Do Real Exchange Rates Affect Employment? A Comparative Perspective on Africa

Zuzana Brixiová [a] , Balázs Égert [b], Jan Švejnar [c]

[a] African Development Bank

[b] Organization for Economic Cooperation & Development

[c] Columbia University

2014 ASSA-ACES Meetings, Philadelphia

Background, Objectives, and Motivation

Background

- Real exchange rate appreciation may have contributed to high unemployment in Latin America in 1990s (Frenkel and Ros, 2006);
- Under-valued exchange rates can stimulate structural transformation (Rodrik, 2008; Bhala, 2008)

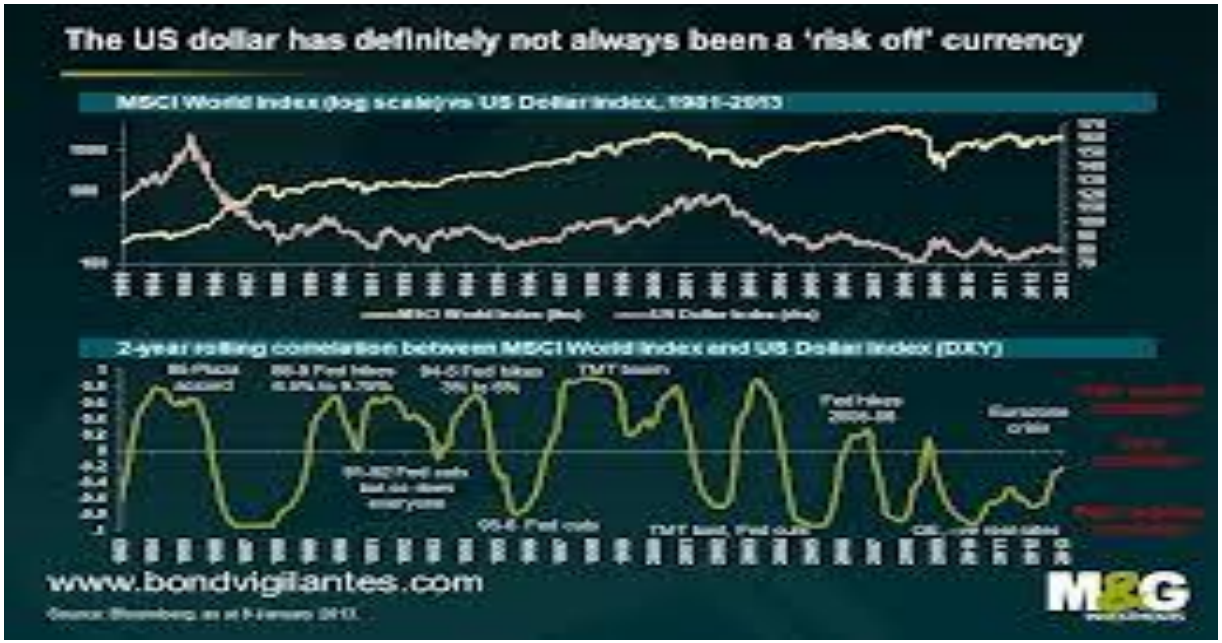
Objectives – This research aims to find out if:

- Real exchange rates (RERs) can affect employment in Africa and how
- Africa is different than other developing (and developed) regions

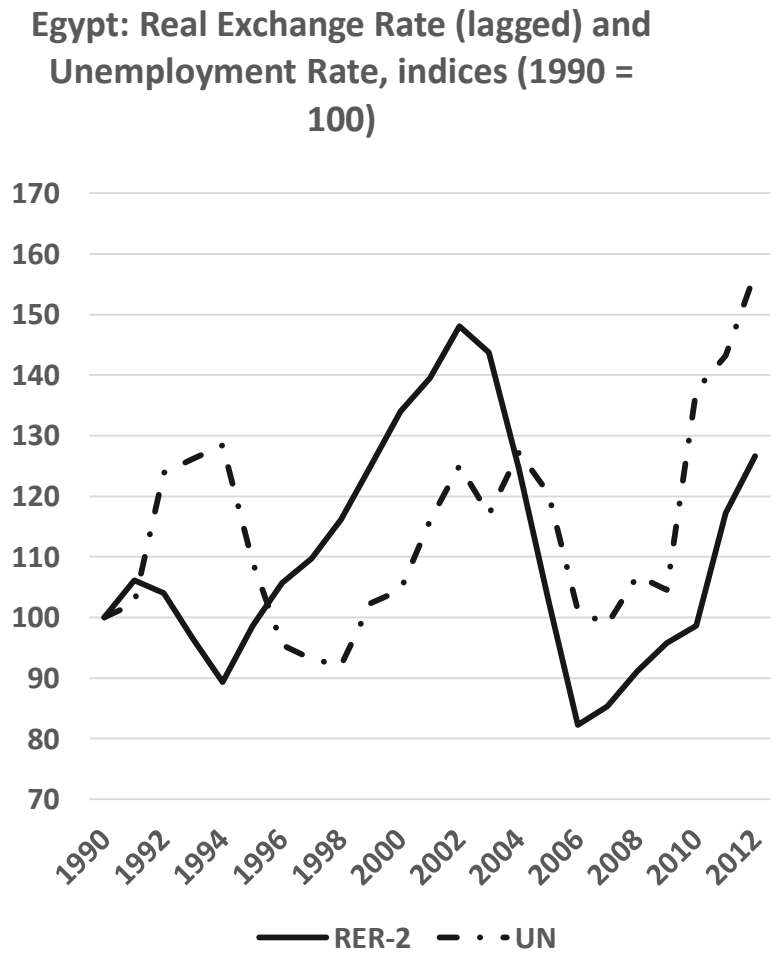
Motivation

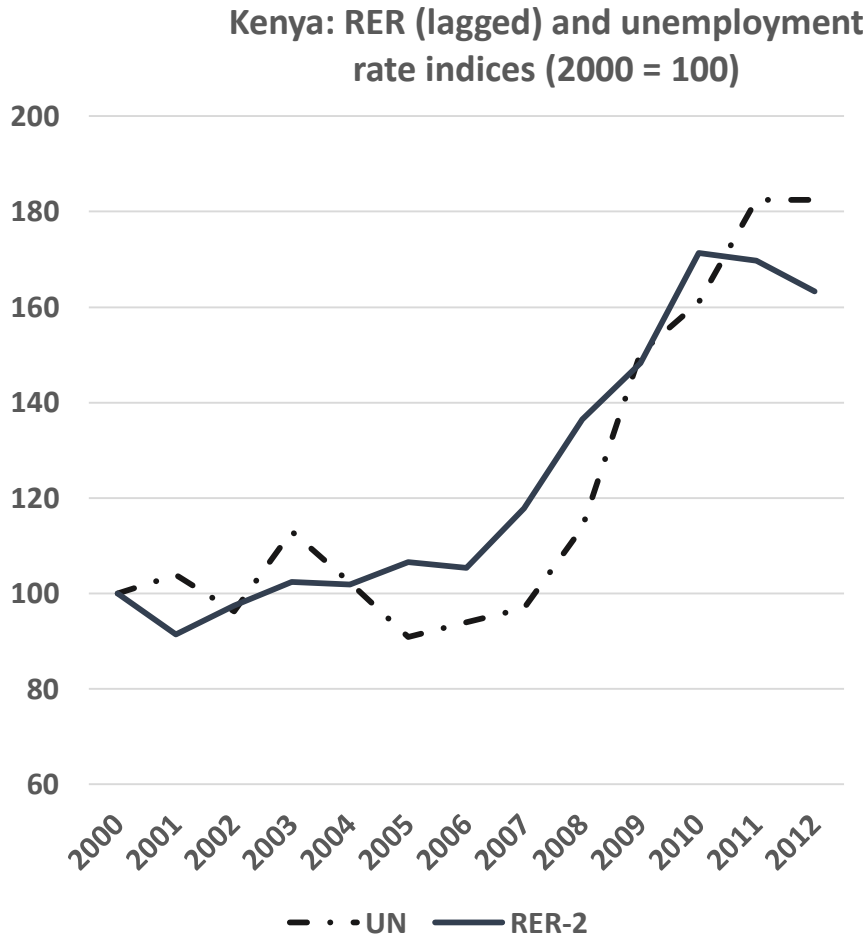
- Africa faces a major employment challenge, especially for youth

Exchange rate trend, volatility and jobs?



Example of some stylized facts for Africa's EMEs





Methodology

Theory

- looking at changes in trend of RER and unemployment levels
- modified Frenkel and Ros (2006) model, which combines Harris-Todaro with 2 sector open economy model;
- added: human capital in the formal sector and technology in the informal sector

Empirical estimations

- Panel data estimations
- Exchange rate returns
- Benchmarking the results against various panels

Literature overview

- A relative large number of papers looking at the relation between exchange rate and employment;

- Typically, examining changes in employment or unemployment levels as a function of a set control variables, including
  - Real exchange rate returns
  - Deviations from long terms trend of RER
  - Real exchange rate volatility

Presumed transmission mechanism people have been hypothesised

- **CHANNEL1:** Exchange rate volatility affects employment via investment (hiring people can be irreversible, depending on regulation)
  - **FX volatility raises interest rates**
  - FX uncertainty has a negative effect => increases option value of waiting
    - Higher risk premium on exchange rate and inflation
  - Higher interest rate reduces the demand for credit
  - FX volatility acts through direct effects on sales, profits and investment risk

Transmission mechanism (cont'd)

- **CHANNEL 2: uncertainty in labour demand** pushes unions to negotiate higher wages => higher unemployment

- **CHANNEL 3: The level of RER affects economic growth and thus employment**
  - Developing countries that maintain undervalued RER may perform better

Transmission mechanisms (cont.)

Further on the 3rd channel, Frankel and Ros (2006) distinguish:

1. **Macroeconomic channel** (short term increase in demand for labor in tradable and non-tradable sector)

1. **The labor intensity** (employment elasticity of growth) channel (real wage in tradable sector falls)

1. **Long term growth channel** (depreciated RER acts like subsidy to tradable sector)

Literature overview (cont.)

- Many studies focusing on specific countries; typically in advanced or emerging market economies
  - Canada (Leung and Yuen, 2005; Bruneau and Moran, 2012)
  - China (Chen and Dao, 2011)
  - Hungary (Koren, 2001)
  - Turkey (Demir, 2010)
- Looking at industry or firm-level data
- Other studies looking at small groups of countries
  - 23 OECD countries (Alexandre et al., 2010)
  - EU countries (Stirboeck and Buscher, 2000)
  - Central and Eastern Europe (Belke and Setzer, 2003)
  - 17 Latin American countries (Frenkel and Ros, 2006)

Literature overview

- Only few studies on Low Income or Lower-Middle Income Countries and Africa
  - Ghana (Mesah et al, 2013)
  - South Africa (Mpofu, 2013)
  - El Salvador, Guatemala, Honduras, Nicaragua, Paraguay (Frankel and Ros, 2006)

  - We analyze a large panel of African countries and benchmark our results against other country groups

Results of the literature

- Exchange rate volatility reduces employment, especially in manufacturing (Belke and Setzer, 2003; Demir, 2010)
- But the size is not always large (Stirboeck and Buscher, 2000)
- Depreciation stimulates employment but differently across sectors
  - Appreciation reduces employment (Latin America, Frankel and Ros, 2006)
  - Generally, industries exposed to trade more responsive (Canada and China) but not always (Hungary)
  - Tradables and nontradables equally responsive in China (nontradables as inputs for tradables)
  - No reaction if there is FX volatility

In Africa (Ghana and South Africa)

- FX volatility has a contractionary effect on manufacturing employment growth
- Real exchange rate depreciation increases manufacturing employment growth

Basic Model

- A small open, 2-sector economy, with Harris-Todaro labor markets
- The production technology in tradable sector is characterised by constant returns to scale:

$$Y_T = A_T F_T(qL_T) = A_T K_T^{\alpha} (qL_T)^{1-\alpha}$$

- The production function in the informal (non-tradable) sector has diminishing returns in labor:

$$Y_N = A_N F_N(L_N) = A_N L_N^{1-\alpha}$$

- The workers earn the same expected wage in each sector:

$$\frac{L_T}{U + L_T} w_T = w_N \qquad u = \frac{U}{U + L_T} = 1 - \frac{w_N}{w_T}$$

Basic Model – Labor Market Equilibrium

- Wages and employment in the tradable sector derived from profit maximization:

$$w_T = p_T(1-\alpha)A_T K_T^{\alpha} q_T^{1-\alpha} L_T^{-\alpha} \qquad L_T^D = \left[\frac{p_T(1-\alpha)A_T}{w_T}\right]^{1/\alpha} K_T q^{(1-\alpha)/\alpha}$$

- In the informal sector, wage is the average product of labor:

$$w_N = p_N A_N L_N^{-\alpha}$$

- Employment in the informal sector is derived from utility maximization (Assuming CES ut. function):

$$\frac{C_T}{C_N} = \left(\frac{\gamma}{1-\gamma}\right)^{\rho}\left(\frac{p_N}{p_T}\right)^{\rho} \qquad L_N^D = \left[q(1-\alpha)\frac{p_T}{w_T}\right]^{\frac{1}{\alpha}} K_T^{\frac{1}{1-\alpha}}\left(\frac{A_T}{A_N}\right)^{\frac{1}{\alpha(1-\alpha)}}\left(\frac{p_T}{p_N}\right)^{\frac{\rho}{1-\alpha}}\left(\frac{1-\gamma}{\gamma}\right)^{\frac{\rho}{1-\alpha}}$$

Basic Model – Results

- Labor market clearing condition:

$$L_N^S = L - L_T \frac{w_T}{w_N}$$

- the real exchange rate devaluation raises employment in tradables and lower unemployment:

$$l_T = \left(\frac{w_T}{w_N}\right) = A_T^{-1/\alpha} q^{\frac{\alpha-1}{\alpha}} \left\{ L\left(\frac{w_T}{p_T(1-\alpha)}\right)^{1/\alpha} - \left(\frac{p_T(1-\gamma)}{p_N\gamma}\right)^{\frac{\rho}{1-\alpha}} K_T^{\frac{1}{1-\alpha}} q^{1/\alpha} \left(\frac{A_T}{A_N}\right)^{\frac{1}{\alpha(1-\alpha)}} \right\}$$

$$l_T = \frac{w_N}{w_T} = l_T(q, K_T, L, \frac{w_T}{p_T}, \frac{A_T}{A_N}, \frac{p_T}{p_N}) \qquad l_1 > 0, l_2 > 0, l_3 < 0, l_4 < 0, l_5 > 0, l_6 > 0$$

- Since $u_t = 1 - \frac{w_T}{w_N} = 1 - l_T$ $\qquad u_1 < 0, u_2 < 0, u_3 > 0, u_4 > 0, u_5 < 0, u_6 < 0$

Basic Model – Results (cont.)

- **Sources of growth of the aggregate output** $Y = Y_T + Y_N$
- **In the tradable sector:**

$$\dot{Y}_T = \dot{A}_T + \alpha\dot{K}_T + (1-\alpha)\dot{L}_T + (1-\alpha)\dot{q}$$

- **In the non-tradable sector:** $\dot{Y}_N = \dot{A}_N + (1-\alpha)\dot{L}_N$

- **Hence lasting RER depreciation may lead to:**

– temporarily higher growth due to one-off increase in employment and
– permanently lower unemployment and more labor intensive growth and

- **But, permanently higher growth can come only from sustained changes in technological progress and accumulation of human capital**

Empirical investigation

- Sample
- Specification
- Estimation techniques

Methodology

- 85 countries, 1500 observations, period covering 1990-2012, unbalanced panel
- Static and dynamic estimations using fixed effect OLS and first-difference GMM estimators
- Regressors: real effective exchange rate returns and real exchange rate volatility
- Note: Increase in RER is an appreciation
- volRER is standard deviation of dRER over 5 years
- Controls include real GDP growth, openness, inflation and real interest rate

Estimated specification

- EG= employment growth

STATIC VERSION

EG= f(dRER, controls)

DYNAMIC VERSION

EG= f(EG(-1),dRER, controls)

ALL COUNTRIES

- dRER => no effect in growth specification
- RER=> expected negative effect in level spec

	STATIC FE OLS				DYNAMIC FE OLS				DYNAMIC 1st-DIFF GMM				NONLINEARITY			
	DEPENDENT VARIABLE = d_emp - GROWTH SPECIFICATION															
c	1.728***	1.393***	0.362	1.726***	1.274***	0.947***	-0.018	1.273***	1.339***	0.582*	-1.788	1.304***	1.727***	1.394***	0.336	1.725***
d_emp(-1)					0.274***	0.264***	0.267***	0.274***	0.292***	0.329***	0.29***	0.348*				
d_rer	0.004	0.003	0.003	0.004	0.001	0.0004	0.001	0.002	-0.057	-0.031	-0.093	-0.036	0.011*	0.008	0.011*	0.011*
d_gdp		0.098***				0.099***				0.191***				0.097***		
open			0.031***				0.029***				0.071				0.032***	
infl				0.0001				0.00002				-0.003				0.0001
d_rer^2													-0.00002	-0.00002	-3e-05*	-0.00002
R2-adj	0.31	0.34	0.32	0.31	0.37	0.40	0.38	0.37					0.31	0.34	0.32	0.31
AIC	4.33	4.28	4.31	4.33	4.21	4.16	4.20	4.21					4.32	4.28	4.31	4.33
SIC	4.62	4.58	4.61	4.62	4.52	4.48	4.51	4.53					4.62	4.59	4.61	4.63
J-stat									0.00	0.00	0.00	0.00				
	DEPENDENT VARIABLE = emp - LEVEL SPECIFICATION															
c	15.429***	15.426***	15.164***	15.432***	0.208***	0.173***	0.255***	0.207***	0.414***	0.23***	0.443***	0.437***	15.447***	15.441***	14.704***	15.356***
emp(-1)					0.99***	0.991***	0.985***	0.99***	0.978***	0.984***	0.974***	0.976***				
rer	-0.091***	-0.09***	-0.072***	-0.091***	-0.007***	-0.004	-0.006*	-0.007***	-0.014***	0.003	-0.012***	-0.011	-0.098	-0.096	0.117	-0.06
d_gdp		0.0002				0.001***				0.003***				0.0002		
open			0.004***				0.0004***				0.0004***				0.004***	
infl				-1e-05*				0				-0.00001				-1e-05*
rer^2													0.001	0.001	-0.02	-0.003
R2-adj	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00					0.99	0.99	0.99	0.99
AIC	-1.13	-1.13	-1.19	-1.13	-4.96	-5.00	-4.97	-4.95					-1.13	-1.13	-1.19	-1.13
SIC	-0.83	-0.83	-0.89	-0.83	-4.64	-4.69	-4.66	-4.64					-0.83	-0.82	-0.88	-0.83
J-stat									0.00	0.00	0.00	0.00				

AFRICAN COUNTRIES

- dRER => no effect in growth specification
- RER=> expected negative effect in static level specification

	STATIC FE OLS				DYNAMIC FE OLS				DYNAMIC 1st-DIFF GMM				NONLINEARITY			
	DEPENDENT VARIABLE = d_emp - GROWTH SPECIFICATION															
c	2.774***	2.723***	2.826***	2.77***	2.415***	2.361***	2.378***	2.414***	4.689***	4.034***	6.175	4.273*	2.769***	2.718***	2.837***	2.766***
d_emp(-1)					0.144***	0.142***	0.144***	0.143***	-0.625	-0.744	-0.693	-0.454				
d_rer	-0.002	-0.002	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.045	-0.034	0.002	-0.023	-0.007	-0.007	-0.007	-0.007
d_gdp		0.013				0.014				0.231				0.013		
open			-0.001				0.001				-0.037				-0.002	
infl				0.00004				0.00002				-0.001				0.00003
d_rer^2													0.00002	0.00002	0.00002	0.00002
R2-adj	0.00	-0.01	-0.01	-0.01	0.02	0.02	0.01	0.01					0.00	-0.01	-0.01	-0.01
AIC	4.32	4.32	4.33	4.33	4.21	4.21	4.21	4.21					4.32	4.33	4.33	4.33
SIC	4.54	4.56	4.56	4.56	4.45	4.46	4.47	4.47					4.56	4.57	4.57	4.57
J-stat									0.00	0.00	0.00	0.00				
	DEPENDENT VARIABLE = emp - LEVEL SPECIFICATION															
c	15.644***	15.587***	15.239***	15.647***	0.139	0.139	0.138	0.136	0.197*	0.154	0.18	0.221	17.524***	17.303***	15.149***	17.384***
emp(-1)					0.994***	0.994***	0.994***	0.994***	0.989***	0.99***	0.992***	0.987***				
rer	-0.132***	-0.122***	-0.087***	-0.133***	-0.004	-0.004	-0.004	-0.004	-0.001	0.004	-0.004	0.001	-0.878***	-0.801***	-0.052	-0.822***
d_gdp		0.002*				0.0001				0.001				0.002		
open			0.005***				-0.00001				-0.0002				0.005***	
infl				-0.00001				0				0				-0.00001
rer^2													0.073***	0.067*	-0.003	0.068*
R2-adj	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00					0.99	0.99	0.99	0.99
AIC	-0.78	-0.78	-0.86	-0.78	-5.05	-5.05	-5.05	-5.05					-0.78	-0.78	-0.86	-0.78
SIC	-0.55	-0.55	-0.63	-0.55	-4.81	-4.80	-4.79	-4.79					-0.55	-0.54	-0.61	-0.54
J-stat									0.00	0.00	0.00	0.00				

NON-AFRICAN COUNTRIES

- dRER => mostly positive effect in growth specification
- RER=> expected negative effect in dynamic level spec

	STATIC FE OLS				DYNAMIC FE OLS				DYNAMIC 1st-DIFF GMM				NONLINEARITY			
	DEPENDENT VARIABLE = d_emp - GROWTH SPECIFICATION															
c	1.38***	0.813***	-0.875***	1.385***	0.969***	0.395***	-0.969***	0.978***	0.944***	0.213	-0.754	0.891***	1.409***	0.784***	-0.833***	1.409***
d_emp(-1)					0.307***	0.294***	0.291***	0.308***	0.457***	0.503***	0.421***	0.34***				
d_rer	0.032***	0.024***	0.034***	0.032***	0.023***	0.009	0.024***	0.023***	-0.188*	-0.14	-0.136	-0.058	0.033***	0.023***	0.034***	0.032***
d_gdp		0.177***				0.184***				0.192***				0.18***		
open			0.049***				0.042***				0.037***				0.049***	
infl				-0.001				-0.001				0.019*				0.0001
d_rer^2													-0.001	0.0004	-0.0005	-0.001
R2-adj	0.33	0.39	0.35	0.33	0.40	0.46	0.41	0.40					0.33	0.39	0.35	0.33
AIC	4.32	4.23	4.29	4.32	4.20	4.09	4.18	4.20					4.32	4.23	4.29	4.32
SIC	4.60	4.51	4.57	4.60	4.50	4.40	4.48	4.50					4.60	4.52	4.58	4.61
J-stat									0.00	0.00	0.00	0.00				
	DEPENDENT VARIABLE = emp - LEVEL SPECIFICATION															
c	15.178***	15.192***	15.034***	15.171***	0.25***	0.157***	0.312***	0.252***	0.529***	0.232***	0.581***	0.584***	5.216***	4.448***	8.113***	4.942***
emp(-1)					0.988***	0.993***	0.982***	0.988***	0.973***	0.985***	0.968***	0.973***				
rer	-0.038	-0.039	-0.041	-0.036	-0.011***	-0.008	-0.011***	-0.011***	-0.025***	-0.001	-0.024***	-0.036	4.342***	4.686***	3.007***	4.457***
d_gdp		-0.002***				0.002***				0.004***				-0.003***		
open			0.004***				0.001***				0.001***				0.003***	
infl				0.00002				-0.00001				-0.0001				0.0001
rer^2													-0.481***	-0.519***	-0.335***	-0.493***
R2-adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00					1.00	1.00	1.00	1.00
AIC	-1.27	-1.27	-1.32	-1.27	-4.92	-5.03	-4.96	-4.92					-1.29	-1.29	-1.32	-1.29
SIC	-0.99	-0.99	-1.03	-0.98	-4.63	-4.73	-4.66	-4.62					-1.00	-1.00	-1.03	-1.00
J-stat									0.00	0.00	0.00	0.00				

EMERGING COUNTRIES (NON-AFRICAN)

- dRER => no effect in growth specification
- RER=> expected negative effect in level spec

	STATIC FE OLS				DYNAMIC FE OLS				DYNAMIC 1st-DIFF GMM				NONLINEARITY			
	DEPENDENT VARIABLE = d_emp - GROWTH SPECIFICATION															
c	1.7***	1.217***	-0.511	1.703***	1.271***	0.746***	-0.9*	1.28***	0.899***	0.334	-1.375	0.934***	1.713***	1.172***	-0.499	1.713***
d_emp(-1)					0.248***	0.241***	0.231***	0.249***	0.61***	0.647***	0.541***	0.39***				
d_rer	0.021***	0.014	0.023***	0.021***	0.017	0.004	0.018*	0.018*	-0.256	-0.214	-0.174	-0.057	0.021***	0.013	0.023***	0.021***
d_gdp		0.131***				0.147***				0.124				0.135***		
open			0.044***				0.043***				0.046*				0.044***	
infl				-0.0003				-0.001				0.02*				-0.00003
d_rer^2													-0.0002	0.0005	-0.0001	-0.0002
R2-adj	0.35	0.38	0.36	0.35	0.39	0.43	0.41	0.39					0.35	0.38	0.36	0.35
AIC	4.41	4.36	4.39	4.42	4.35	4.28	4.33	4.36					4.42	4.36	4.39	4.42
SIC	4.68	4.64	4.66	4.69	4.64	4.58	4.62	4.65					4.69	4.64	4.67	4.70
J-stat									0.00	0.00	0.00	0.00				
	DEPENDENT VARIABLE = emp - LEVEL SPECIFICATION															
c	15.09***	15.096***	14.99***	15.096***	0.175*	0.128	0.23***	0.177*	0.385***	0.222***	0.433***	0.446*	4.207	3.542	6.778***	4.055
emp(-1)					0.992***	0.994***	0.987***	0.992***	0.981***	0.987***	0.976***	0.98***				
rer	-0.101***	-0.101***	-0.116***	-0.103***	-0.009	-0.007	-0.01*	-0.009	-0.021***	-0.004	-0.022***	-0.031	4.69***	4.986***	3.506***	4.753***
d_gdp		-0.002				0.002***				0.003***				-0.002*		
open			0.003***				0.001***				0.001***				0.003***	
infl				-0.00002				-0.00001				-0.0001				0.00004
rer^2													-0.526***	-0.559***	-0.398***	-0.533***
R2-adj	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00					0.99	0.99	0.99	0.99
AIC	-1.04	-1.04	-1.08	-1.04	-4.82	-4.89	-4.85	-4.82					-1.06	-1.07	-1.09	-1.06
SIC	-0.77	-0.77	-0.80	-0.77	-4.53	-4.59	-4.56	-4.52					-0.79	-0.78	-0.81	-0.78
J-stat									0.00	0.00	0.00	0.00				

Conclusions

- **THEORETICAL MODEL**
  - Lasting real exchange rate depreciation may raise employment, provided that offsetting factors (e.g., rising labor force) do not dominate
- **EMPIRICAL RESULTS**
  - No robust empirical evidence in Africa that employment growth is related to changes in the real exchange rate
  - Maybe a statistical problem of measuring employment?
  - Evidence a bit stronger, though not overwhelming, for non-African countries

FUTURE RESEARCH

- Modify the model for searching frictions as in Mortensen & Pissaridies, to make it applicable also to advanced economies
- Look into low income and lower-middle income groups
- Look more at individual countries
- Integrating human capital and innovation
- Looking at the impact of RER on T/NT prices

Thank you.