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Assessing the Old Export Channel with Panel Cointegration Test: The Westerlund Panel Cointegration Test

Oscar Kuikeu, PhD in Economics, Lecturer
Department of International Management of International Trade,
Higher School of Economics and Commercial Studies,
University of Douala, Cameroon

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Abstract

Background: according to the Old Export channel the external competitiveness account for the dynamics of a country's export performance. Nevertheless the New Export channe is now presented as the main framework in explaining export performance with the domestic demand as the main driving force of exports. This reverse explanations is generally attributed to some stylized facts concerning the international trade, as in Africa the high tendency of these countries to have exports concentrated in natural resources a products for which the externational competiteveness have limited ground since the price of these raw materials products result from the law of supply and demand in the international markets ; in Europe the difference in manufacturing performance between the Germany in the one hand and the France, Italy and Spain in the other, this difference resulting from the demand policy applies by the former mainly austerity policy.

Aims: in a recent study, the literature reachs to the outcome thzt when the evidence of cointegration is strong there is no hope to observe the New Export channel. In fact, the Old Export channe lis mainly an long term relationship while the New Export channe lis an short run evidence. Then the aim of thsi pape ris to revisite the issue of cointegration in the Model governing the Exports dynamics.

Method: currently to test evidence of cointegration in the Model underlying the Exports dynamics **the standard** cointegration technique have been used into the literature**. Nevertheless these one are considered are first generation test**. Then to overcome the evidence of cointegration in the Model underlying the Exports dynamics we use here a second generation cointegration test that relies on the pooled estimation of the Model than individual or country's estimates and finally the computation, of the asymptotic p value as usually.

Main findings: according to the obtained resultttsss the Old Export channe lis well assess into the CEMAC area since the second generation of panel cointegration cannot acepeted the null of no cointegration at the standard level according to the computed statistics.

Conclusion: depite the findings that when the evidence of cointegration is strong there is no or little hope to observe the New Export channel in the short run with this study we reach to an another outcome according to hich even when the evidence of cointegration s few there is no doubt that is an cointegrating relationship or the assessment of the Old Export channel.

Keywords: External competitiveness, Domestic Demand, Error Correction Model, Cointegration, Panel

1. Introduction

Several tests have been employed to examine the issue of cointegration in the Models underlying the exports dynamics. In times series modelling (Kuikeu, 2025a) in the one hand the Johansen and Juselius (1992) cointegration rank test. In the other hand (Kuikeu, 2026a), the Single Equation Approach, and finally (Kuikeu, 2026b ; Kuikeu, 2026d) the ARDL Bound testing of Pesaran et al (2001).

Concerning panel data modelling, we have (Kuikeu, 2025b) the Pedroni (2000, 1996, 1995, 1999) cointegration test in the one hand. In the other hand (Kuikeu, 2026c, Kuikeu, 2026 e) the PMG and MG estimates.

Then in a panel data framework, Kuikeu (2026 e) examining the short run dynamics for the Model underlying the New Export channel finds that there is no evidence of an inverse relationship between domestic demand and export performance i.e the New Export channel. Considering that the evidence of cointegration is almost strong than the previous studies in the literatute for which there is an inverse relationship between domestic demand and export the study reaches to the outcome that when the evidence of cointegration is strong there is no hope to observe the New Export channel in the short run.

For this purpose this paper aims of reconsidering the issue of cointegration in the Model underlying the export dynamics, in a panel data framework. Considering that the preceding tst used into the literature are first generation tests (Pedroni, 2000, 1996, 1995, 1999). ; Pesaran et al, 2001, 1999) the present study will relies on esterlund panel cointegration test (Westerlund, 2007) that is a second generation cointegration test. The procedure is standard and consist to estimate the Pool regression and the the individual ECM after this to obtain in each case the student t statistic that is the mean in the second case and to evaluate the standard asymptotic p value for he null of no cointegration.

This study will be organise as follow, in the next section (section 2) we present the Method, in section 3 the Results and finnaly in section 4 asummry of the main results as concludng remarks.

2. Method

We assume that the export market share of the country *i* at time *t* (the difference between exports of goods and services X_{it} and the foreign demand D_{it}) follows both short run and long-run determinants. For the long-run dynamics, we consider the Real effective exchange rate $REER_{it}$ a price/cost competitiveness indicator defined such as an increase represents an appreciation. For the short-run behavior, the export market share is explained by its own evolution in the previous year, and the present and past developments of the real exchange rate $REER_{it}$ and domestic demand DD_{it} (Esteves and Rua, 2013 ; Bobeica and *al.*, 2015 ; Esteves and Prades, 2016).

Thus considering an error correction model for annual data:

$$\Delta X_{it} - \Delta D_{it} = \alpha_i + \beta(\Delta X_{it-1} - \Delta D_{it-1}) + \sum_{k=0}^{1} \varphi_k \Delta REER_{it-k} + \sum_{l=0}^{1} \omega_l \Delta DD_{it-l} + +\theta(X_{t-1} - D_{t-1}) + \lambda REER_{t-1} + \varphi t \quad (1)$$

where Δ is the first difference operator. The Model considers all the variables except the trend measured in log allowing for a maximum of one lag. The interpretation of the time trend is not straightforward as it can capture the long-run effects of the so-called non-price competitiveness factors.

In term of formulation, this Model constrats with Belke et al (2014, 2013)'s capacity constraints[1] models (Kuikeu, 2025b). we assess the role of capacity constraints in explaining this substitution effect by the alternative explanative of domestic demand as given by the output gap. As in the standard case, we assume that "production potential" (the difference between exports of goods and service X and production Y) follows both short run and long-run determinants. For the long-run dynamics, we consider the Real effective exchange rate $REER_{it}$ a price/cost competitiveness indicator defined such as an increase represents an appreciation. For the short-run behavior, the "production potential" is explained by its own evolution in the previous year, and the present and past developments of the real exchange rate $REER_{it}$ and the domestic demand as given by the output gap $YGAP$:

$$\Delta X_{it} - \Delta Y_{it} = \alpha_i + \beta(\Delta X_{it-1} - \Delta Y_{it-1}) + \sum_{k=0}^{1} \varphi_k \Delta REER_{it-k} + \sum_{l=0}^{1} \omega_l YGAP_{it-l} + \theta(X_{t-1} - Y_{t-1}) + \lambda REER_{t-1} + \varphi t \quad (2)$$

where Δ is the first difference operator. The model considers all the variables except the trend and the output gap measured in log allowing for a maximum of one lag. The interpretation of the time trend is not straightforward as it can capture the long-run effects of the so-called non-price competitiveness factors.

Method

We will evaluate two of the four statistics of the Westerlund (2007) cointegration test. Gt the Mean-group tau statistic i.e the mean of the individual t-ratios $\hat{\alpha}_i / \widehat{se}(\hat{\alpha}_i)$ and the Pt the Pooled tau statistic i.e a pooled t-type statistic based on a pooled $\hat{\alpha}$ and its pooled standard error. P-values are computed as a left-tail test.

[1] The capacity constraints model of Belke et al (2014, 2013) is another line of modelling exporting dynamics that explain the substitution effect between domestic demand and exports by avoiding the use of foreign demand variable (D) who is scare and costly to compute. According to this reasonning, generally, it is argued that increases in export demand cannot be satisfied in the short-run when capacity utilisation is high and when production is sold mainly on the domestic market. Conversely, during a domestic recession, firms will be able to shift more resources to export activities. In these periods, firms strive to compensate for the decline in domestic sales through increased efforts to export in order to stay in or enter the export market. That is the role of capacity constraints in this substitution effect between exports and domestic sales

Data Set

The macroeconomic data set covers 1974 to 2021 in annual frequency thus 41 observations measured in real terms. The time frame is bounded by the availability of real exchange rates series where the data is available between 1973-2021 It were able to use the data coming from the World Bank but in this case this would be done at the cost of missing two countries namely Chad and Congo.

Table 1 presents the variables used in the analysis.

Table 1 : List of Variables

Variables	Definition	Units	Abreviation	Source
The exportations of goods and services	The value of all goods and other markets services provided to the rest of the world.	$ US constant of 2015	X	World Bank, WDI
The foreign demand	The imports of goods and services of the main trading partners.	$ US constant of 2015	D	World Bank, WDI
The real effective exchange rate	The price/cost competitiveness indicator of the home economy compare to the foreign partner.	Base 100=2010	$REER$	Cepii, EQCHANGE
The GDP gap as percent of potential GDP	The output gap computed using the Hodrick-Prescott[2] filter with the smoothing parameter set to 100	$YGAP$	World Bank, WDI	
The domestic demand	The final demand including private and public consumption and gross fixed capital formation[3].	$ US constant of 2015	DD	World Bank, WDI

Source: Author

3. Result

These results were grouped according to the Model of exports dynamics. We begin first with the basic model (equation 1) and following with the capacity constraints model (equation 2).

3.1. Pooled tau statistic

We begin with the standard IPS (Im, Pesaran and Shin, 1997) unit root test. The results are reported in the following Table 2.

[2] Hodrick and Prescott (1997).

[3] Esteves and Rua (2013, p. 15).

Table 2: Im, Pesaran and Shin (1997) unit root test

H0: unit root for all cross sections		Im-Pesaran-Shin	
		Constant	Trend
$REER$	(1)	-0.78	-0.48
	(2)		
X	(1)	-0.10	
	(2)		
D	(1)		
	(2)		
$YGAP$	(1)	-10.25***	-9.18***
	(2)		
DD	(1)		
	(2)		

Source: Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%).
(1) = Level, (2) = First Difference.

Considering these stochastic properties of the series where the IPS test can not readily be dome for some of one this may justify the pool regresion approach in order to stacke the data and disgard the missing observations. In the first time we present the the Basic model (3.1.1) and after the capacity constraints model (3.1.2).

3.1.1. Basic model

Then now we can run the Pool ECM regression and compute the pooled t-type statistic with the associated p value. This will done according to three Row, Row 1 : Model with constant and trend, Row 2 : Model with constant without trend and finally Row 3 : Model without constant and trend.

Table 3: Model with constant and trend

$\Delta X_t - \Delta D_t$	(1) OLS
Error Correction Term	
$X_{t-1} - D_{t-1}$	-0.01 (0.01)
Long Run parameters	
$REER_{t-1}$	0.19 (0.13)
t	0.00 (0.01)
t^2	0.00 (0.00)
Short Run parameters	
$Constant$	-1.02 (0.78)
$\Delta REER$	0.07 (0.12)
ΔDD	-0.10 (0.11)

$\Delta X_{t-1} - \Delta D_{t-1}$	0.07 (0.07)
Statistics	
Nobs	103
Sample	1974-2021
N	6
Adjusted R^2	0.10

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Table 4: Model with constant without trend

$\Delta X_t - \Delta D_t$	(1) OLS
Error Correction Term	
$X_{t-1} - D_{t-1}$	-0.01** (0.01)
Long Run parameters	
$REER_{t-1}$	0.10 (0.07)
Short Run parameters	
$Constant$	-0.49 (0.34)
$\Delta REER$	0.04 (0.14)
ΔDD	-0.15 (0.11)
$\Delta X_{t-1} - \Delta D_{t-1}$	0.07 (0.08)
Statistics	
Nobs	103
Sample	1974-2021
N	6
Adjusted R^2	0.02

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Table 5: Model without constant and trend

$\Delta X_t - \Delta D_t$	(1) OLS
Error Correction Term	
$X_{t-1} - D_{t-1}$	-0.01** (0.01)
Long Run parameters	
$REER_{t-1}$	-0.00 (0.00)
Short Run parameters	
$\Delta REER$	0.03 (0.13)
ΔDD	-0.19*

	(0.11)
$\Delta X_{t-1} - \Delta D_{t-1}$	0.10 (0.08)
Statistics	
Nobs	103
Sample	1974-2021
N	6
Centered R^2	0.07

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Then according to Tables 3 to 5 the Pt the Pooled tau statistic are given in the following Table 6 :

Table 6: The pooled tau statistics for the Basic model

Pt	Value	P value
Model with constant and trend	-1.40	0.08
Model with constant and no trend	-1.99	0.02
Model without constant and trend	-1.51	0.06

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level.

Then the null hypothesis of no cointegration is readily rejected respectively at the 5%, 1% and 5% level.

Westerlundis pooled statistics can be sensitive to nuisance parameters and cross sectional dependence in finite samples. Then bootstrap p values provide a more robust inference than asymptotic p value. Then to have an extend of this the following Table 7 provides the classical tet of Pesaran (2007) for each Row and in the case of cross dependence the bootstrap p value.

Table 7: More acurate inference for the pooled statistics for Basic model

Row	*Pesaran CD* *H0: no correlation between the cross-sections*	Bootstrap p value 1000 Replications
Model with constant and trend	1.44 **(0.149)**	0.861
Model with constant and no trend	1.55 **(0.12)**	0.588
Model without constant and trend	1.85 **(0.06)**	

Source : Author, (.) the significance level.

3.1.2. Capacity constraints models

Then now we can run the Pool ECM regression and compute the pooled t-type statistic with the associated p value. This will done according to three Row, Row 1 : Model with constant and trend, Row 2 : Model with constant without trend and finally Row 3 : Model without constant and trend.

Table 8: Model with constant and trend

$\Delta X_t - \Delta Y_t$	(2) OLS
Error Correction Term	
$X_{t-1} - Y_{t-1}$	-0.02 (0.01)**
Long Run parameters	
$REER_{t-1}$	-0.02 (0.02)
t	-0.00 (0.00)
t^2	0.00 (0.00)
Short Run parameters	
$Constant$	0.14 (0.13)
$\Delta REER$	-0.08** (0.04)
$YGAP$	-0.34*** (0.10)
$\Delta X_{t-1} - \Delta Y_{t-1}$	-0.05 (0.05)
Statistics	
Nobs	177
Sample	1974-2021
N	6
Adjusted R^2	0.55

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Table 9: Model with constant without trend

$\Delta X_t - \Delta Y_t$	(2) OLS
Error Correction Term	
$X_{t-1} - Y_{t-1}$	-0.02* (0.01)
Long Run parameters	
$REER_{t-1}$	0.00 (0.03)
Short Run parameters	
$Constant$	-0.04 (0.16)
$\Delta REER$	-0.09** (0.03)
$YGAP$	-0.29*** (0.10)
$\Delta X_{t-1} - \Delta Y_{t-1}$	-0.07 (0.06)
Statistics	

Nobs	177
Sample	1974-2021
N	6
Adjusted R^2	0.20

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Table 10: Model without constant and trend

$\Delta X_t - \Delta Y_t$	(2) OLS
Error Correction Term	
$X_{t-1} - Y_{t-1}$	-0.02** (0.00)
Long Run parameters	
$REER_{t-1}$	-0.00* (0.00)
Short Run parameters	
$\Delta REER$	-0.10 (0.13)
$YGAP$	-0.22** (0.06)
$\Delta X_{t-1} - \Delta Y_{t-1}$	-0.04 (0.04)
Statistics	
Nobs	177
Sample	1974-2021
N	6
Centered R^2	0.03

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Then according to Tables 8 to 10 the Pt the Pooled tau statistic are given in the following Table 11:

Table 11: The pooled tau statistics for the Capacity constraints model

Pt	Value	P value
Model with constant and trend	-2.244	0.01
Model with constant and no trend	-1.767	0.04
Model without constant and trend	-3.257	0.00

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level.

Then the null hypothesis of no cointegration is readily rejected respectively at the 5%, 5% and 1% significance level.

Table 12: More acurate inference for the pooled statistics for Capacity constraints model

Row	*Pesaran CD* *H0: no correlation between the cross-sections*	Bootstrap p value 1000 Replications
Model with constant and trend	0.60 **(0.548)**	0.000
Model with constant and no trend	0.71 **(0.476)**	0.000
Model without constant and trend	0.75 **(0.451)**	0.002

Source : Author, (.) the significance level.

3.2. Mean-group tau statistic

Considering the data availability the Basic model can not not be done and for this purpose we present just the capacity constraints model. We begin with the individual countries unit root tests (3.2.1), after the individual country's regression and finally the computation of the Gt the Mean-group tau statistic (3.2.2).

3.2.1. Country's unit root tests

Table 13: ADF unit root tests

Series		Cameroon	Central African Republic	Chad	Congo	Equatorial Guinea	Gabon
X	(1)	-2.89			-0.06*		0.00
	(2)	-1.44***					-0.78***
$REER$	(1)	-0.14	-0.00	-0.07	-0.21	-0.97***	-0.00
	(2)	-0.89***	-1.04***	-1.11***	-1.08***		-1.00***
Y	(1)	-0.13*	-0.32	-0.20	-0.04	-0.03	-0.76***
	(2)		-1.04***	-1.20*	-0.48***	-0.35***	
$YGAP$		-0.68***	-0.53***	-0.75***	-0.31***	-2.33***	-1.08***

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. (1) = Level, (2) = First Difference.

Considering these stochastic properties concerning the series the individual regression will then be run for three countries: Cameroon, Congo and Gabon. These are presented in the following Table 14 to 16 respectively for each Row.

3.2.2. Country's regression

Then now we can run the individual ECM regression and compute the mean t-type statistic with the associated p value. This will done according to three Row, Row 1 : Model with constant and trend, Row 2 : Model with constant without trend and finally Row 3 : Model without constant and trend.

Table 14: Model with constant and trend

$\Delta X_t - \Delta Y_t$	**Cameroon OLS**	**Congo OLS**	**Gabon OLS**
Error Correction Term			
$X_{t-1} - Y_{t-1}$	**-0.62*** (0.15)**	**-0.35*** (0.08)**	**0.02 (0.12)**
Long Run parameters			
$REER_{t-1}$	**-0.13 (0.12)**	**-0.35*** (0.09)**	**0.23* (0.12)**
t	**0.03*** (0.01)**	**0.00 (0.00)**	**0.00 (0.01)**
t^2	**0.00*** (0.00)**	**-0.00 (0.00)**	**0.00 (0.00)**
Short Run parameters			
$Constant$	**-0.66 (0.64)**	**1.38* (0.43)**	**-1.21* (0.70)**
$\Delta REER$	**-0.44* (0.24)**	**-0.07 (0.10)**	**0.13 (0.20)**
$YGAP$	**0.02 (0.32)**	**-0.45** (0.17)**	**-0.22 (0.19)**
$\Delta X_{t-1} - \Delta Y_{t-1}$	**0.19 (0.15)**	**0.22** (0.10)**	**-0.28 (0.19)**
Statistics			
Nobs	**46**	**46**	**46**
Sample	**1976-2021**	**1976-2021**	**1976-2021**
N	**6**	**6**	**6**
Adjusted R^2	**0.26**	**0.20**	**0.40**

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Table 15: Model with constant without trend

$\Delta X_t - \Delta Y_t$	**Cameroon OLS**	**Congo OLS**	**Gabon OLS**
Error Correction Term			
$X_{t-1} - Y_{t-1}$	**-0.19*** (0.05)**	**-0.37*** (0.05)**	**-0.13* (0.07)**
Long Run parameters			
$REER_{t-1}$	**0.00 (0.09)**	**-0.37*** (0.05)**	**0.10** (0.05)**
Short Run parameters			
$Constant$	**-0.31 (0.42)**	**1.48*** (0.21)**	**-0.58** (0.22)**
$\Delta REER$	**-0.71** (0.29)**	**-0.03 (0.10)**	**0.13 (0.17)**
$YGAP$	**0.10 (0.39)**	**-0.70*** (0.19)**	**-0.39** (0.18)**
$\Delta X_{t-1} - \Delta Y_{t-1}$	**0.02 (0.09)**	**0.17* (0.10)**	**0.05 (0.17)**
Statistics			

Nobs	**46**	**46**	**46**
Sample	**1976-2021**	**1976-2021**	**1976-2021**
N	**6**	**6**	**6**
Adjusted R^2	**0.36**	**0.75**	**0.22**

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Table 16: Model without constant and trend

$\Delta X_t - \Delta Y_t$	**Cameroon OLS**	**Congo OLS**	**Gabon OLS**
Error Correction Term			
$X_{t-1} - Y_{t-1}$	**-0.21*** (0.04)**	**-0.16*** (0.05)**	**-0.12 (0.07)**
Long Run parameters			
$REER_{t-1}$	**-0.06*** (0.01)**	**-0.02** (0.00)**	**-0.01 (0.01)**
Short Run parameters			
$\Delta REER$	**-0.70** (0.29)**	**0.22 (0.13)**	**-0.15 (0.15)**
$YGAP$	**0.05 (0.38)**	**-0.27 (0.20)**	**-0.19 (0.18)**
$\Delta X_{t-1} - \Delta Y_{t-1}$	**0.05 (0.08)**	**0.37** (0.14)**	**-0.12 (0.16)**
Statistics			
Nobs	**46**	**46**	**46**
Sample	**1976-2021**	**1976-2021**	**1976-2021**
N	**6**	**6**	**6**
Centered R^2	**0.46**	**0.28**	**0.11**

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level. *Nobs* is available observations, (.) standard deviation. **(.)** the significance level.

Then according to Tables 14 to 16 the Gt the **Mean-group tau statistic** are given in the following Table :

Table 17: The Mean-group tau statistics for the Capacity constraints model

Pt	Value	P value
Model with constant and trend	-4.733	0.00
Model with constant and no trend	-10.745	0.00
Model without constant and trend	-3.046	0.00

Source : Author, *** (**, *) null hypothesis is rejected at the 1% (5%, 10%) significance level.

Then the null hypothesis of no cointegration is readily rejected at the 1% significance level

Conclusion

Considering the tau statsistics of the Westerlund (2007) panel cointegration test we cannot accept the null hypothesis of no cointegration in th model underlying the exports dynamics. Then the Old explanations of exports hold. Then whenever when the evidence of cointegration is strong here is no or little hope to observe the New Export channel in the short run even when the evidence of cointegration is few this is already an cointegrating relationship. Concerning the estimates there is evidence that the Export channel hold with the New Export channel mainly for country's ECM regression. In fact, in some cases the Real Exchange Rate have a significant negative effect on exports dynamics while concerning the New Expot channerl there s case where the outpu gap haved a negative significant effect on exports dynamics. Concerning the pool regression the evidence is less clear as the parameters are generally non significative.

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