

Do FDI and Public Investment Crowd in/out Domestic Private Investment in the SADC Region?

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Our study examines the crowding-in/out effect of foreign direct investment and government expenditure on private domestic investment for 15 members of the Southern African Development Community (SADC) for the period 1991–2019. The study employed the panel Pool Mean Group (PMG)/ARDL technique in estimating the short-run and long-run cointegration relationships between FDI, government capital expenditure and domestic private investment and adds three more variables for control purposes (interest rate, GDP growth rate and trade openness). For the full sample, FDI crowds-in domestic investment whilst government crowds-out domestic investment. However, in performing a sensitivity analysis, in which the sample was segregated into low and high income economies, both FDI and government investment crowd-in domestic investment whilst government expenditure crowds-out domestic investment in lower income SADC countries with no effect of FDI on domestic investment. Policy implications are discussed.

Key Words: FDI, domestic investment, SADC countries, PMG estimators

JEL Classification: C21, C22, C33, E22, O16

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Introduction

This study seeks to investigate the relationship between foreign direct investment (FDI), government expenditure and domestic private investment in the Southern African Development Community (SADC) region. From a theoretical perspective, domestic private investment is considered as the engine of dynamic economic growth as advocated by Neoclassical and Endogenous theorists. Nevertheless, the effectiveness of FDI and government expenditure in stimulating domestic investment has been

the source of much academic contention. For instance, the standard Keynesian model predicts that an increase in government spending increases total demand, and, as a result, increases total investment and employment. The multiplier effect is a key argument used by Keynesians to advocate for government spending as an effective tool to stimulate private sector investment. However, Neoclassical economists disagree with this view and argue that government spending can crowd-out consumer spending and private investment, either through interest rates or the tax channel (Kim and Nguyen 2015). On the other hand, FDI, which is typically viewed by endogenous economists as promoting development through technological and knowledge spillover effects, can either act as a complement (crowd-in) or as a substitute (crowd-out) to domestic private investment (Agosin and Machado 2005; Jude 2018).

It is against this background that our study seeks to investigate these two heavily contended issues in macroeconomics, the first being the crowding-in/out effect of FDI on direct investment, and the second being the crowding-in/out effect of government expenditure on domestic expenditure. We consider SADC countries as an interesting case since private investment in the region has remained relatively low, accounting for only 7 percent of the GDP, which is 63 percent lower than the continental average of 80 percent of total production (African Development Bank 2020). Over the last few decades, private sector investment in the SADC region has generally not exceeded a quarter of GDP and the sector's contribution is almost equal to that of their respective government spending. What remains surprising is that investment promotion has been one of the objectives of SADC as stipulated in the protocol on Investment and Finance (Southern African Development Community 2006). Moreover, SADC countries also adopted several other initiatives to attract FDI, and governments in the region have also restructured their spending through rationing, increased budget allocation towards development projects, and enhanced prudent government expenditure management to create an enabling environment for private investment (International Monetary Fund 2019; Southern African Development Community 2020).

To the best of our knowledge, our study is the first to investigate the crowding-out effects of FDI or government spending in the SADC region. The closest studies to ours are presented by Ndikumana and Verick (2008), Adams, Sakyi, and Opoku (2016), Mutenyi, Asmah, and Kalio (2010), Biza, Kapingura, and Tsegaye (2015), Mukuyana and Odhiambo (2018), and Bank of Botswana (2020), who include SADC coun-

tries within larger samples of Sub-Saharan Africa (SSA) countries, hence making the results from the studies prone to an aggregation bias towards non-SADC countries. Besides, the aforementioned studies present conflicting evidences, with Ndikumana and Verick (2008) and Adams, Sakyi, and Opuku (2016), finding crowding-in effects, whereas Mutenyo, Asmah, and Kalio (2010), Biza, Kapingura, and Tsegaye (2015), Mukuyana and Odhiambo (2018), and Bank of Botswana (2020) find crowding-out effects. Our study re-examines the empirical evidence by focusing exclusively on the SADC countries for which, as far as we are concerned, there exists no available empirical literature.

The rest of our study is structured as follows. The next section presents the literature review. The third section of the paper outlines the methodology whilst the fourth section presents the data and empirical results. The study is then concluded in the fifth section of the paper.

Literature Review

As mentioned in the introduction, there are two strands of literature related to our current study, the first being the crowding-out effects of FDI on domestic investment and the second the crowding-in/out effects of government spending on domestic investment. We conduct an extensive search of related empirical research for the two strands of literature and summarize the reviewed literature in tables 1 and 2, respectively. We then discuss the literature according to two themes, those being FDI crowding effects and government spending crowding effects.

Firstly, we discuss the literature according to whether crowding-out or crowding-in effects were found for FDI and government. Concerning FDI, there is a first group which finds crowding-in effects on domestic investment: Ramirez (2006) for Latin American countries, Ndikumana and Verick (2008) for SSA countries, Ang (2009) for Malaysia, Lautier and Moreaub (2012) for developing countries, Amassoma and Ogbuagu (2015) for Nigeria, Choong, Law, and Pek (2015) for Malaysia, Adams, Sakyi, and Opoku (2016) for SSA countries, Aboye (2017) for Ethiopia, Ameer, Xu, and Alotaish (2017) for China, and Polat (2017) for OECD countries. The second group of studies find crowding-out effects: Mutenyo, Asmah, and Kalio (2010) for SSA countries, Morrissey and Udomkerdmongkol (2012) for developing countries, Szkorupová (2014) for Eastern European countries, Ivanović (2015) for Croatia, Fahinde et al. (2015) for WAEMU countries, Almounsor (2017) for Saudi Arabia, Chen, Yao, and Malizard (2017) for China, Mamingi and Martin

(2018) for OECD countries, and Jude (2018). There also exists a separate group of studies which are inconclusive in their panel findings: Agosin and Machado (2005) for developing countries, Apergis, Katrakilidis, and Tabakis (2006) for mixed economies, and Pilbeam and Oboleviciute (2012) for EU countries.

Secondly, concerning government spending, most previous studies find crowding out effects on domestic investment: Blejer and Khan (1984) for developing countries, Ramirez (1994) for Mexico, Voss (2002) for US and Canada, Link (2006) for the US, Cavallo and Daude (2008) for developing countries, Haidiwibowo (2010) for Indonesia, Oyieke (2011) for Kenya, Furceri and Sousa (2011) for mixed economies, Fogha and Mbella (2013) for Cameroon, Mahmoudzadeh and Sadeghi (2013) for mixed economies, Sinevičienė (2015) for Eastern European countries, Biza, Kapingura, and Tsegaye (2015) for South Africa, Dreger and Reimers (2016) for European countries, Adegboye and Alimi (2017) for Nigeria, Yovo (2017) for Togo, Akinlo and Oyeleke (2018) for Nigeria, Mukuyana and Odhiambo (2018) for Zambia, Mutuku and Kinyanjui (2018) for Kenya, and Bank of Botswana (2020) for Botswana. Fewer studies find crowding-in effects: Erden and Holcombe (2005) for developing countries, Gjini and Kukeli (2012) for Eastern European countries, Al-Sadig (2012) for developing countries, Nwosa, Adebisi, and Adedeji (2013) for Nigeria, Hailu (2015) for Ethiopia, Akinlo and Oyeleke (2018) for Nigeria, and Nguyen and Trinh (2018) for Vietnam. Even fewer studies find mixed results: Afonso and St. Aubyn (2009) for developed countries, Xu and Yan (2014) for China, and Dash (2016) for India.

In collectively summarizing the 50 studies reviewed in this section, we note that 10 articles find FDI crowding-in effects, with 4 of these studies having been conducted for African countries. On the other hand, 8 articles find FDI crowding-out effects, with 2 of these studies having been conducted for African countries. Concerning the government spending effects on domestic investment, we find 19 articles confirming crowding-out effects, with 9 of these studies having been conducted for African countries. We also find 8 articles which find government spending crowding-out effects, with 3 of these studies having been conducted for African countries. The remaining 6 articles produce conflicting evidence on the crowding effects of FDI and government spending. It is interesting to note that very few studies have included SADC countries in their analysis: Ndikumana and Verick (2008), Adams, Sakyi, and Opoku (2016), Mutenyo, Asmah, and Kalio (2010), Biza, Kapingura, and Tsegaye

(2015), Mukuyana and Odhiambo (2018), and Bank of Botswana (2020). Notably, the empirical evidence for studies inclusive of individual SADC countries is conflicting with studies of Ndikumana and Verick (2008) and Adams, Sakyi, and Opoku (2016) finding FDI crowding-in effects, whereas the studies of Mutenyo, Asmah, and Kalio (2010), Biza, Kapingura, and Tsegaye (2015), Mukuyana and Odhiambo (2018), and Bank of Botswana (2020), find FDI crowding-out effects in their respective studies. Against this inconclusiveness in the previous literature our study examines the FDI and government spending crowding effects for an exclusive panel of SADC countries.

Methodology

EMPIRICAL SPECIFICATION

Our baseline empirical model can be specified as follows:

$$INV_t = a_1 FDI_t + a_2 GOV_t + a_3 OPEN_t + a_4 GDP_t + a_5 RIR_t, \quad (1)$$

where INV is domestic investment, FDI is foreign direct investment, GOV is government expenditure, $OPEN$ is trade openness, GDP is economic growth and RIR is the real interest rate. Note that the effect of FDI on private investment remains inconclusive or ambiguous. Based on the literature, one strand suggests that FDI displaces domestic firms through competition in the financial, labour and product markets. Analytically, this implies the substitution effect or crowding-out (negative relationship). On the other hand, FDI is expected to complement private investment in the host country through spillover of advanced capital and technology. Thus, in this case a positive (crowding-in effect) relationship is expected between private investment and FDI .

Similarly, the impact of government capital expenditure (GOV) on private investment is ambiguous. As shown in the literature review, some researchers conclude that a positive relationship appears between public capital expenditure and private investment while others argue that a negative relationship exists. Literature also dictates that government expenditure on capital goods such as roads, energy, information and technology and education complements private investment, thereby resulting in a crowding-in effect (Choong, Law, and Pek 2015). On the contrary, public capital expenditure may substitute private investment. This crowding-out effect occurs when governments fund their capital expenditure through borrowing from the private sector. As the government enters the market for loanable funds, this triggers an increase in interest

TABLE 1 Previous Literature on FDI Crowding-in/out Domestic Investment

Authors	Period	Countries	Methods	Results
Mišun and Tomšik (2002)	1990–2000	Czech Republic, Hungary and Poland	GMM	FDI crowd-out Private Investment in Poland. FDI crowd-in Private Investment in Czech Republic and Hungary.
Agosin and Machado (2005)	1971–2000	Developing countries	GMM	Crowding-out effect in Latin America. Crowding-in effect in Africa and Asia.
Apergis, Katrakilidis, and Tabakis (2006)	1992–2002	30 countries	PMG	Crowding-in in Africa and Asia. Crowding-out in Europe and America.
Ramirez (2006)	1981–2000	Latin America	Pooled Regression	Crowding-in
Ndikumana and Verick (2008)	1970–2004	Sub-Saharan African countries	OLS	Crowding-in
Ang (2009)	1960–2003	Malaysia	Cointegration Technique	Crowding-in
Mutenyo, Asmah, and Kalio (2010)	1990–2003	Sub-Saharan Africa (34 countries)	2 Semiparametric Least Square	Crowding-out
Pilbeam and Oboleviciute (2012)	1990–2008	26 countries in European Union (excluding Luxembourg)	GMM	Crowd-out Private Investment in Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom. Crowd-in Private Investment in Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovenia and Slovakia.

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rates, credit rationing and the tax burden (Mutenyo, Asmah, and Kalio 2010).

Another key determinant of private investment is the external shock to the economy measured by the terms of trade (OPEN). According to Jude (2018) and Kapingura (2018), a positive relationship is expected between openness and private investment. An open economy is expected to promote investment. Also, an increase in trade openness indicates relative cheaper imports and this ultimately has the potential of encouraging investment.

Real GDP growth rate is expected to be positively correlated to private

TABLE 1 *Continued from the previous page*

Authors	Period	Countries	Methods	Results
Lautier and More-aub (2012)	1984–2004	68 developing countries		Crowding-in
Morrissey and Udomkerd-mongkol (2012)	1996–2009	46 developing countries	GMM	Crowding-out
Szkorupová (2014)	1993–2012	Czech Republic, Estonia, Hungary and Slovakia	Panel regression	Crowding-out
Omri and Kahouli (2014)	1990–2010	13 MENA countries	GMM	Uni-directional causal relationship
Ivanović (2015)	2001Q1–2014Q4	Croatia	VAR	Crowding-out
Amassoma and Ogbuagu (2015)	1981–2012	Nigeria	VAR	Crowding-in
Choong, Law, and Pek (2015)	1970–2011	Malaysia	VECM	Crowding-in
Fahinde et al. (2015)	1996–2011	WAEMU countries	GMM	Crowding-out
Adams, Sakyi, and Opoku (2016)	1981–2010	Sub-Saharan Africa	PMG	Crowding-in
Aboye (2017)	1975–2014	Ethiopia	VECM	Crowding-in
Almounsor (2017)	1970–2016	Saudi Arabia	VECM and VAR	Crowding-out
Ameer, Xu and Alotaish (2017)	2003–2013	China	ARDL	Crowding-in
Polat (2017)	2006–2013	30 OECD	GMM	Crowding-in
Chen, Yao, and Malizard (2017)	1994–2014	China	ARDL	Equity joint venture crowds in and foreign funded enterprise crowds out.
Mamingi and Martin (2018)	1988–2013	34 OECD	GMM	Crowding-out
Jude (2018)	1995–2015	10 Central and Eastern European countries	GMM	Crowding-out

investment because higher income implies higher consumption, which requires additional production capacity provided through investment. According to the Keynesian school of thought, a negative relationship is expected between real interest rate (RIR) and private investment. A rise in interest rate increases the cost of borrowing, thereby resulting in a decrease in aggregate demand, thereby further suppressing domestic investment. The theoretical link between economic growth and interest rates and domestic investment is outlined in the monetary transmission mechanism discussed in Ireland (2005).

TABLE 2 Previous Literature on Public Expenditure Crowding-in/out Domestic Investment

Authors	Period	Countries	Methods	Results
Authors	Period	Countries	Methods	Results
Blejer and Khan (1984)	1971–1976	Developing countries	OLS	Crowding-out
Ramirez (1994)	1950–1990	Mexico	OLS	Crowding-out
Voss (2002)	1947Q1–1988Q1 (USA) 1947Q1–1988Q4 (Canada)	USA, Canada	VAR	Crowding-out
Alesina et al. (2002)	1960–1996	OECD		Crowding-out
Erden and Holcombe (2005)	1980–1997	50 developing countries	2SLS	Crowding-in
Link (2006)	1986–2004	US	OLS	Crowding-out
Cavallo and Daude (2008)	1980–2016	116 developing countries	ECM	Crowding-out
Afonso and St. Aubyn (2009)	1960–2005	14 European countries plus Canada, Japan and USA	VAR	Crowding-out in France, Italy, Japan, USA, Ireland, Canada, United Kingdom, Netherlands and Belgium. Crowding-in in Austria, Germany, Denmark, Finland, Greece, Portugal, Spain and Sweden.
Haidiwibowo (2010)	1984–1995	Indonesia	VECM	Crowding-out
Oyieke (2011)	1964–2006	Kenya	ECM	Crowding-out
Furceri and Sousa (2011)	1960–2007	145 countries	OLS (Panel data)	Crowding-out
Gjini and Kukeli (2012)	1991–2009	Eastern European countries	Panel data regression analysis	Crowding-in
Al-Sadig (2012)	1970–2000	91 developing countries	GMM	Crowding-in
Fogha and Mbella (2013)		Cameroon	VAR	Crowding-out

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PMG ESTIMATORS

To estimate the baseline regression, we rely on the pooled mean group (PMG) estimators, which are intermediate estimators between the Mean Group (MG) and the traditional pooled estimators such as the fixed and

TABLE 2 *Continued from the previous page*

Authors	Period	Countries	Methods	Results
Nwosa, Adebisi, and Adedeji (2013)	1981	Nigeria	ECM	Crowding-in
Mahmoudzadeh and Sadeghi (2013)	2000–2009	Developed and developing countries	OLS	Crowding-out
Sinevičienė (2015)	2003–2012	Bulgaria, Estonia, Latvia, Lithuania, and Slovenia	Cross-correlation and Granger causality	Crowding-out
Xu and Yan (2014)	1980–2011	China	SVAR	Government investment in public goods crowd-in private investment. Government investment in private goods crowd-out private investment.
Biza, Kapingura, and Tsegaye (2015)	1994–2009	South Africa	Co-integration and VAR	Crowding-out
Hailu (2015)	1980–2012	Ethiopia	Cointegration	Crowding-in
Dash (2016)	1970–2013	India	ARDL	Public Investment crowd-out Private investment in the long run but crowd-in in the short-run.
Dreger and Reimers (2016)	1991–2012	16 European countries	ECM	Crowding-out
Adegboye and Alimi (2017)	1981–2015	Nigeria	ARDL	Crowding-out
Yovo (2017)	1980–2013	Togo	Two-Stage Least Squares	Crowding-out
Akinlo and Oyeleke (2018)	1980–2016	Nigeria	ECM	Crowding-in
Mukuyana and Odhiambo (2018)	1970–2014	Zambia	ARDL	Crowding-out
Mutuku and Kinyanjui (2018)	1960–2016	Kenya	VAR	Crowding-out
Nguyen and Trinh (2018)	1990–2016	Vietnam	ARDL	Crowding-in
Bank of Botswana (2020)	1985–2015	Botswana	VECM	Crowding-out

random effect estimators. Moreover, PMG estimators are considered superior to other competing panel cointegration frameworks since the estimators do not require the series to be integrated of similar order and produce good power performance even in small sample groups (Pesaran, Shin, and Smith 1999). Our PMG model can be obtained from the follow-

ing panel autoregressive distributive lag (P-ARDL (p, q, q, \dots, q) model:

$$inv_{it} = \sum_{j=1}^p \lambda_{ij} inv_{i,t-j} + \sum_{j=0}^q \delta_{ij} x_{i,t-j} + \alpha_i + \varepsilon_{it}, \quad (2)$$

where $t = 1, 2, \dots, T$, $i = 1, 2, \dots, T$, x is the vector of explanatory variables defined as $x = (fdi, gov, gdp, open, rir)$, α_i is the fixed effect, and λ_{ij} and δ_{ij} are vectors of parameters. The error correction representation of equation (2) is:

$$\Delta inv = \phi_i inv_{i,t-1} + x_{it} \beta_i + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta inv_{i,t-1} + \sum_{j=0}^{q-1} \Delta x_{i,t-j} \delta_{ij}^* + \mu_i + \varepsilon_{it}, \quad (3)$$

where ε_{it} are serially not correlated across i and t , have zero means, variance $\sigma_i^2 > 0$, and finite fourth-order moment conditions, and:

$$\phi_i = -1 \left(1 - \sum_{j=1}^p \lambda_{ij} \right) \quad \text{and} \quad \beta_i = \sum_{j=0}^q \delta_{ij}. \quad (4)$$

The long-run relationship can compactly be denoted as:

$$y_{it} = \theta_i x_{it} + \eta_{it}, \quad (5)$$

where $\theta_i = -\beta_i' / \phi_i$ are the long run-run coefficients and η_{it} is a stationary process. The long-run coefficients defined by θ_i are constrained to be the same for all cross-sectional units and can be expressed as:

$$\Delta Y_i = \phi_i \xi_i(\theta) + W_i k_i + \varepsilon_i, \quad i = 1, 2, \dots, N, \quad (6)$$

with

$$W_i = (\Delta y_{i,-1}), \dots, \Delta y_{i,-p+1}, \Delta X_i, X \Delta_{i,-1}, \dots, \Delta X_{i,-q+1,t}),$$

$$k_i = \lambda_{i1}^*, \dots, \lambda_{i,p-i}^*, \sigma_{i0}^{*'}, \sigma_{i1}^{*'}, \dots, \sigma_{i,-q-1}^{*'}, \mu_1$$

and the error correction term is computed as:

$$\xi_i(\theta) = y_{i,-1} - X_i \theta, \quad i = 1, 2, \dots, N, \quad (7)$$

and the error correction term measures the speed of 'correction' back to steady-state equilibrium following a shock to the system of time series variables.

PEDRONI PANEL COINTEGRATION TESTS

To test for cointegration effects we rely on Pedroni's (1995, 2004) cointegration tests which are known to be superior to other panel cointegration tests and offer advantages such as overcoming the problem of small samples, allowing multiple regressors and also allowing heterogeneity in the

intercepts and slopes of the cointegrated equation. To perform the cointegration test, we extract the error term, $e_{i,t}$, from the PMG estimators and for the following two estimation regressions:

$$e_{i,t} = \psi_i e_{i,t-1} + \Delta e_{i,t-1} + \Delta e_{i,t-2} + \dots + \Delta e_{i,t-p} + v_{i,t}, \quad (8)$$

$$e_{i,t} = \psi_i e_{i,t-1} + v_{i,t}. \quad (9)$$

From equation (8) we test the null hypothesis of no cointegration effects (i.e. $H_0: \rho\psi_i = 1$) for all against the alternative of cointegration effects (i.e. $H_{11}: \psi_i = \psi < 1$), whereas from equation (9) the null hypothesis of no cointegration (i.e. $H_{10}: \psi_i = 1$) for all is tested against the alternative of cointegration effects (i.e. $H_{11}: \psi_i < 1, \psi_i \neq \psi$). Pedroni (1995, 2004) proposes 4 within-dimension (i.e. panel cointegration) statistics and 3 between-dimension (i.e. group mean panel) statistics to test for the different sets of formulated hypotheses which will be compared to critical values reported in Pedroni (1995, 2004).

Data and Empirical Results

Data description

Our study uses 6 time series variables: gross domestic fixed investment as a percentage of GDP (INV), net inflows of foreign direct investment as a percentage of GDP (FDI), government expenditure as a percentage of GDP (GOV), gross domestic product growth (GDP), total trade as a percentage of GDP (OPEN) and real interest rate (RIR). All data is sourced from the World Bank online database and is collected on an annual frequency spanning between 1991–2019 for the 15 SADC countries (Angola, Botswana, Democratic Republic of the Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe). Table 3 summarises the descriptive statistics of the time series whilst Table 4 presents the correlation matrix of the variables.

Note that the summary statistics indicate that the average trade openness as a percentage of GDP for the SADC countries is relatively high, while the average domestic private investment, government capital expenditure, FDI and GDP growth rate are very low. According to OECD (2019), the SADC countries' GDP growth rates are much lower than the estimated GDP growth rate for Emerging Asian countries (6.5% for 2017 and 6.6% for 2018). Moreover, the correlation matrix, particularly, provides us with preliminary evidence of a negative and insignificant corre-

TABLE 3 Descriptive Statistics

Item	INV	FDI	GOV	GDP	RIR	OPEN
Mean	27.2921	4.2799	21.0699	4.0383	17.8617	87.8668
Median	14.9940	2.8615	20.6469	4.2201	8.4086	80.0636
Maximum	439.0859	38.5491	43.0513	16.7288	1158.0260	225.0231
Minimum	-6.7452	-7.0396	2.0004	-17.6689	-60.7813	23.9808
Std. Dev.	51.9691	5.6328	8.2024	4.2541	76.1292	37.7771
Skewness	4.6879	2.7347	0.1304	-1.1309	11.6209	1.0122
Kurtosis	27.9154	13.2853	2.6821	7.6594	157.6166	3.9599
Jarque-Bera	10364.5200	1984.6390	2.4731	392.3262	357529.9000	73.4152
Probability	0.0000	0.0000	0.2904	0.0000	0.0000	0.000
Sum	9579.5440	1502.2380	7395.5650	1417.4460	6269.4770	30841.2600
Sum Sq. Dev.	945275.7000	11105.1400	23547.9400	6334.1150	2028481.0000	499489.3000
Observations	351	351	351	351	351	351

TABLE 4 Correlation Matrix

Correlation	INV	FDI	GOV	GDP	RIR	OPEN
INV	1					
FDI	-0.0403 (0.4500)	1				
GCE	-0.1280 (0.0100)**	0.3782 (0.0000)***	1			
GDP	-0.0745 (0.1600)	0.1432 (0.0000)***	0.2561 (0.0000)***	1		
I	0.0458 (0.3900)	-0.0628 (0.2400)	-0.2514 (0.0000)***	-0.3477 (0.0000)***	1	
OPEN	0.2502 (0.0000)***	0.3800 (0.0000)***	0.3329 (0.0000)***	0.0044 (0.9300)	-0.0175 (0.7400)	1

NOTES The values in brackets are the corresponding probability values; ***, ** and * denote 1%, 5% and 10% significance level, respectively.

lation coefficient between FDI and domestic investment whilst a negative and statistically significant correlation is observed between government spending and domestic investment. Nevertheless, we treat these observations as preliminary findings to our main empirical analysis.

UNIT ROOT TESTS

Since the PMG estimators require the time series to be integrated or an order lower than $I(2)$, we firstly perform the panel unit root tests of Levin, Lin, and Chu (2002) (hereinafter LLC) and Im, Pesaran, and Shin (2003) (hereinafter IPS) on the first differences of the time series. The results of

TABLE 5 Panel Unit Root Tests on First Differences

Variables	Panel A: LLC at 1st difference		Panel B: IPS at 1st difference	
	(1)	(2)	(1)	(2)
INV	-4.9232*** (0.0000)	-9.5171*** (0.0000)	-9.5171*** (0.0000)	-7.5969*** (0.0000)
FDI	-11.8071*** (0.0000)	-14.2543*** (0.0000)	-14.2543*** (0.0000)	-12.3072 (0.0000)
GOV	-9.3274*** (0.0000)	-9.9772*** (0.0000)	-9.9772*** (0.0000)	-7.4144 (0.0000)
GDP	-13.5627*** (0.0000)	-16.7830*** (0.0000)	-16.7830*** (0.0000)	-15.2059*** (0.0000)
RIR	-4.5483*** (0.0000)	-10.0254*** (0.0000)	-10.0254*** (0.0000)	-7.1882 (0.0000)
OPEN	-9.0231*** (0.0000)	-9.6942*** (0.0000)	-9.6942*** (0.0000)	-6.3508 (0.0000)

NOTES Column headings are as follows: (1) intercept, (2) intercept & trends. The values in brackets are the corresponding probability values; ***, ** and * denote 1%, 5% and 10% significance level, respectively.

the unit root tests are reported in table 5, with panel A reporting the LLC and panel B reporting the IPS. In both panels, the reported test statistics produce estimates which reject the unit root null hypothesis at all critical levels regardless of whether the test is performed with an intercept or inclusive of a trend. These results imply that none of the time series is integrated of an order higher than $I(1)$ and hence, our time series is compatible with the PMG estimators.

PANEL COINTEGRATION TESTS

Having validated that all empirical series are compatible with the PMG estimators, we proceed to present the findings from our panel cointegration tests. The 4 'within-statistics' and 3 'in-between statistics' obtained from Pedroni's (1995, 2004) procedure are reported in table 6. The null hypothesis of no cointegration is rejected at 1% significance level for 3 'within-statistics' and for 1 'in-between statistics.' We treat this evidence as being sufficient enough to validate significant cointegration amongst the time series.

PMG ESTIMATES

Subsequent to conducting unit root and cointegration tests on the series, the next step in our modelling process is to provide long-run and short-

TABLE 6 Pedroni Cointegration Test Results

Panel A: Within statistics	Panel v -Statistic	6.9236	(0.0000) ^{***}
	Panel rho-Statistic	1.2622	(0.8966)
	Panel PP-Statistic	-6.0607	(0.0000) ^{***}
	Panel ADF-Statistic	-1.6914	(0.0454) ^{**}
Panel B: Between statistics	Group rho-Statistic	3.1731	(0.9992)
	Group PP-Statistic	-6.3313	(0.0000) ^{***}
	Group ADF-Statistic	0.9829	(0.8372)

NOTES The values in brackets are the corresponding probability values; ^{***}, ^{**} and ^{*} denote 1%, 5% and 10% significance level, respectively.

run PMG estimates of our regressions. The findings are summarized in table 7. Note that the optimal lag length of the panel ARDL (1,1,1,1,1,1) is chosen by minimization of information criterion as proposed by Pesaran, Shin, and Smith (1999), stating that coefficients of PMG estimates are robust to the choice of lag order.

The long-run estimates, reported in Panel A of table 7, show a positive coefficient estimate on the FDI variable which is statistically significant at all levels. This result provides support in favour of the FDI crowding-in hypothesis for the SADC countries, which is comparable to those found in the previous studies of Ramirez (2006), Ndikumana and Verick (2008), Ang (2009), Lautier and Moreaub (2012), Amassoma and Ogbuagu (2015), Choong, Law, and Pek (2015), Adams, Sakyi, and Opoku (2016), Aboye (2017), Ameer, Xu, and Alotaish (2017), and Polat (2017).

On the other hand, the coefficient estimate on government expenditure is negative and statistically significant at a 10 percent critical level, hence lending support to the government crowding-out hypothesis as previously found by Blejer and Khan (1984), Ramirez (1994), Voss (2002), Cavallo and Daude (2008), Haidiwibowo (2010), Oyieke (2011), Furceri and Sousa (2011), Fogha and Mbella (2013), Mahmoudzadeh and Sadeghi (2013), Sinevičienė (2015), Biza, Kapingura, and Tsegaye (2015), Dreger and Reimers (2016), Adegboye and Alimi (2017), Yovo (2017), Akinlo and Oyeleke (2018), Mukuyana and Odhiambo (2018), Mutuku and Kinyanjui (2018), and Bank of Botswana (2020).

The short-run estimates, reported in Panel B of table 7, show positive and statistically significant estimates on both FDI and government spending variables, being statistically significant at 5 percent for the for-

mer variable and significant at 1 percent for the latter variable. This result implies that FDI and government spending mutually crowd-in private investment over the short run, and yet the government expenditure effect switches to negative (i.e. crowding-out) over the long run whilst the effect of FDI remains positive in the long-run. The significant and negative error correction term further indicate that the short-run effects converge to their long-run equilibrium. Moreover, the ECT of -0.33 indicates that approximately 33% of shocks are corrected annually following shock-induced disequilibrium in the system.

Lastly, we observe that for the remaining control variables, the coefficient estimates are either significant in the short-run or long-run but not over both horizons. For instance, the real interest rate produces a negative and statistically significant estimate over the short-run but not over the long-run.

Note that this finding indicates that keeping short-run interest rates low is more beneficial for private investment only over the short-run as this effect does not hold of the steady state equilibrium. The remaining variables, openness and economic growth, produce positive and statistically significant estimates, hence highlighting the importance of trade and faster growing economies in boosting private investment in the SADC region.

SENSITIVITY ANALYSIS

In this section of the paper, we present our sensitivity analysis for robustness in findings. To this end, we split the sample into two groups: (1) Low and lower middle income countries (Angola, Comoros, Democratic Republic of the Congo, Eswatini, Lesotho, Madagascar, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe) and (2) Upper middle income and high income group (Botswana, Mauritius, Namibia, Seychelles and South Africa), which are in accordance with the 2019 World Bank classifications of countries by income (World Bank 2019). The PMG estimators for the low and lower middle income countries are reported in table 8, whereas those for the upper-middle and high income countries are reported in table 9.

From tables 8 and 9, we observe three general discrepancies in the present results when compared with that of the full sample previously presented. Firstly, for the low and lower income countries, we now observe a negative and statistically significant coefficient on the government spending variable over the long run whilst the coefficient on FDI is sta-

TABLE 7 Long-run and Short-run PMG/ARDL Results

		Coefficient	Std. error	<i>t</i> -Statistics	Probability
Panel A	FDI	0.089602	0.025137	3.564576	0.0004***
	GOV	-0.066916	0.035620	-1.878577	0.0615*
	GDP	0.122830	0.034767	-3.532905	0.0005***
	RIR	0.023373	0.014245	1.640839	0.1021
	OPEN	0.023045	0.005045	4.567508	0.0000***
	Constant	3.581170	0.860926	4.159674	0.0000
Panel B	ECT(-1)	-0.325515	0.103502	-3.144993	0.0019***
	D(FDI)	0.380119	0.185776	2.046120	0.0418**
	D(GOV)	0.350696	0.121694	2.881781	0.0043***
	D(GDP)	0.149376	0.144194	1.035939	0.3013
	D(RIR)	-0.104900	0.041445	-2.531075	0.0120**
	D(OPEN)	$9.12e^{-5}$	0.058940	0.001547	0.9988

NOTES Dependent variable: INV; Panel A: Long-run estimates; Panel B: Short-run estimates. ***, **, and * denote 1%, 5% and 10% significance level, respectively.

tistically insignificant. In other words, in low and lower income SADC countries, government spending crowds-out investment with no effect of FDI whilst for both, government spending and FDI crowd-in domestic investment. Secondly, we note that for the upper-middle and high income countries, both FDI and government spending variables are positively and statistically significantly correlated with private investment over the long run. Thirdly, we also observe discrepancies in the ECT estimates, being -0.11 for the low and lower income countries and -0.53 for upper-middle and high income countries. These results show that convergence in the latter group of economies is quicker than that of the former, implying that upper-middle and high income SADC countries recover much more quickly than their low and lower income country counterparts in the face of external shocks to the region.

Conclusion

Private investment in the SADC region is amongst the lowest globally and this continues to present a bottleneck in achieving higher levels of development. Our study sought to investigate the crowding in/crowding out effects of FDI and government spending on direct investment in the SADC region between 1991 and 2018. To ensure that we capture short-

TABLE 8 PMG Results with Dummy Control Variable for Low and Lower Income SADC Countries

		Coefficient	Std. error	t-Statistics	Probability
Panel A	FDI	0.056899	0.343769	0.165514	0.8687
	GOV	-0.866560	0.139258	6.222713	0.0000***
	GDP	-0.043193	0.210310	-0.205378	0.8375
	RIR	0.060123	0.030284	1.985317	0.0488**
	OPEN	-1.199626	4.883559	-0.245646	0.8063
Panel B	ECT(-1)	-0.109434	0.101555	-1.077580	0.2828
	D(FDI)	0.122985	0.245735	0.500477	0.6174
	D(GOV)	0.143493	0.164824	0.870581	0.3852
	D(GDP)	0.452689	0.040488	10.07658	0.0284*
	D(RIR)	-0.019734	0.004510	-4.36883	0.0662*
	D(OPEN)	-0.364598	6.301496	-0.057859	0.9539
	Constant	0.166245	0.707584	0.234947	0.8145

NOTES Dependent variable: INV; Panel A: Long-run estimates; Panel B: Short-run estimates. ***, **, and * denote 1%, 5% and 10% significance level, respectively.

run and long-run cointegration effects between the variables, we employ the PMG estimators which are flexible and accommodate combinations of stationary and first differences time series. For the full sample, our empirical estimates indicate that both FDI and government spending crowd-in domestic investment over the short-run and yet over the long-run government spending crowds-out domestic investment whilst FDI retains its crowding-in effect. However, in distinguishing between lower income and upper income economies, we find crowding-in effects of both FDI and government spending in upper income countries, whilst a crowding-out effect on government spending is found for FDI.

Our results generally show discrepancies between the investment dynamics between upper and lower income countries of SADC countries. These observations have policy implications. For starters, the findings highlight the inefficiency of government size in boosting investment in lower income countries, a result which indicates a lack of fiscal synchronization between the lower and upper income countries within the SADC countries. Secondly, FDI is only useful for investment in higher income SADC countries, hence implying that FDI levels in lower income countries are either too low or not efficiently directed to improve the domestic investment levels. This result implies that policymakers should

TABLE 9 PMG Results with Dummy Control Variable Upper and High Income SADC Countries

		Coefficient	Std. error	t-Statistics	Probability
Panel A	FDI	0.136469	0.016829	8.108780	0.0000***
	GOV	0.381036	0.086191	4.420845	0.0000***
	GDP	0.401883	0.186216	2.158156	0.0334**
	RIR	-0.291513	0.071793	-4.060484	0.0001***
	OPEN	-1.049545	1.881212	-0.557909	0.5782
Panel B	ECT(-1)	-0.531727	0.105159	-5.056407	0.0000***
	D(FDI)	0.112405	0.064894	1.732124	0.0865*
	D(GOV)	0.477782	0.217224	2.199488	0.0303**
	D(GDP)	-0.002480	0.069674	-0.035593	0.9717
	D(RIR)	-0.014233	0.004354	-0.032689	0.0745*
	D(OPEN)	2.409981	0.806363	2.988706	0.0036**
	Constant	5.177764	1.142037	4.533798	0.0000***

NOTES Dependent variable: *INV*; Panel A: Long-run estimates; Panel B: Short-run estimates. ***, **, and * denote 1%, 5% and 10% significance level, respectively.

focus on removal of barriers to FDI by reviewing existing policies, regulations and procedures that tend to impose high transaction costs of doing business in these lower income countries. Thirdly, fiscal reforms are required in lower-income countries through identifying and targeting public expenditure items which crowd-out private investment, and identifying projects which will boost private sector activities. The main focus of these projects should be to build implementation capacity, tackle corruption and wasteful public expenditure and ensure high investment efficiency through project appraisal, selection, implementation and evaluation.

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