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**The causal link between Trade Openness and Government Size: Evidence  
from the five largest economies in Africa**

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**Abstract**

**Purpose** – *The purpose of this paper is to examine the causal link between trade openness and government size for the five largest economies in Africa taking into account the role of compensation hypothesis in an economy.*

**Design/methodology/approach** – *Time series data for five countries covering the period 1970 to 2010 was used for the analysis. The data was obtained from Penn table and World development indicator (WDI). The causality test adopted for this study is based on the ECM framework. This was done for each of the five countries selected.*

**Findings** – *Empirical evidence show a positive causal link between trade openness and government size for Nigeria and Algeria. In the case of South Africa negative causality was found while there was no causality for Angola and Egypt. Therefore, the government of these countries need to spend productively in order to cushion the effect of exposure to risks.*

**Research limitations/implications** – *The need to consider the sustainability of growth due to increasing demand for African countries to diversify their economy in order to take advantage of its export potential and enjoy the gains of trade led to the consideration of the five largest economies in Africa. However, the same causality approach can be applied for other African countries.*

**Originality/value** – *The results tend to support the existence of compensation hypothesis for Nigeria and Algeria.*

**Keywords:** Compensation-Hypothesis, Algeria, Angola, Egypt, South Africa, Nigeria

**JEL Classification:** F41, H11

## **1. Introduction**

The compensation hypothesis as proposed by Cameron (1978) marks the first theoretical link on the relationship between trade openness and government size. This hypothesis suggests that there is a positive causal relationship running from trade openness to government size. This assertion is adduced from the fact that as a country becomes increasingly open to bilateral and multilateral trade, there is likelihood of greater exposure to external risk, thus informing the need to increase the size of government to serve as a source of social insurance to the citizenry.

Empirical studies testing the validity of this hypothesis range from country-specific (time series) to cross-country (cross-sectional) analysis. The submission of these studies has been mixed. For example; the cross-country study by Rodrik (1998) which was the first investigation of this issue, reveal a positive causal link between trade openness and government size. Cross-country study by Alesina and Wacziarg (1998); Garen and Trask (2005); Benarroch and Pandey (2009) and Ram (2009) all point to a negative association between openness and government size. Further, country-specific studies like Molana, Montagna and Violato (2004) and Aydogus and Topcu (2013) also found a negative link between openness and government size.

However, country-specific studies like Khalid (2005); Shahbaz, Rehman and Amir (2010); and Aregbeyen and Ibrahim (2014) for Saudi Arabia, Pakistan and Nigeria respectively found a positive nexus between openness and government size. The findings of these studies cast doubt on the result of the cross-country studies that largely suggest a negative relationship between openness and government size. Perhaps, a country-specific study on some of the countries used in the cross-country studies would give an insight on the exact link between these two variables.

In Africa, there is increasing demand for countries to diversify their economy in order to take advantage of its export potential and enjoy gains of trade such as: market expansion for local goods; receipts of foreign exchange; creation of employment; and generate sustainable inclusive growth to alleviate poverty. The export stances of most countries in Africa suggest that there is need for countries to increase their trade volume and pursue an export promotion policy. However, as countries increasingly promote an export-oriented policy, there is high possibility for these countries to be exposed to high external risk caused by turbulence in international market. In order for African countries to cushion such effect, government would have to provide more employment and

income to dampen the impact of this risk on the economy.

According to World Bank report (2013), the five largest economies in Africa using GDP (measured in billions of dollars) are: Nigeria (\$521.803), South Africa (\$ 350.630), Egypt (\$271.973), Algeria (\$210.183) and Angola (\$121.704). An observation of the trends of government size and trade openness for these countries revealed that government size (measured by government consumption as a % GDP) in 2005 stood at 5.96%, 6.02%, 12.32%, 19.21%, and 8.96% while trade openness was 50.75%, 55.25%, 71.25%, 128.72, and 64.16% for Nigeria, South Africa, Algeria, Angola, and Egypt respectively. Government size increased in 2010 to 17.1%, 8.03% and 14.96% for Nigeria, South Africa and Algeria while that of Angola and Egypt decreased to 17.25% and 8.5% respectively. Trade openness for the same period was 78.65%, 55.01%, 72.44%, 125.91% and 47.48% for Nigeria, South Africa, Algeria, Angola and Egypt respectively.

Theoretically, it is expected that as a country increases its trade volume, government size is also expected to increase in order to help cushion the risks caused by and/ or induced by turbulence in product and commodity markets. This issue has attracted significant discussions but with little empirical evidence. Therefore, this study reconsidered

openness-government size nexus for these countries in Africa between 1970 and 2010. These countries were selected because their diversification index and Gross Domestic Product (GDP) revealed that they are more prone to international market turbulence. The rest of the paper is organized as follows: section 2 presents a review of the literature on trade openness-government size nexus. It is followed by the discussion of the estimation procedure and data used for the study in section 3. Section 4 discusses empirical results, while the last section concludes with policy implications.

## **2. Literature Review**

The theoretical relationship between trade openness and government size, referred to as the compensation hypothesis, can be traced to Cameron's (1978) paper. Since then, many studies have tested the validity of the hypothesis. These studies included both cross-country and specific country studies. In line with the argument presented in section 1, the review of some existing literature is divided into cross-country studies and country-specific studies (see, Table 1).

Rodrik (1998) demonstrated that there is link between trade openness and government size. The study argued that government consumption as a measure of government size appeared as a risk-reducing role for countries that are

exposed to external shocks depending on the extent of the country's exposure to trade (measured as the share of trade in GDP). The paper concluded that the positive link between government size and trade openness holds for a large cross-section of countries in low and high-income countries. The author opined that irrespective of the number of control variables included in a model to show this relationship, a positive association between trade openness and government size is expected.

Islam (2004) investigated the link between government size and economic openness for six member countries of the Organizations for Economic Co-operation and Development (OECD) namely: Australia, Canada, England, Norway, Sweden, and the United State of America. The empirical results support the submission of Rodrik (1998) for the USA and Canada but negative for the other four countries. Garen and Trask (2005) in their study used non-budgetary measures to proxy government size and showed a positive but not very robust relationship between openness and government size.

Using the Autoregressive Distributed Lag [ARDL] bounds testing approach to cointegration, Swee Kueh, Chin-Hong and Chiew-Meu (2008) examined the association between trade openness and government expenditure for the

Association of Southeast Asian Nations [ASEAN] countries namely: Indonesia, Malaysia, Philippines and Thailand between 1974 and 2006. Their results suggested a positively significant long-run link between government expenditure and trade openness for all the sampled countries.

Nahidi, Parvizkhanlou and Badri (2014) assessed the relationship between trade openness, financial openness and government size in seven Economic Cooperation Organization (ECO) countries (Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan and Turkey) for the period 2000 to 2009. His empirical result corroborates the submission of Cameron (1978) and Rodrick (1998). In Contrast, the result on the linkage between financial openness and government size was negative.

Contrarily, using cross-sectional data comprising Latin American, Sub-Saharan Africa, South East Asia and OECD countries, Alesina and Wacziarg (1998) examined the relationship between among trade openness, country size and government size for the period 1960 to 1989. Their results revealed that country size is negatively related to government size, and trade openness for most of the countries considered. In the same vein, Alvarez, Pascual and Romero (2003) utilized a simple analysis of correlation coefficients to investigate the nexus between trade

openness and public expenditure in the EU-15 from 1998 to 2000 and found a negative association. Furthermore, Liberatti (2006) examined the link between trade openness, financial openness and government size for 16 European countries, USA, Canada, and Australia and confirmed a non-robust negative relation between trade openness and government size.

Benarroch and Pandey (2009) also examined the relationship between trade openness and government size (measured by government consumption as share of GDP). Their results revealed that a negative and significant relationship the two variables. Using cross country data for 54 countries covering the period 1960 to 2000, Ram (2009) also supported the confirmation of a negative relationship between government size and trade openness. Although the consideration of cross-country heterogeneity through fixed effects model revealed no evidence of negative connect but concluded that a positive relationship between openness and government size does not arise due to the intervening role of country size.

For country-specific studies, measuring trade openness by the sum of exports and imports as a share of gross domestic product and government size by public expenditure on goods and services as a proportion of GDP, Molana *et al.* (2004) found no causal relationship

between trade openness and government size for Spain covering the period 1948-1998. They, however, attributed their results to the unsuitable measurement of the variables used in their analysis. However, Rivas, Sort and Rodríguez (2009) reported a significant positive long-run bond between government size (public expenditure as a percentage of GDP) and trade openness for Spain during the period 1960-2000.

Khalid (2005) made use of Vector Error Correction Model (VECM), to examine the long-and-short run relationship between trade openness and government size in the Kingdom of Saudi-Arabia. He found the existence of a positive and significant long-run relationship between the variables while a uni-directional causal link that runs from government size to trade openness was observed.

Utilizing the Fully Modified Ordinary Least Square (FMOLS) and Error Correction Mechanism (ECM), Shahbaz, Rehman and Amir (2010) analysed the existence of a long- and short-run nexus between trade openness and government size in Pakistan between 1971 and 2006. The results of this study are in consonance with the findings of Rodrik (1998) and Khalid (2005).

Aydogus and Topcu (2013) used residual based cointegration and the standard causality test to investigate the long-run and causal relationship

between trade openness and government size in Turkey between 1974 and 2011. The study found a negative connection between trade openness and government size.

Using the bounds testing approach to cointegration within an ARDL framework, Aregbeyen and Ibrahim (2014) investigated the nexus between trade openness and government size by disaggregating government expenditure into total government expenditure as a share of GDP; recurrent expenditure as a share of GDP; and capital expenditure as a share of GDP. Their result revealed that total government expenditure in GDP and recurrent expenditure as share (percent) of GDP had positive and significant relationship with trade openness in

the long run but capital expenditure as percentage share of GDP does not. The standard causality test result supports these findings. They concluded that compensation hypothesis holds for Nigeria.

Summarily, the studies reviewed indicate that understanding the relationship between government size and trade openness is critical to the overall growth and sustainable development of any country. In addition, the hypothesis regarding the relationship between government size and trade openness has no discernable direction of causality in terms of whether the country is developed or developing. Finally, the results obtainable are sensitive to the measurement of government size and estimation technique adopted.

**Table 1: Summary of some Empirical Findings**

Author/year	Study Area	Methodology	Measurement of government size	Findings
Rodrik, 1998	23 OECD	Semi-logarithmic regression	Government consumption as a share of GDP	Positive link holds for a large cross-section of countries in low and high-income countries.
Alesina and Wacziarg, 1998	133 countries	OLS regression	Government consumption as a % of GDP; Govt. current expenditure as a % of GDP; Govt. spending on education as a % of GDP; Govt. spending on defence as a % of GDP; Govt. consumption net of	Negatively insignificant links between: Government consumption as a % of GDP and trade openness; and Govt. consumption net of defence/education . Positively significant links between: govt. current

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			defence/education as a % GDP; public investment as a % of GDP.	expenditure and trade openness; public investment and trade openness; and Govt. spending on education and trade openness.
Benarroch and Pandey, 2009	96 countries	Panel regression (fixed effect)	Government consumption	Negatively insignificant relationship between government size and trade openness.
Ram, 2009	154 countries	Panel regression (pooled and fixed effect)	Government consumption as a % of GDP	Pooled regression support a negative link between government size and trade openness; while fixed effect revealed a positive link between the two variables.
Nahidi et al., 2014	Economic Cooperation Organization (ECO) countries	Panel regression	Government consumption as a % of GDP	Positive and significant relationship between government size and trade openness.
Molana et al., 2004	23 OECD	VAR	Government consumption as a % of GDP	Found no causal link between government size and trade openness for most countries
Khalid, 2005	Saudi Arabia	VECM	Government consumption as a % of GDP	Long run relationship between trade openness and government size; and uni-directional causal link running from trade openness to government size
Shahbaz, Rehman and Amir, 2010	Pakistan	Fully-modified OLS and ECM	Total government expenditure as a % of GDP	Positive relationship between government size and trade openness.
Aydogus and Topcu, 2013	Turkey	Engle and Granger residual based	General government final consumption expenditure as a % of GDP.	No link between government size and trade openness.

		cointegration		
Aregbeyen and Ibrahim, 2014	Nigeria	ARDL bound testing approach to cointegration	Total government expenditure as a % to GDP; recurrent expenditure as a % GDP; and capital expenditure as a % of GDP	Positive link exist between: total expenditure and trade openness; and recurrent expenditure and openness. While no link was found between capital expenditure and trade openness.

Source: Author’s Compilation

### 3. Estimation Procedure and data

The functional form proposed by Aregbeyen and Ibrahim (2014) was augmented by including GDP per capita as a control variable to account for its possible effect on trade openness in line with Wagners’ hypothesis. The causality test adopted for this study is based on the ECM framework. This approach is adopted because of the dynamic nature of the link between government size and trade openness in which static regression adopted by most cross-country studies is not captured. This approach involves three steps; first, is to determine the stationarity of the time series data for each country; second, is to conduct cointegration using Johansen and Juselius (1990) procedure and the third, is the estimation of the parsimonious model to ascertain the direction of causality. ECM approach involves the estimation of the over-parameterized model and then eliminates lags with estimated parameter that are highly

insignificant. The parsimonious model derived from this process must be the model with the lowest value of Schwarz Information Criterion (SIC). Time series data for five countries covering the period 1970 to 2010 was used for the analysis. The variables of interest are: trade openness (the sum of exports and imports on Gross Domestic Product - GDP); government size measured by the share (percent) of government consumption in GDP; and GDP per capita in international dollars at constant prices.

Following Aregbeyen and Ibrahim (2014), the nexus between trade openness and government size can either be unidirectional or bi-directional. Thus, this is expressed below as:

$$openc = f(govcon) \quad (1)$$

Where: *openc* is trade openness (the sum of exports and imports on Gross Domestic Product - GDP) and *govcon* is government size measured by the share (percent) of

government consumption in GDP. Augmenting equation (1) by including GDP per capita as control variables give:

$$openc = f(govcon, rgdpl) \quad (2)$$

Expressing equation 2 in logarithm form gives:

$$\ln openc = f(\ln govcon, \ln rgdpl) \quad (3)$$

From equation (3) the ECM estimated for each country is expressed as:

$$\Delta \ln openc_t = \alpha_0 + \sum_{i=1}^n \alpha_1 \Delta \ln govcon_{t-i} + \sum_{i=1}^n \alpha_2 \Delta \ln rgdpl_{t-j} + \pi_{et-1} + \mu_t \quad (4)$$

$$\Delta \ln govcon_t = \beta_0 + \sum_{i=1}^p \beta_1 \Delta \ln openc_{t-i} + \sum_{i=1}^p \beta_2 \Delta \ln rgdpl_{t-j} + \mu_{et-1} + \nu_t \quad (5)$$

#### 4. Empirical Results

The result of the unit root test based on Augmented Dickey-Fuller

(ADF) presented in Table 2 reveal that all the series for analysis were integrated of order one I(1).

**Table 2: Result for Augmented Dickey-Fuller (ADF) Unit Root Tests**

Variables	AGO	ALG	EGY	NIG	SA
LNCG	-6.899* (1)	-6.383* (1)	-6.613* (1)	-6.789* (1)	-6.373* (1)
LNOPENC	-8.492* (1)	-5.073* (1)	-5.588* (1)	-7.981* (1)	-5.173* (1)
LNRGDPL	-6.918* (1)	-9.155* (1)	-4.756* (1)	-4.839* (1)	-9.145* (1)

Note: The graphical view of the data show that they all have constant and trend; therefore the ADF test that include constant and trend was adopted. The null hypothesis is that the variable has unit root. \* denote significance at the 5% level and the figure in the parenthesis indicate the order of integration.

AGO = Angola, ALG = Algeria, EGY = Egypt, NIG = Nigeria, SA = South Africa

After establishing that all the series are integrated of order one, the Johansen and Juselius cointegration test was conducted to check if the linear combination of these series is stationary. An optimal lag length and one (1) was relied upon based on

Akaike information Criterion (AIC) and Schwarz Information Criterion (SIC). The results of the cointegration relationship are presented in Table 3. The results show that there is at least one cointegrating equation for each country specification.

**Table 3: Cointegration Test Results between Pairs of Variable for the five countries**

Model	Null Hypothesis	Alternative Hypothesis	Trace Statistics	5% critical level	Max-Eigen Statistic	5% critical	No of cointegrating Equation

<b>AGO</b>	R=0*	R=1	35.159	29.797	31.535	21.132	1
	R≤1*	R=2	3.624	15.494	3.589	14.265	
	R≤2*	R=3	0.036	3.841	0.0356	3.841	
<b>ALG</b>	R=0*	R=1	28.656	24.276	19.251	17.797	1
	R≤1*	R=2	24.276	12.321	6.382	11.225	
	R≤2*	R=3	3.0237	4.129	3.024	4.129	
<b>EGY</b>	R=0*	R=1	34.569	24.276	24.172	17.797	1
	R≤1*	R=2	10.397	12.321	8.702	11.225	
	R≤2*	R=3	1.695	4.129	1.695	4.129	
<b>NIG</b>	R=0*	R=1	25.863	24.276	23.031	17.797	1
	R≤1*	R=2	2.832	12.321	2.683	11.225	
	R≤2*	R=3	0.149	4.129	0.149	4.129	
<b>SA</b>	R=0*	R=1	34.432	29.797	23.393	21.132	1
	R≤1*	R=2	11.039	15.495	11.028	14.265	
	R≤2*	R=3	0.011	3.841	0.011	3.842	

Note: R represents the number of cointegrating vectors.

#### 4.1. Causality

This study adopted the ECM framework to test the causal link between trade openness and government size. The results for each country are presented in Tables 4 to 8. The causality test for Angola as shown in Table 4 revealed that openness does not granger 'cause' government size when government

size is the dependent variable. When openness is made the dependent variable, there is evidence of causal link running from government size to openness. The implication of this is that higher government size causes lower openness indicating that the size of government consumption impedes on trade balance of the economy.

**Table 4: Causality Test Based on Error Correction Model Between openness and government size for Angola**

Equation: $\Delta LNCG$ 'cause' $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			Dependent variable: $\Delta LNOPENC$		
Variables	Coefficient	t-Stat.	Variables	Coefficient	t-Stat.
Constant	0.001	0.040	Constant	0.025	1.035
$\Delta LNOPENC_{t-1}$	0.265	1.357	$\Delta LNGOVCON_{t-1}$	-0.254	-2.993*
$\Delta LNRGDPL_{t-1}$	-0.852	-5.399*	$\Delta LNRGDPL_{t-1}$	-0.718	-2.485**
$ECT_{t-1}$	-0.195	-8.039*	$ECT_{t-1}$	-0.088	-1.057
DW-Stat: 1.734			DW-Stat: 2.102		

Note: \* and \*\* depict significance at 1% and 5% levels

The result for Algeria as presented in Table 5 show a bi-directional causal relationship between trade openness and government size. When government size is made the dependent variable, a positive causal link supporting the compensation hypothesis was found. This suggests that the Algerian governments' responsiveness to cushion the effect

of high trade is effective. However, when trade openness is made the dependent variable, one lag period of government size exerts a negative impact on openness suggesting that government consumption had negative impact on the component of trade openness (export and import).

**Table 5: Causality Test Based on Error Correction Model Between openness and government size for Algeria**

Equation: $\Delta LNCG$ 'cause' $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			Dependent variable: $\Delta LNOPENC$		
Variables	Coefficient	t-Stat.	Variables	Coefficient	t-Stat.
Constant	0.009	0.696	Constant	0.011	0.597
$\Delta LNOPENC$	0.246	2.461**	$\Delta LNGOVCON$	0.518	2.275**
$\Delta LNRGDPL_{t-1}$	-0.382	-1.556	$\Delta LNOPENC_{t-1}$	0.251	1.687
$ECT_{t-1}$	-0.148	-2.461**	$ECT_{t-1}$	-0.124	2.362**
DW-Stat: 2.181			DW-Stat: 1.789		

Note: \*\* indicate significance at 5% levels

The causality test result for Egypt as presented in Table 6 reveal a negative uni-directional causal relationship running from government size to openness. This

implies that government consumption size in Egypt impacted negatively on trade openness during the period covered in this study.

**Table 6: Causality Test Based on Error Correction Model Between openness and government size for Egypt**

Equation: $\Delta LNCG$ 'cause' $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			Dependent variable: $\Delta LNOPENC$		
Variables	Coefficient	t-Stat.	Variables	Coefficient	t-Stat.
Constant	0.011	1.346	Constant	-0.003	-0.161
$\Delta LNOPENC$	-0.006	-0.158	$\Delta LNGOVCON_{t-1}$	-1.412	-3.282*

$\Delta LNRGDPL$	-0.589	-3.757*	$\Delta LNOPENC_{t-1}$	0.330	2.210**
$ECT_{t-1}$	-0.523	-3.323*	$ECT_{t-1}$	-0.291	-3.080*
DW-Stat: 1.924			DW-Stat: 2.090		

Note: \* and \*\* depict significance at 1% and 5% levels

The result for Nigeria in Table 7 shows a positive bi-directional causality between these two variables indicating government’s positive response to external shocks caused by

turbulence in international markets. This result corroborates the findings of Aregbeyen and Ibrahim (2014).

**Table 7: Causality Test Based on Error Correction Model Between openness and government size for Nigeria**

Equation: $\Delta LNCG$ 'cause' $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			Dependent variable: $\Delta LNOPENC$		
Variables	Coefficient	t-Stat.	Variables	Coefficient	t-Stat.
Constant	0.082	1.744***	Constant	0.039	1.355
$\Delta LNOPENC$	0.615	2.685**	$\Delta LNGOVCON$	0.255	2.752*
$\Delta LNRGDPL_{t-1}$	1.073	1.603	$\Delta LNRGDPL$	0.778	1.853***
$ECT_{t-1}$	-0.136	-2.478**	$ECT_{t-1}$	-0.286	-2.997*
DW-Stat: 2.243			DW-Stat: 2.404		

Note: \*, \*\* and \*\*\* indicate significance at 1%, 5% and 10% levels respectively

The causal relationship between openness and government for South Africa presented in Table 8 indicates a negative uni-directional causality running from trade openness to government size. This suggests that

higher trade openness causes lower government size. This also indicates that the South African government has not been able to cushion the effect risk associated with export-oriented polices pursued by government.

**Table 8: Causality Test Based on Error Correction Model Between openness and government size for South Africa**

Equation: $\Delta LNCG$ 'cause' $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			Dependent variable: $\Delta LNOPENC$		
Variables	Coefficient	t-Stat.	Variables	Coefficient	t-Stat.
Constant	0.009	0.696	Constant	0.010	0.537
$\Delta LNOPENC$	-0.246	-2.461**	$\Delta LNOPENC_{t-1}$	0.360	2.440**

$\Delta \text{LN} \text{RGDPL}_{t-1}$	-0.382	-1.555	$\Delta \text{LN} \text{GOVCON}$	-0.528	-2.549
$\text{ECT}_{t-1}$	-0.148	-1.619	$\text{ECT}_{t-1}$	-0.184	-2.203**
DW-Stat: 2.181			DW-Stat: 1.785		

Note: \*\* indicate significance at 5% level

## 5. Conclusion

This paper employs the ECM framework to examine causal link between trade openness and government size for the five largest economies in Africa. Evidence of a positive causal relationship running from trade openness to government exists for Algeria and Nigeria implying that the compensation hypothesis holds. Notably, these are oil-producing countries with high exposure to risks occasioned by volatility of international crude oil market. This suggests that these two countries need to expand government size through the pursuit of export diversification in order to cushion the effect of their exposure to oil cycle risks.

The negative causal link found in the case of South Africa suggests that increased openness has not induced the expected increase in government size. This does not conform to the postulate of the compensation hypothesis. Likewise in the case of Angola and Egypt no evidence of causal link running from openness to government size was found but a negative causality from government size to openness exist for both countries indicating non-responsive of the government of Angola and Egypt to fluctuation in trade

openness. Conclusively, the compensation hypothesis holds for Nigeria and Algeria while the negative causality found in the case of South Africa suggest the need for urgent action by the government in order to sustain its growth level.

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