 -0,000 (1,02)	0,006 -0,000 (0,9)	-0,012 0,001 (-0,68)	-0,01 0,001 (-0,54)	0,007 -0,001 (0,34)	0,007 -0,001 (0,81)	-0,015** 0,001 (-2,41)	-0,019*** 0,001 (-2,61)
inv	0,243* -0,07 (1,77)	0,2* -0,059 (1,7)	0,823* -0,038 (1,61)	0,941* -0,04 (1,73)	-0,229 0,012 (-0,82)	-0,357 0,012 (-1,26)	-0,366*** 0,045 (-2,7)	-0,317** 0,05 (-2,02)
inf	0,122 -0,05 (0,26)	0,099 -0,045 (0,25)	3,416** -0,222 (2,25)	3,881** -0,22 (2,5)	0,589 -0,04 (0,4)	0,599 -0,042 (1,21)	4,556** -0,707 (2,5)	5*** -0,721 (2,92)
g	0,6*** -0,1 (3)	0,62*** -0,122 (2,8)	-0,476* 0,016 (-1,84)	-0,419* 0,014 (-1,62)	-0,088 0,008 (-0,86)	-0,112 0,007 (-0,89)	-0,09 0,004 (-0,53)	-0,1 0,005 (-0,88)
menage	0,013 -0,004 (0,25)	0,01 -0,004 (0,27)					-0,646*** 0,132 (-4,29)	-0,601*** 0,132 (-3,36)