Volume 19
Number 1
Spring 2021

ISSN 1854-6935

Managing Global Transitions International Research Journal

EDITOR IN CHIEF
Jana Hojnik

Managing Global Transitions
International Research Journal
ISSN 1854-6935 · www.mgt.fm-kp.si

INDEXING AND ABSTRACTING
Managing Global Transitions is indexed/listed in the International Bibliography of the Social Sciences, EconLit, IBZ Online, DOAJ, Erih Plus, EconPapers, Cabell's, EBSCO, and ProQuest.

Managing Global Transitions
International Research Journal
VOLUME 19 · NUMBER 1 · SPRING 2021 · ISSN 1854-6935

https://doi.org/10.26493/1854-6935.19_1

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PUBLISHED BY

University of Primorska Press
Titov trg 4, 6000 Koper, Slovenia
zalozba@upr.si · www.hippocampus.si

Copy-edited by Susan Cook.

Revija Managing Global Transitions je namenjena mednarodni znanstveni javnosti, izhaja v angleščini.

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

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Received: 11 January 2021 · Accepted: 18 March 2021 · Published online: 8 April 2021

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

https://doi.org/10.26493/1854-6935.19.3-25

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), Mutenyo, 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, Adebiyi, and Adedeji (2013) for Nigeria, Hailu (2015) for Ethopia, 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 counties), 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:

$$\text{INV}_t = a_1\text{FDI}_t + a_2\text{GOV}_t + a_3\text{OPEN}_t + a_4\text{GDP}_t + a_5\text{RIR}_t, \quad (1)$$

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.

Continued on the next page

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 Moreaub (2012)	1984–2004	68 developing countries		Crowding-in
Morrissey and Udomkerdmongkol (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

Continued on the next page

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, Adebiyi, 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 $(p, q, q, \ldots, q)$ model:

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

where $t = 1, 2, \ldots, T$, $i = 1, 2, \ldots, T$, 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:

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

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:

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

The long-run relationship can compactly be denoted as:

$$y_{it} = \theta_i x_{it} + \eta_{it}, \tag{5}$$

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:

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

with

$$W_i = (\Delta y_{i,-1}), \ldots, \Delta y_{i,-P+1}, \Delta X_i, X\Delta_{i,-1}, \ldots, \Delta X_{i,-q+1,\iota}),$$
$$k_i = \lambda_{i1}^{*}, \ldots, \lambda_{i,p-i}^{*}, \sigma_{i0}^{*\prime}, \sigma_{i1}^{*\prime}, \ldots, \sigma_{i,-q-1}^{*\prime}, \mu_1$$

and the error correction term is computed as:

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

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 repressors and also allowing heterogeneity in the

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

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

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

From equation (8) we test the null hypothesis of no cointegration effects (i.e. H0: $qpsi_i = 1$) for all against the alternative of cointegration effects (i.e. H11: $\psi_i = \psi < 1$), whereas from equation (9) the null hypothesis of no cointegration (i.e. H10: $\psi_i = 1$) for all is tested against the alternative of cointegration effects (i.e. H11: $\psi_i < 1, \psi_i \neq \psi$). 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) (herinafter 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***	−9.5171***	−9.5171***	−7.5969***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
FDI	−11.8071***	−14.2543***	−14.2543***	−12.3072
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GOV	−9.3274***	−9.9772***	−9.9772***	−7.4144
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GDP	−13.5627***	−16.7830***	−16.7830***	−15.2059***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
RIR	−4.5483***	−10.0254***	−10.0254***	−7.1882
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
OPEN	−9.0231***	−9.6942***	−9.6942***	−6.3508
	(0.0000)	(0.0000)	(0.0000)	(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 interceptor 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	*t*-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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Regional Business Confidence as Early Indicator of Regional Economic Growth

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Received: 15 September 2020 · Accepted: 18 March 2021 · Published online: 8 April 2021

Official sub-national GDP figures in South Africa are usually published with long delays or not at all, i.e. relevant, reliable, and real-time economic data on a provincial and local (municipal) level are often non-existent, causing a significant data asymmetry at the sub-national level. The search for an 'optimal' sub-national proxy for regional economic growth focuses on the possible use of regional business confidence. This article, therefore, investigates the use of regional business confidence indices (RBCI) as an early indicator or proxy of the regional economic growth rate (RGDP). To this end, the study employed panel cointegration methodology and techniques to interrogate the possible association between regional business confidence and regional economic growth, focusing on three specific regions of KwaZulu-Natal, South Africa. The results suggest that the utilisation of regional business confidence indicators indeed has merit. Constraints experienced in the study indicate the direction that further studies may follow, especially concerning the scope of the period and cross-sections. The research, therefore, addresses a fundamental gap in the data asymmetry in South Africa, while also setting a benchmark for other researchers to follow.

Key Words: business confidence, gross regional product, economic growth, panel data econometrics, fixed effects, random effects, GDP, BCI
JEL Classification: C23, C53, E01, E17, O11

https://doi.org/10.26493/1854-6935.19.27-48

Introduction

This article investigates the potential use and/or application of confidence indicators, especially business confidence indicators, to proxy economic activity, at the sub-national level in South Africa. This is relevant since up-to-date knowledge and relevant data concerning the state of the national, provincial, and local economy are of utmost importance to conduct eco-

nomic analysis and policy formulation (Mitchell et al. 2005; Gossman and Hayes 2018). Unfortunately, in South Africa (SA), like many other developing countries, such data of the sub-national economy are in most cases only available with significant time delays of up to one to two years, if available at all.

The gross domestic product (GDP) is generally used as the appropriate indicator representing economic activity and should be available at a sub-regional level (Porter 2003). However, in SA, Statistics South Africa (Stats SA) only publishes provincial GDP data with a one-year lag, while not publishing any municipal GDP data at all. To this end, two private sector companies do publish provincial and municipal GDP data, but also with at least a one-year lag. Also, given that the private sector data are not deemed to be official data, it complicates the use of such data, especially for policymaking.

On the other hand, the demand for sub-national economic analysis has substantially increased over the past number of years, especially since sub-national governments (provincial and municipal authorities) have taken on greater responsibilities regarding economic development and growth. It seems evidently counterproductive to use national data for sub-national economic analysis and policymaking, except for setting the scene and national overview.

This disjuncture between the demand and supply for sub-national data makes it important and relevant for the search and assessment of viable proxies that can be used with some confidence and reliability in sub-national economic analysis and policymaking. One such proxy is business confidence since, according to the European Central Bank (ECB), during the past years, indicators on business confidence or sentiment and its ability to monitor and forecast short-term economic developments have emerged (European Central Bank 2003).

The empirical relationship between business confidence indicators and economic output at the sub-national level is explored in this article to determine whether business confidence indices might be employed as an early indicator of regional gross domestic product (GDP), using data of the urban regions of KwaZulu-Natal (KZN), South Africa.

This article commences by studying some relevant empirical work already published, mainly from the ECB, but also others. Against that background, a business confidence index series and an economic growth rate series for each of three provincial regions are developed, followed by evaluating the panel. Thirdly, the article focuses on the application of panel

data econometric and ARDL techniques to empirically test and evaluate the relationship between regional business confidence and regional economic growth rates.

Literature Overview of Existing Research

As stated by De Mello and Figueiredo (2014), a relevant empirical question is whether confidence indices (including business confidence) contain any piece of relevant information about the current/future behaviour of the level/rate of growth of economic activity. To this end, Curtin (2000) argues that this particular topic has been under debate since the release of the first confidence surveys. While there seemingly is no consensus in the literature, according to Dées and Brinca (2013), most authors find a statistically significant relationship between measures of confidence and the current and future behaviour of economic variables, for example, Mourogane and Roma (2003), Ludvigson (2004) and Wilcox (2007) for the US, Kwan and Cotsomitis (2006) for Canada, as well as Easaw and Heravi (2004).

Santero and Westerlund (1996) examined the usefulness of consumer and business surveys in assessing the cyclical position of the economy and for forecasting output movements. The study included eleven Organization for Economic Cooperation and Development (OECD) countries between 1980 and 1995 following a panel data methodology. In the main, the study found that sentiment measures obtained from business surveys provide valuable information for the assessment of the economic situation and forecasting. However, the relationship between sentiment indicators and output varies considerably across countries and sentiment measures. The study also found that the results of the Granger tests suggest that business sentiment indicators in most countries contain relevant information for the prediction of output, in particular when measured by industrial production.

The ECB studied the possibility of using statistics on confidence to estimate GDP, using the ECB Economic Sentiment Indicator (ESI) and their Industrial Confidence Indicator (ICI) (European Central Bank 2003). Their analysis included the six largest euro countries (in terms of GDP) and estimated their relationship between the confidence indicators and the real economy of each country.

The use of a bottom-up or country-specific approach is deemed appropriate when country-specific shocks occurred in the period under investigation and data are available on a country level on a deeper his-

torical basis (Gossman and Hayes 2018). The ECB model constructed by Mourougane and Roma (2003, 519), for the individual euro area countries, is displayed in equations 1 and 2.

$$\Delta \ln \text{GDP}_t = [\text{I}\Delta\text{INDIC}] \times \begin{bmatrix} A_t \\ \Gamma_t \end{bmatrix} + w_t = [\text{I}\Delta\text{INDIC}] \times \beta_t + w_t, \quad (1)$$

$$\beta_t = \beta_{t-1} + s_t. \quad (2)$$

A measurement equation (equation 1), where the real GDP growth rate is a function of the variation in the confidence indicator, forms the essence of the model. The vector of coefficients of the system (β_t) is determined by a transition equation (equation 2). A random walk process ($\beta_{t-1} + s_t$) is assumed for the transition equation. Equation 2 disappears when the parameters are assumed to be constant over time. Equation 1 then takes the form of a basic linear function relating the variation of confidence indicators and real GDP growth rates. The expected Gamma (Γ) should be positive, implying that an increase in confidence will translate into higher GDP growth. The error terms w and s are white noise orthogonal vectors.

The ECB central bank applies Granger causality tests between the GDP growth rates (in real terms) and confidence indicators (in first difference format). The results suggest that, except for Spain, the ICI indicator Granger causes real GDP and that the reverse causations do not hold for any of the countries. The results suggest the usefulness of the ICI and its lagged values in explaining real GDP growth. Regarding the ESI, i.e. ESI Granger causing real GDP, for all countries except Spain, the ECB states that the results are encouraging as a preliminary sign of the utility of confidence indicators.

The ECB concluded that the results demonstrate that confidence indicators could indeed be practical in estimating and forecasting real short-term GDP growth rates. There are, however, some ambiguities in the results, for example in the case of Spain, which suggest that confidence indicators are not perfect. It is therefore not guaranteed that the results suggest uniformity over countries and therefore country-specific characteristics need to be considered.

The ECB followed up their research and focused on predicting real economic growth for the euro area in the short term, applying vintage data. Numerous monthly indicators (including confidence indicators), individually and in combinations, were used. The selection was guided not by selecting the 'best' combination of monthly indicators, but rather

determined by its merits, investigating its pseudo-real-time and comparing it to actual figures and establishing the estimation's rigour and quantifying the comparative significance of identified forecast errors of the inputs. Three attributes of significance are how close the variables and GDP growth are related, the scope of the revisions, and its timeliness (European Central Bank 2006).

Equation 3 estimates the relationship between GDP growth (in real terms) and confidence as proxied by the ECB Sentiment Indicator (ESI).

$$\mathrm{d}\log(\mathrm{GDP}) = \alpha_0 + \alpha_1 \times \mathrm{ESI} + \alpha_2 \times \mathrm{d}\log(\mathrm{GDP}(-1)). \tag{3}$$

A major benefit of equation 3, according to the ECB, is parsimony, while the *ad-hoc* weight assignment among the different confidence indicators within the ESI is seen as a cause of concern. The various sectoral confidence indicators were also considered separately.

Equation 4 includes sectoral business confidence indicators of manufacturing (MAN_CONF), construction, retail trade and other services (SER_CONF). Confidence indicators of construction and retail trade were excluded because of their very high levels of volatility (Diron 2008). The equation can be written as:

$$\mathrm{d}\log(\mathrm{GDP}) = \alpha_0 + \alpha_1 \times \mathrm{d}(\mathrm{MAN\_CONF}) + \alpha_2 \times \mathrm{SER\_CONF}. \tag{4}$$

Binette and Chang (2013) state several challenges when forecasting real short-term GDP growth. Given the large volume of data, it takes time, and specific instruments must be developed to handle various time intervals and deal with truncated data, which resulted from the redefinitions of variables. In response to these challenges, the Bank of Canada developed a single-factor dynamic model estimating Canada's Short-Term Indicator (CSI). This is published monthly and based on the assumptions that a data series consists of two components, namely the common and an idiosyncratic part. Both these common and individual dynamics components, as described by autoregressive (AR) processes, are used to estimate the indicators of the CSI.

Two sets of criteria were used in the choice of indicators to construct the CSI (Binette and Chang 2013). Firstly, there should be a direct link between the variables and the Canadian economy, and secondly, the historic forecasts had to be superior to those already published in the existing literature. The CSI includes 32 indicators, such as the volume of retail trade, housing and total hours worked. It included financial data and international variables, as well as soft information including consumer confidence. The CSI model performs generally as anticipated according to the Bank of Canada. The study also found that the accuracy

of the CSI increases as more information becomes available. The views expressed by the Bank of Canada on the usefulness of confidence indicators are supported by both the Bank of Latvia (Benkovskis 2008) and the Bank of Albania (2018), stating that the choice of a monthly indicator should be based on its timeliness and relevance to GDP. It should also be based on sound theoretical and economic rationale. To this end, business sentiment or confidence is one such monthly indicator that fulfils these criteria. The Banks state that the results of their estimation models are statistically rigid.

With relevance to South Africa, Binge (2020) states that business confidence indicators are widely used leading indicators of economic activity. Binge uses the microdata from the Bureau for Economic Research (BER) business tendency surveys to create new composite indicators of business confidence for South Africa. These surveys usually contain a small number of qualitative questions. Indicators are derived from the subjective answers to questions on past, current, and future developments. The assumption is that agents form opinions about economic conditions before a specific business activity is implemented. These opinions may be called 'confidence.'

The relationship is investigated for the aggregate variables, as well as separately for each sector, using bivariate recursive VARS featuring a measure of confidence and real GDP growth (Binge 2020). In the bivariate VAR, both variables are treated as endogenous:

$$y_t = \beta_{10} - \beta_{12} z_t + \gamma_{11} y_{t-1} + \gamma_{12} z_{t-1} + \varepsilon y_t, \tag{5}$$

$$z_t = \beta_{20} - \beta_{21} y_t + \gamma_{21} y_{t-1} + \gamma_{22} z_{t-1} + \varepsilon z_t, \tag{6}$$

where y is the output, z is the confidence indicator, and *qvarepsilon* is the residual of each equation. According to Binge, the results, in general, provided evidence at least of significant co-movement between the sectoral and aggregate confidence indicators and real economic activity. The indicators had a positive and significant impact on real GDP growth in the VAR models. Shocks to the indicators accounted for a sizeable fraction of variation in economic activity.

The Data

The choice of regions (3 regions) and years (11 periods) is purely by default. The three regions were included on the basis that at the conception stage of the regional business confidence project, they had functioning

chambers of commerce with sufficient memberships. The regions were expanded to include three more regions, but only at a much later stage; unfortunately, too late to include in this study in that the associated period only covers the latter four years, i.e. 2012 to 2015. The regional business confidence project only started in 2005 because of funding availability and lasted until 2015 when the funding ended. At the conception stage, the regional business confidence project was planned to incrementally expand to around eight regions and become self-financed, therefore continuing as long as the need exists. However, this, unfortunately, did not materialise, hence the limited panel data set, which is not ideal for a study of this nature. Notwithstanding the limitations of the panel data set, it still holds some value in that it can be used for exploratory purposes with the caveat that further research still needs to be done to further test and verify the methods and results.

REGIONAL GROSS DOMESTIC PRODUCT AND GROWTH RATES

The regional gross domestic product (GDP) for each of the three regions studied in the current study is estimated using a national, provincial and regional structure model. The model uses national gross domestic product estimates as published by Statistics South Africa (http://www.statssa.gov.za) to estimate the gross domestic product for each of the three regions. The model is quite similar to models used by IHS Global Insight (https://www.ihsmarkit.co.za/Products/ReX) and Quantec in their regional economic estimates.

To estimate the gross domestic product of each region, the study utilised a national disaggregation methodology (see Rossouw 2017). Aggregate indicators are transformed to disaggregate indicators using a related series, for example, the gross domestic product of each region was estimated using analogous regional and national indicators (Coetzee and Kleynhans 2017). These disaggregated data are, however, only used in this study to test the various models. Once the model is accepted, it would be used as an instrument to estimate economic activity. Chow-Lin's (1971) approach supports this methodology, i.e. disaggregated regional data can be estimated when only the fully observed aggregated data are available (Vidoli and Mazziotta 2012; Polasek 2009).

The base year for the model is determined by updating the latest available regional level GDP data published by Statistics South Africa from the release date of November 1994 to the start of the model in 2015. This is done by estimating the structural relationships from various na-

TABLE 1 Fuel Consumption Structure (As a % of National)

Region	2008	2009	2010	2011	2012	2013	2014	2015
eThekwini	9.68	9.58	8.64	9.77	10.99	10.77	10.08	9.75
Msunduzi	1.16	1.29	1.29	1.36	1.32	1.39	1.35	1.58
uMthlatuze	1.09	0.96	0.91	0.89	0.87	0.91	0.84	0.74

NOTES Authors' calculations based on data from Department of Energy (https://www.gov.za/department-energy-m).

TABLE 2 Growth Rates of Regional Gross Domestic Product (%)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Msunduzi	5.66	5.36	6.10	2.28	5.23	−0.24	4.09	3.65	1.49	2.47	1.42
eThekwini	5.66	5.36	6.10	4.95	−4.00	5.10	3.61	2.17	2.62	2.21	1.23
uMthlatuze	5.66	5.36	6.10	9.73	−12.94	10.66	3.55	0.51	3.77	2.01	0.98

NOTES Authors' estimations based on data from Statistics South Africa (http://www.statssa.gov.za).

tional provincial regional proxies such as fuel consumption and buildings reported as completed and applying these to the latest national gross domestic product figures (Rossouw 2017). Table 1 indicates the structural relationships between national fuel consumption and regional fuel consumption over the period. The major urban regions of KwaZulu-Natal (KZN), which were considered in this study, are eThekwini, Msunduzi and uMthlatuze (previously known as Durban, Pietermaritzburg and Richards Bay, respectively). These structural relationships form the basis of the national disaggregation model from which the regional GDP is estimated.

The equation estimating regional gross domestic product (GDP) using the fuel consumption structure is:

$$\text{GDP}_{it} = \text{GDP}_{st} \times \left[\frac{\sum \frac{P_{in}}{P_{sn}}}{n} \right], \tag{7}$$

where i is the particular regional economy/proxy, s national economy/proxy; t the annual period; n the number of national and regional proxies; P national economic proxy, i.e. fuel consumption; GDP_{it} is regional gross domestic product at time t; and GDP_{st} the national GDP at time t.

The gross domestic product (growth rate) for each of the three regions is displayed in table 2. The data were generated using equation 7 and are based on the fuel consumption structure as per table 1.

REGIONAL BUSINESS CONFIDENCE INDICATOR (RBCI)

The business confidence indicator for each of the three regions of KwaZulu-Natal is estimated using a primary survey. The survey for this current study follows the methodology employed by the Bureau of Economic Research (BER). They disseminated a questionnaire annually to a panel of respondents (Bureau for Economic Research 2016). The KZN RBCI does, however, differ from BER's way of dissemination and processing. The surveys are conducted through the various local chambers of commerce and other local business organisations operating in the three urban centres. The survey is an online anonymous business survey designed to generate data and information on several local economic characteristics and trends, and the general level of business confidence in the particular urban centre.

The surveys are conducted annually at the same time to ensure consistency (Kleynhans and Coetzee 2017, 15). The period of investigation was chosen to ensure confidentiality and circumvent ethical issues. In total, a response between 150 and 200 was received annually from the various chambers of commerce and business organisations. The response rate varies between 2 and 5 per cent, depending on the district and the year. It must be said that the response rate is on the low side and as such may not be as reliable as one would ideally want. Nonetheless, the derived confidence indicators do seem to reflect the wider sentiment in that when presenting the results to the wider audience within the districts, there is full agreement with the confidence indicators.

This regional business confidence index (RBCI) is compiled from the percentages of respondents' answers to questions regarding their views on the present business/trading conditions and expected sales over the next year and can be expressed via the following equation:

$$\text{RBCI} = \left(\frac{\sum B_{it} C_{it} G_{it} H_{it}}{\sum A_{it} B_{it} C_{it} D_{it} E_{it} F_{it} G_{it} H_{it} I_{it} J_{it}} \right), \tag{8}$$

where i is particular local economy; t period; A_{it} excellent responses to present business/trading conditions are; B_{it} = good responses to present business/trading conditions are; C_{it} fair responses to present business/trading conditions are; D_{it} = poor responses to present business/trading conditions are; E_{it} = very poor responses to present business/trading conditions are; F_{it} much better responses to your expected sales performance over the next year; G_{it} better responses to expected sales performance for the next year; H_{it} same responses to expected sales performance for the

TABLE 3 Regional Business Confidence Index

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Msunduzi	83.60	82.60	83.00	65.95	63.50	58.88	63.45	68.20	49.95	83.30	64.70
eThekwini	57.10	72.80	81.09	68.13	65.75	68.50	74.95	68.55	69.65	54.20	59.70
uMthlatuze	89.70	81.10	80.90	61.38	69.05	66.65	73.70	78.55	41.65	66.80	37.50

NOTES Authors' estimations based on data from Statistics South Africa (http://www.statssa.gov.za).

TABLE 4 Unit Root Statistics for the Panel from 2005 to 2015

	RGDP (Y)	RBCI (X)
(1) Levin, Lin and Chu t*	−4.185*** (0.000)	−9.329*** (0.000)
(2) Im, Pesaran and Shin (2003) W-stat	−2.535*** (0.006)	−6.721*** (0.000)
ADF – Fisher chi-square	17.723*** (0.007)	36.611*** (0.000)
PP – Fisher chi-square	28.309*** (0.000)	38.563*** (0.000)

NOTES Row headings are as follows: (1) null: unit root – assumes common unit root process, (2) null: unit root – assumes individual unit root process. *p*-values reported in parenthesis. $p < 0.05$ accept the alternative hypothesis of no unit root. *** indicates significance of the coefficients or rejection of the null hypothesis on a 1% significance level.

following year; I_{it} worse responses to expected sales for the coming year; J_{it} much worse responses to your expected sales performance over the next 12 months.

The regional business confidence index (RBCI) varies between 0 and 100. Values of 50 are interpreted as neutral, 100 reveals extreme confidence, while 0 indicates an extreme lack of confidence. The estimated regional business confidence indices (RBCI) for each of the three regions are given in table 3.

Constructing and Evaluating the Panel

Figure 1 displays the results from the panel showing the real growth rate of GDP (regional economic growth rate, RGDP) per region (*y* variable), and the variance (log(*rbcit*/*rbcit* − 1)) in the regional business confidence index (RBCI) per region (*x* variable). The panel consists of three regions (cross-sections) and 11 years (time sections), i.e. 33 observations.

Table 4 displays the outcomes of the panel unit root test for the two variables. It suggests that the variables are stationary, i.e. I(0). As stated previously, the panel does, unfortunately, suffer from a lack of cross-section (regions) data, which poses some risks; for example, the model

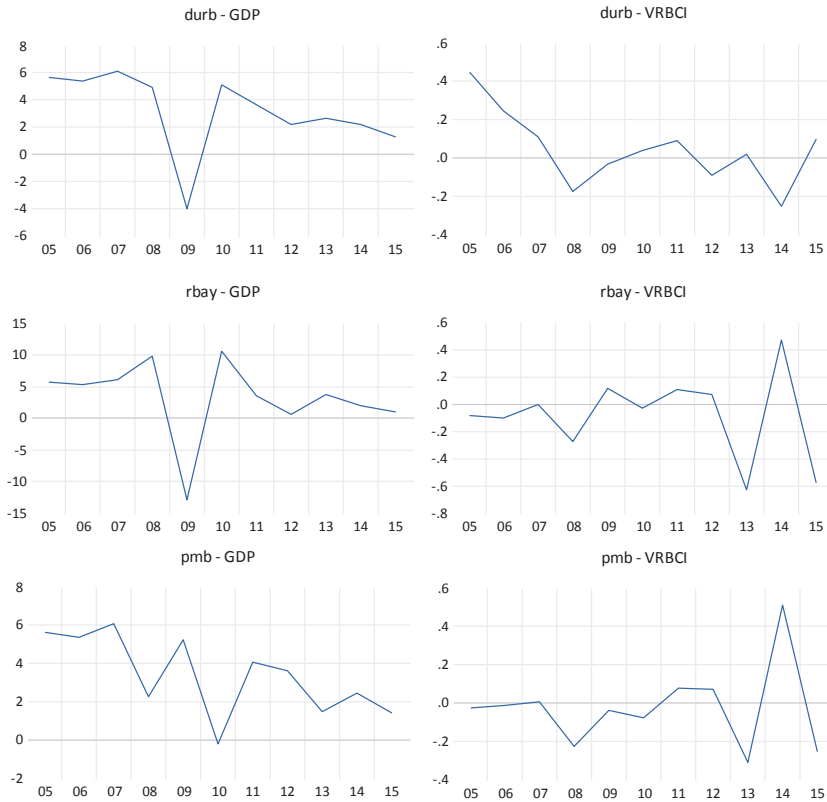

FIGURE 1 Panel for the Three Regions 2005 to 2015

NOTES durb = eThekwini, pmb = Msunduzi, rbay = uMhlatuze, GDP = regional growth rate, VRBCI = log variance in regional business confidence index, *y*-axis = percentage in the case of GDP and log value in the case of VRBCI, *x*-axis = year; authors' estimations based on data from Statistics South Africa (http://www.statssa.gov.za).

may potentially suffer from misspecification bias, poor fit and statistical insignificance. The Granger causality tests also yield few significant results. These are important issues that should be addressed in further research once this article has illustrated the value of the RBCI's potential. These constraints should, however, not detract from the potential use of business confidence indicators, especially if and when the data limitations have been addressed.

Methodology of Analysis

Mitić, Ivanović, and Zdravković (2017) suggest the use of panel econometric modelling for the estimation of the interdependency between vari-

ables. To this end, panel cointegration tests strive to provide more reliable results in testing of cointegration presence relative to those obtained by individual tests. The most frequently used panel cointegration tests are based on unit root testing of residuals from the OLS-wise regression, known in the literature under the umbrella term of the 'Engle-Granger based' (EG) cointegration test. The broadest framework for a panel cointegration test based on the EG procedure was proposed by Pedroni (1999).

Following from the above, the methodology employed in this study follows the methodology employed by Kirikkaleli et al. (2018) and Srithilat et al. (2018). Kirikkaleli et al. (2018) studied the long-run linkage between the electricity consumption, economic growth and internet demand variables for OECD countries using panel cointegration tests, while Srithilat et al. (2018) studied the relationship between inflation, exchange rate, and currency substitution following the panel vector error correction model approach. The methodology follows that for the same order of integration (I(0) or I(1)) variables; cointegration linkage is investigated following the panel unit root test procedure (table 4). As stated by Pedroni (1999), the Pedroni cointegration test is based on pooling among both within dimensions and between dimensions. Pedroni (2001) has developed statistics that are based on pooling among dimensions, which will allow for heterogeneity in the autoregressive term (Kirikkaleli 2016, 213). The equation for Pedroni (2001) cointegration tests can be written as follows:

$$\text{RGDP}_{it} = \alpha_i + \varphi_{it} + \beta_1 \text{RBCI}_{it} + \varepsilon_{it}, \tag{9}$$

where $i = 1, \ldots, N$ for each region in the panel and $t = 1, \ldots, T$ refers to the time period. The parameters α_i and α_{it} allow for the possibility of region-specific fixed effects and deterministic trends, respectively. The cointegration tests involve computing residuals from equation (9) and then using the residuals to test the presence of a unit root. The residual equation is given by:

$$\varepsilon_{it} = \rho \varepsilon_{it} - 1 + \nu_t. \tag{10}$$

As proposed by Oche, Khamfula, and Mah (2019) and Srithilat et al. (2018), following the panel cointegration test, the study will also estimate a vector error correction model:

$$\Delta y_{it} = \alpha_i \beta_i y_{i,t} - 1 + \sum_{j=1}^{pi-1} \Gamma_{ij} \Delta y_{i,t} - j + Z_i d_t + \varepsilon_{it}, \tag{11}$$
$$t = 1, \ldots, T, \; i = 1, \ldots, N.$$

where t and i are indexes of time dimension and cross-section, respectively, while ε_{it} is an error term assumed to be distributed independently. The process y_{it} of K-dimension is at most integrated of order one; that is, I(1) with a cointegrating rank of $0 \leq r_i \leq K$. The unknown $(K \times r_i)$ and α_i and β_i are the loading and the cointegrating matrices, respectively, and they have full column rank. $pi - 1$, is the lag order of the vector error correction (VEC) process and is either different across the cross-section or controlled to be constant (Shrestha and Bhatta 2018).

The short-run dynamics of the process are represented by the unknown coefficient matrices denoted as Γ_{ij}, $i = 1, \ldots, N$; $j = 1, \ldots, pi - 1$, while the long-run dynamics are represented as $\Pi_i = \alpha_i \beta_i$, $i = 1, \ldots, N$. Z_i is the unknown parameter vector of the deterministic terms, while the dt vector contains the deterministic terms (Shrestha and Bhatta 2018).

It is further suggested (Mark and Sul 2003), for panel cointegration, that fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) tests are applied to determine the long-run connection between variables. This methodology is further supported by Mitić, Ivanović, and Zdravković (2017) through their analysis of the relationship between real GDP and CO_2 emissions for 17 transitional economies. Endogeneity bias and serial correlations are corrected by FMOLS and DOLS techniques and therefore these estimators allow for standard normal inference (Carlsson, Lyhagen, and Österholm 2007).

The panel cointegration methodology will be augmented with the auto-regressive distributed lag (ARDL) methodology, predominantly to verify the results of the applied panel models. Asteriou, Pilbeam, and Pratiwi (2021) employed the asymmetric panel ARDL method to analyse the impact of a change in public debt on economic growth in a panel of selected Asian countries from 1980 through 2012. Asteriou, Pilbeam, and Pratiwi (2021) state that it is indeed possible to examine the short- and long-run relationships using the panel ARDL as initiated by Pesaran and Smith (1995) and Pesaran, Shin, and Smith (1999). Panel autoregressive distributed lag (ARDL) is conducted if no-cointegration is found from the previous methods. This method is superior regardless of whether the underlying regressors exhibit I(0), I(1) or a mixture of both (Pesaran and Shin 1995).

Ghouse, Khan, and Rehman (2018) state that the dependent variable of an ARDL model is expressed by the lag and current values of the independent variable and its lag. The ARDL model normally starts from a reasonably general and large dynamic model and progressively reduc-

ing its mass and altering variable by imposing linear and non-linear restrictions (Charemza and Deadman 1997). The ARDL model is one of the most general dynamic unrestricted models in econometric use (Shrestha and Bhatta 2018).

A generalised ARDL (p, q) model is specified as:

$$Y_t = \gamma 0_j + \sum_{i=1}^{p} \delta_j Y_t - 1 + \sum_{i=0}^{q} \beta_j X_t - 1 + \varepsilon_{jt}, \tag{12}$$

$p \geq 1$, for simplicity, assumes that the lag order q is the same for all variables in the $K \times 1$ vector x_t. δ is a coefficient, γ is the constant and ε_{jt} is a vector of the error terms. Y_t is the regional GDP (RGDP) at period t and X_t is the variance in regional business confidence (RBCI).

Econometric Analysis of the Panel

Following the methodologies employed by Mark and Sul (2003), Kirikkaleli et al. (2018) and Asteriou, Pilbeam, and Pratiwi (2021), two cointegration tests are conducted to analyse the long-run relationship between regional economic growth and regional business confidence. The results of the Pedroni cointegration test (automatic lag selection using the Schwarz info criterion) are displayed in table 5. The outcome of the Pedroni panel cointegration indicates that eight out of 11 statistics in model 1, six out of 11 statistics in model 2, and seven out of 11 statistics in model 3 are significant at the 5% level. This suggests that the no cointegration null hypothesis for all models can be rejected. The panel statistics assume common AR (autoregressive) coefficients (within dimensions), while the group statistics assume individual AR coefficients (between dimensions).

The findings from the Kao panel cointegration test for all models are in line with the findings from the Pedroni panel cointegration test as shown in table 5 (ADF statistic is minus 1.615123 with a p-value of 0.0531**). Therefore, both results confirm the existence of a long-run cointegration relation between regional economic growth and regional business confidence.

The Fisher-Johansen cointegration test (intercept and trend) results are displayed in table 6, indicating that the no cointegration null hypothesis can be rejected.

Given the existence of a cointegrating relationship between RGDP and RBCI (tables 5 and 6), it is possible to estimate the panel vector error correction model as suggested by Oche (2019). The results are displayed in table 7. The results suggest that the long-run coefficient (12.67178) is sta-

TABLE 5 Results of the Pedroni cointegration test (RGDP and RBCI)

		(1)	(2)	(3)	(2)
Model 1	Panel v-Statistic	−1.033451	0.8493	−0.8785	0.8102
	Panel rho-Statistic	−1.945918	0.0258***	−1.6602	0.0484***
	Panel PP-Statistic	−8.650277	0.0000***	−6.2958	0.0000***
	Panel ADF-Statistic	−5.705665	0.0000***	−4.7942	0.0000***
	Group rho-Statistic	−0.566669	0.2855		
	Group PP-Statistic	−7.325659	0.0000***		
	Group ADF-Statistic	−4.656979	0.0000***		
Model 2	Panel v-Statistic	−2.336323	0.9903	−2.1350	0.9836
	Panel rho-Statistic	−0.558121	0.2884	−0.4622	0.3219
	Panel PP-Statistic	−18.56025	0.0000***	−15.1930	0.0000***
	Panel ADF-Statistic	−4.531988	0.0000***	−4.9101	0.0000***
	Group rho-Statistic	0.244963	0.5968		
	Group PP-Statistic	−15.69201	0.0000***		
	Group ADF-Statistic	−5.58721	0.0000***		
Model 3	Panel v-Statistic	−0.540941	0.7057	−0.673866	0.7498
	Panel rho-Statistic	−2.329033	0.0099***	−1.168057	0.1214
	Panel PP-Statistic	−3.124649	0.0009***	−2.049121	0.0202***
	Panel ADF-Statistic	−3.216785	0.0006***	−2.205183	0.0137***
	Group rho-Statistic	−0.168863	0.4330		
	Group PP-Statistic	−2.386564	0.0085***		
	Group ADF-Statistic	−2.460465	0.0069***		

NOTES Column headings are as follows: (1) statistic, (2) probability, (3) weighted statistic. *** denotes 10% significance level.

TABLE 6 Results of the Fisher-Johansen Cointegration Test

Hypothesised no. of CE(s)	(1)	(2)	(3)	(2)
None	21.32	0.0016***	15.01	0.0202***
At most 1	11.96	0.0628	11.96	0.0628

NOTES Column headings are as follows: (1) Fisher statistics (from trace test), (2) probability, (3) Fisher statistics (from max-eigen test); *** denotes 10% significance level.

tistically significant, as well as the error correction term (−0.958025). The short-run lag 1 period coefficient (12.21207) is also statistically significant. The results suggest that there is indeed long-run causality running from

TABLE 7 Results of the Panel Vector Error Correction Model

Cointegrating eq.	Cointegrating eq.1	Error correction	D(GDP)
RGDP(−1)	1	Error Term	−0.95803***
			(−0.46888)
			[−2.04320]
RBCI(−1)	12.67180***	D(RGDP(−1))	−0.38709
	(−3.90616)		(−0.37890)
	[3.24405]		[−1.02163]
C	−2.71359	D(RGDP(−2))	−0.25857
			(−0.22207)
			[−1.16436]
		D(RBCI(−1))	12.21207***
			(−4.72176)
			[2.58634]
		D(RBCI(−2))	9.06565
			(−6.46707)
			[1.40182]
		C	−0.69075
			(−0.98862)
			[−0.69870]

NOTES *** denotes 10% significance level; standard errors in (), *t*-statistics in [].

RBCI to RGDP and that there is an adjustment process to long-run equilibrium (negative error correction term).

The vector error correction model (as displayed in table 7) can be expressed as follows:

$$\begin{aligned} \mathrm{D(RGDP)} = {} & \mathrm{C(1)} \times (\mathrm{RGDP}(-1) + 12.671798474 \times \mathrm{RBCI}(-1) \\ & - 2.71359215585) + \mathrm{C(2)} \times \mathrm{D(RGDP}(-1)) \\ & + \mathrm{C(3)} \times \mathrm{D(RGDP}(-2)) + \mathrm{C(4)} \times \mathrm{D(RBCI}(-1)) \\ & + \mathrm{C(5)} \times \mathrm{D(RBCI}(-2)) + \mathrm{C(6)}, \end{aligned} \tag{13}$$

where C(1) is error correction term −0.958025, C(2) short-run RGDP lag 1 term −0.387093, C(3) short-run RGDP lag 2 term −0.258572, C(4) short-run RBCI lag 1 term 12.21207, C(5)short-run RBCI lag 2 term 9.065647, C(6) short-run constant term −0.690752.

Table 8 illustrates the outcomes of the FMOLS and DOLS estimates for

TABLE 8 Panel FMOLS and DOLS results

			Coefficient	Probability
Y = RGDP FMOLS	Constant	RBCI	1.358957	0.4213
	Linear Trend	RBCI	0.406644	0.8001
	None	RBCI	0.075009	0.9866
Y = RGDP DOLS	Constant	RBCI	1.298782	0.5306
	Linear Trend	RBCI	0.301675	0.8629
	None	RBCI	1.017768	0.8239

TABLE 9 Results of the ARDL model

Equation	Variable	Coefficient	Std. error	*t*-statistic	*p*-value
Long Run	RBCI(−1)	7.634437	2.888130	2.64338	0.0145***
Short Run	COINTEQ01	−1.195213	0.227691	−5.24928	0.0000***
	D(RBCI(−1))	−6.754286	3.181049	−2.12328	0.0447***
	C	3.758449	0.754256	4.98298	0.0000***

NOTES *** denotes 1% significance level.

the three models (panel method = grouped). The findings are particularly consistent with existing literature in that the models suggest positive relationships between RGDP and RBCI. However, the models could not find the relationships as statistically significant in the long run. This is contrary to the results thus far obtained and can possibly be explained because of model-specific limitations such as the lack of cross-sections to perform the FMOLS and DOLS estimates.

The ARDL model results are displayed in table 9. Estimating the generalised ARDL model (equation 9) suggests the use of an ARDL (1, 1) model. The optimal lag structure was derived from the Akaike Information Criteria (AIC). It suggests that there exists both a short-run and long-run relationship between regional business confidence (RBCI) and regional economic growth (RGDP). The error correction term (COINTEQ01) is –1.19 with a *p*-value of 0.000, suggesting that the co-integration coefficient is statistically significant. Furthermore, the long-run coefficient (7.634437) is statistically significant, as well as the short-run lag 1 period coefficient (–6.753185).

The cross-section short-run coefficients using ARDL are displayed in table 10. For each of the three regions, the error correction terms (COINTEQ01) are statistically significant, suggesting that there is indeed long-

TABLE 10 Cross Section Short Run Coefficients

Region	Variable	Coefficient	Std. error	*t*-statistic	*p*-value
eThekwini	COINTEQ01	−1.494570	0.080925	−18.468510	0.0003***
	D(RBCI(−1))	−0.015055	0.004018	−3.746534	0.0332***
	C	4.270804	0.934469	4.570302	0.0197***
Msunduzi	COINTEQ01	−1.051115	0.084246	−12.476800	0.0011***
	D(RBCI(−1))	−0.104839	0.001339	−78.308750	0.0000***
	C	3.747103	1.539497	2.433978	0.0930***
uMhlathuze	COINTEQ01	−1.543835	0.090992	−16.966740	0.0004***
	D(RBCI(−1))	−0.102348	0.004008	−25.532780	0.0001***
	C	5.677368	5.128576	1.107007	0.3491

NOTES *** Denotes 1% significance level.

run causality running from RBCI to RGDP and that there is an adjustment process to long-run equilibrium (negative error correction term) for each of the three regions.

Conclusions

The association between regional business confidence and regional real GDP growth was estimated in this article using panel data methodology and estimation techniques, in an attempt to account for both time and region heterogeneity and homogeneity. The estimation ability of the suggested model exhibits good statistical qualities, yielding significant estimations of regional economic activity.

The techniques enable sub-regional GDP analysis and take sub-regional heterogenic factors into regard when estimating regional economic activity. This includes unobservable region-specific factors. The method of estimation also considered time-series and cross-section dimensions of the data, which improve the quality of the estimated relevant coefficient, as the degrees of freedom were improved when these estimation techniques were employed.

Given the limited panel data, i.e. a limited number of cross-sections, these estimates need further investigation. Nonetheless, the estimation results suggest that, on grounds of the range of specifications applying econometric panel data techniques, regional business confidence and regional real GDP growth rates display some positive relationships. It is therefore concluded that business confidence can be utilised as an early indicator of real regional gross domestic economic growth. Therefore, the

key fundamental reason for the study, i.e. to fill the data asymmetry that exists at the sub-national level in SA, has been addressed.

The value of BCI as an early indicator of economic indicators has been substantiated in this article. The estimation method has been developed, as well as its potential proven motivation for further research. The proposed method should now be applied in practice by managers, and development and policy designers, both nationally and sub-regionally. The estimation of GDP using BCI should now be expanded to other provinces and cities, as well as neighbouring countries. The relationship between countrywide BCI of BER and the national GDP should also be investigated using a similar methodology.

Acknowledgments

The authors acknowledge the support from the World Trade Organization (WTO) and the National Research Foundation (NRF). The findings, views and opinions expressed, and conclusions arrived at in this article, are those of the authors and should not necessarily be attributed to the funding institutions.

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Received: 17 January 2021 · Accepted: 27 February 2021 · Published online: 8 April 2021

Income Inequality and Socio-Political Instability in Sub-Saharan Africa

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In this paper, we analyse the impact of income inequality on Socio-Political Instability (hereinafter SPI) in Sub-Saharan Africa from 1990 to 2018 with a sample of 47 countries. We first present the theoretical and empirical debate on income inequality and SPI. This literature review allows us to measure SPI using the principal component analysis method and hierarchical clustering and partitioning to analyse the similarities and differences between countries from a multidimensional perspective. We then estimate the SPI concerning income inequality and democracy. The findings are that assassinations are not linked to a regime's duration, and the duration of a regime reduces if coups d'état (successful or not) are rampant. Between democracy and income inequality, the former has 34 times more impact on SPI. GDP growth increases SPI and education reduces SPI.

Key Words: income inequality, democracy, socio-political instability, political regime, Sub-Saharan African countries
JEL Classification: D74, P16

https://doi.org/10.26493/1854-6935.19.49-72

Introduction

According to economic theory, income inequality is one of the principal causes of Socio-Political Instability (hereinafter SPI). In more unequal societies, the motive that drives people to rise up is the demand for a fair share of economic resources. Populations from the same tribe, belonging to the same religion or sharing the same political ideology, engage in violent protests, demonstrations, unrest, assassinations, rebellions and coups d'état to claim their share of the country's wealth. We can cite the case of South Africa, Rwanda, Liberia, Nigeria or Casamance (Senegal). That is why Alesina and Perotti (1996, 1205) said: 'More unequal societies are more politically unstable.'

Government use all means, such as intimidation, imprisonment of opponents, confiscation of the press, and prohibition of public demonstrations, to impose their ideas. Poor people,[1] who constitute much of the

population in Sub-Saharan African (hereinafter SSA) countries, use violence to express themselves and assert their rights. They carry out strikes, repeated demonstrations, breakages, and disturb public order to be heard. Anne Krueger, first deputy managing director of the International Monetary Fund in 1997, said that poor people are ready to do anything to improve their material conditions in a situation of high inequality (Krueger 2002). Based on the high levels of income inequality[2] coupled with frequent SPI (demonstrations, wars, killings, terrorisms, rebellions, coups d'état) in SSA, it is imperative to examine the social, economic and political cost of such phenomena.

Hitherto, some authors have studied the relationship between economic outcomes and political instability. The most used economic variables are GDP growth and investment. Barro (1991; 1999), Kormendi and Meguire (1985) and Alesina et al. (1996) found that SPI reduces growth. According to Cukierman, Edwards, and Tabellini (1992), SPI has instability effects on inflation. For Alesina and Perotti (1996), Keefer and Knack (2000), Perotti (1996) and Fosu (1992; 2002), SPI is the channel through which inequality harms investment and growth because SPI creates economic uncertainty and disrupts production activities.

In this regard, the paper's objective, which ties in with its contribution to the literature, is to analyse the impact of income inequality on SPI in SSA countries. Additionally, the impact of democracy on SPI is also empirically examined. The author is confident that findings from this research will inform policy making and extend the boundaries of academic research. To the best of our knowledge, the relationship between income inequality and SPI in SSA has not yet been an object of research. The paper's contributions are enumerated as follows:

- The research uses a new methodology, Hierarchical Clustering on Principal Components, to build the SPI index to study the similarities and differences between countries concerning SPI. This approach is a novel idea.
- The study covers 47 SSA countries for an extended time frame from 1990–2018.

Findings showed that a political regime's longevity does not trigger killings, and the duration of a regime reduces if coups d'état (successful or not) are rampant. Further evidence suggests that democracy explains SPI more than income inequality does, that GDP growth increases SPI and that education reduces SPI.

The rest of this paper is structured as follows. The next section (the literature review) builds the SPI index using the Principal Component Analysis (hereinafter PCA) method and presents the theoretical and empirical debate on income inequality and SPI. The methodology estimates the SPI in relation to income inequality, democracy and controlled variables. At the end, we have the conclusion.

Literature Review

SOCIO-POLITICAL INSTABILITY CONCEPT

SPI refers to troubles and crises: at a social level – demonstrations, bad social cohesion, terrorism, genocide, economic level – destruction of goods and economic infrastructures, reduction of production, and political level – imprisonment, coups d'état, assassinations, civil war, rebellion (Hibbs 1973; Alesina et al. 1996; Acemoglu and Robinson 2001). There are three approaches to SPI.

The first approach is the measure of SPI by a dichotomous variable. Fosu (1992) uses a binary variable to estimate the impact of political instability on SSA growth. A study carried out on Côte d'Ivoire, Kouakou (2010), calculates the index of political instability using a binary variable. The index takes the value 1 in the event of political instability and 0 otherwise. Lalime (2010) uses an indicator variable which takes the value 1 if at least one of the typical characteristics of political instability has been observed and 0 otherwise. These characteristics are coups d'état, political assassinations, untimely demonstrations, political protests and strikes, arrests, political repression and military spending.

This approach (measuring political instability by a binary variable of 0 and 1) has the disadvantage of giving the same weight, or even the same impact, to all the variables that constitute the political instability. Some of them, like genocide, have much greater impact than others (mere protests). This dichotomous measure of instability does not fully exploit all the informational values of SPI.

The second approach to measuring SPI highlights the frequency of regime change. These changes can be constitutional, thus happen according to the law, or unconstitutional, that is, occur from a coup d'état. A high propensity for executive change results in high political instability. This propensity to government changes is measured by probit regressions in which the probability of a change in the executive is related to several economic, socio-political and institutional variables. Angelopoulos and

Economides (2008), Beck, Levine, and Loayza (2000), Treisman (2000), Cukierman, Edwards, and Tabellini (1992) and Edwards and Tabellini (1991) adopt this definition of instability in their work.

The third approach to measuring political instability does not directly relate to the changes in executive power. It is constructing an index that sums up various variables that capture social unrest and political violence using PCA. This approach is implemented by Hibbs (1973), Fosu (1992) and Alesina and Perotti (1996).[3]

The advantage of this method lies in the fact that it makes it possible to identify variables that best explain the largest possible part of SPI variability. We could have collinearity between the variables because they are closely related. The proximity of the variables comes from the fact that they explain the same phenomenon. Correlation between variables means repeating the information. The PCA method makes it possible to sort the information and retains as much information as possible.[4]

A reference for the political instability index calculated with PCA is Hibbs (1973). It builds the collective protest index using riots, anti-government demonstrations and political strikes.

Barro (1991), one of the first to measure political instability, does so simply by using the number of assassinations (expressed in millions of population per year) and the occurrence of violent revolutions and coups (per year). He finds that the frequency of coups and the number of political assassinations negatively influence growth.

Alesina and Perotti (1996) extend Barro's (1991) approach to explain political instability better. They use PCA to build a weighted average of variables that capture political unrest: mass violence, political assassinations, coups d'état and a measure of dictatorship. The choice of these variables is to capture the idea of political instability as a danger to private law. Alesina and Perotti (1996) built their SPI index using Gupta's (1990) data from 1960 to 1985.

The SPI index of Alesina and Perotti (1996) and that of Gupta (1990) differ in three aspects: the country samples are different; Gupta (1990) used discriminant analysis; and he includes many more variables (the number of political demonstrations against a government, the number of riots, the number of political strikes, the number of politically motivated attacks, the number of political executions). Despite these differences, the two indices are 83% correlated. Fosu (2002) also used the PCA method to build SPI. He used the frequencies of coups d'état, involuntary changes of government, aborted coups and failed coups.

BILATERAL RELATIONSHIP BETWEEN INCOME INEQUALITY AND SPI

The relationship between income inequality and SPI is bidirectional. The literature suggests that SPI is caused by inequality. Dutt and Devashish (2008) argued that most SSA countries have significant natural resources, but the income from these resources is diverted by the ruling powerful elites.

In cases of large inequalities, election results are unreliable due to the wealthy and lobbyists (Krugman 2007). Kaufmann, Kraay, and Zoido-Lobaton (1999), using the Worldwide Governance Indicators, found that, as a general rule, unequal societies are much more prone to political instability, they are subjected to violence, coups d'état, etc.

Like Alesina and Perotti (1996), Dutt and Devashish (2008) conclude that inequality is positively correlated with political instability. They find significant and robust results.

Reducing inequalities is very beneficial for the economy, social cohesion and peace. Many authors defend this thesis (Dabla-Norris et al. 2015; Persson and Tabellini 2000; Venieris and Gupta 1986).

SPI is also caused by inequality. Several studies showed a difference in the allocation of resources among favourable and unfavourable areas to the ruling party (Lindbeck and Weibull 1987; Dixit and Londregan 1996; 1998; Bardhan and Mookherjee 2010). This is the case in India, where, after the elections, partisan districts received transfers that are more than 16% greater than those of non-partisan districts (Arulampalam, Devereux, and Maffini 2010).

The SPI evolved during a recession and economic instability. Gasiorowski (1995) and Przeworski et al. (1996) show that recessions significantly increase coups. This was the case for Brazil in 1964, Chile in 1973 and Argentina in 1976, to mention a few. On the other hand, rich countries (Norway, Iceland, Sweden) consolidated their democracy thanks to their stability. These authors point out that SSA countries, which are poor, have SPI because of economic instability.

According to Bourguignon and Morrisson (1998), levels of violence, as measured by homicide rates, have increased sharply in the two most unequal regions of the world (Latin America and SSA), and less in regions where growth is the fastest (Eastern Europe, Russia and Central Asia).

Addressing the issues of instability and its consequences for economic development, Collier (2007) shows that 73% of the poorest countries have

TABLE 1 Variables of Equation (1)

Variable	Description	Source
SCOUP1	Successful coup d'état	Center for systemic peace
ATCOUP2	Attempted coup d'état	
PCOUP3	Coup d'état plots	
AGCOUP	Subversion of the constitutional order and the imposition of an autocratic regime	
REBOUTEX	Rebel forces fighting against forces loyal to the regime	
ASSASSEX	Assassination of executive	
DURABLE	Regime durability	
NDEATH	Number of persons killed in an event	Social conflict analysis database
REPRESS	Government uses repression or violence against participants in an event	
NKILL	Number of total confirmed fatalities caused by terrorists	Global terrorism database

recently experienced a civil war. According to this study, the causality between poverty and political instability is a two-way street. Londregan and Poole (1990; 1991) argue that there is a positive correlation between political instability and poverty: poor countries are unstable because they fail to get rich, and they fail to get rich because they are politically unstable.

Methodology

MEASURE OF SOCIO-POLITICAL INSTABILITY USING THE PCA METHOD

The variables used to build the SPI index are as follows:

$$\begin{aligned} \text{SPI}_{it} = {} & \tau_1 \text{SCOUP1}_{it} + \tau_2 \text{ATCOUP2}_{it} + \tau_3 \text{PCOUP3}_{it} + \tau_4 \text{AGCOUP}_{it} \\ & + \tau_5 \text{REBOUTEX}_{it} + \tau_6 \text{ASSASSEX}_{it} + \tau_7 \text{DURABLE}_{it} \\ & + \tau_8 \text{NDEATH}_{it} + \tau_9 \text{REPRESS}_{it} + \tau_1 \text{ONKILL}_{it}. \end{aligned} \quad (1)$$

Alesina and Perotti (1996) use five variables to build the SPI index using the PCA method.[5] To these variables, we add the other five variables to consider the specificity of SSA countries. Presidents, at the end of their mandate, change the constitution to continue staying in power. The other concepts we take into account are the rebellions and terrorism which are numerous in SSA: the terrorism in the Sahel region (Burkina-

TABLE 2 The Country List

C	Code	Countries	C	Code	Countries
1	AGO	Angola	25	LSO	Lesotho
2	BEN	Benin	26	LBR	Liberia
3	BWA	Botswana	27	MDG	Madagascar
4	BFA	Burkina Faso	28	MWI	Malawi
5	BDI	Burundi	29	MLI	Mali
6	CPV	Cabo Verde	30	MUS	Mauritius
7	CMR	Cameroon	31	MOZ	Mozambique
8	CAF	Central African Republic	32	NAM	Namibia
9	TCD	Chad	33	NER	Niger
10	COM	Comoros	34	NGA	Nigeria
11	COD	Congo, Democratic Rep. of the	35	RWA	Rwanda
12	COG	Congo, Republic of the	36	STP	Sao Tome and Principe
13	CIV	Côte d'Ivoire	37	SEN	Senegal
14	DJI	Djibouti	38	SYC	Seychelles
15	GNQ	Equatorial Guinea	39	SLE	Sierra Leone
16	ERI	Eritrea	40	SOM	Somalia
17	SWZ	Eswatini	41	ZAF	South Africa
18	ETH	Ethiopia	42	SDN	Sudan
19	GAB	Gabon	43	TZA	Tanzania
20	GMB	Gambia, The	44	TGO	Togo
21	GHA	Ghana	45	UGA	Uganda
22	GIN	Guinea	46	ZMB	Zambia
23	GNB	Guinea-Bissau	47	ZWE	Zimbabwe
24	KEN	Kenya			

Faso, Chad, Mali, Mauritania, Niger), the Boko Haram in Nigeria and Cameroon; rebellions in Angola (1991–2002), Liberia (1999–2003), Côte d'Ivoire (2002–2010), and the Democratic Republic of the Congo (since 2000). We do not include the variable democracy because we analyse the impact of democracy on SPI in the second part.

Another specificity of our SPI index is that the sample is constituted only by SSA countries (47, see table 2) The SPI of Alesina and Perotti (1996), Gupta (1990), Venieris and Gupta (1986) and Hibbs (1973) cover the period of 1960–1985; our index is from 1990 to 2018. This difference

TABLE 3 Principal Components (Eigenvalues)

Component	Eigenvalue	Proportion	Cumulative
COMP1	2.840	0.284	0.284
COMP2	2.298	0.230	0.514
COMP3	1.469	0.147	0.661
COMP4	0.977	0.098	0.758
COMP5	0.781	0.078	0.836
COMP6	0.629	0.063	0.899
COMP7	0.411	0.041	0.940
COMP8	0.314	0.031	0.972
COMP9	0.197	0.020	0.991
COMP10	0.086	0.009	1.000

of the period makes difficult the comparison of this SPI with our SPI. The two periods, 1960–1985 and 1990–2018, are very different in terms of political events in SSA. 1990 is an important date for democracy in SSA. During that period, most SSA countries, after many years of single-party rule and dictatorship, adhered to political pluralism, multiparty politics, freedom of expression, and the state of law.

We start the PCA method with the matrix of correlations between the ten variables. The most correlated variables are NDEATH – REPRESS – NKILL; SCOUP1 – ATCOUP2 – ASSASSEX. As some variables are highly correlated, we can apply the PCA method[6] using fewer than ten components. Normalised PCA is used because all variables are not on the same scale. It is the case of the regime durability whose highest value is 37 and the number of persons killed which are thousands. Thus the variables are standardized.

After the normalisation of the variables, we determine the eigenvalues of the ten components. The components are new variables, linear combinations of the initial variables, and not correlated with each other (they are orthogonal to each other; each has information that is not explained by the others).

Based on the Kaiser's (1960) criterion, which recommends retaining those components with eigenvalues equal to or higher than 1 (the variance of each standardised variable), we retain four components which explain 75.8% of the total inertia.

To interpret the new axes, we use the circle of correlations (between

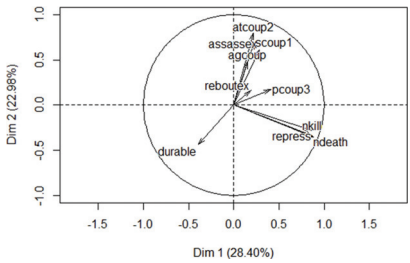

FIGURE 1 Variables Factor Map (PCA)

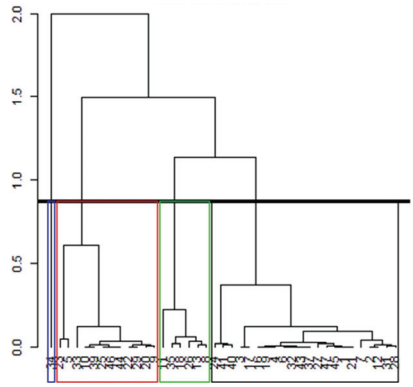

FIGURE 2 Dendrogram Showing the Partition of Countries (1990–2018)

the variables and between each variable and the first two components) of the variables factor map. The variables are represented in a plane by the first two components (figure 1).

Following the variables factor map (PCA), we can group the variables into three: DURABLE; NKILL-REPRESS-NDEATH; REBOUTEX-PCOUP3-ATCOUP2-ASSASSEX-SCOUP1-AGCOUP.

When we take the first axis as reference (the horizontal axis), the variables NKILL, REPRESS and NDEATH are orthogonal to the variable durable. The first axis opposes the killings to the regime durability in the SPI. The killings are not linked to the duration of a regime.

When we take the second axis as reference (the vertical axis), the variables REBOUTEX, PCOUP3, ATCOUP2, ASSASSEX, SCOUP1, and AGCOUP are opposed to the variable durable. The more coup d'état there is, the less the duration of a regime is. It means that the alternation in power in SSA takes place in several cases by coup d'état. There are two ways to change a regime in office: the change can appear according to the law or following a coup d'état.

PCA, HIERARCHICAL CLUSTERING AND PARTITIONAL CLUSTERING

In addition to PCA for constructing the SPI index, we use two other methods: Hierarchical Clustering, also called Ascending Hierarchical Clustering (AHC), and Partitional Clustering. These three standard methods put together constitute the Hierarchical Clustering on Principal Components (hereinafter HCPC) approach. The objective of HCPC is

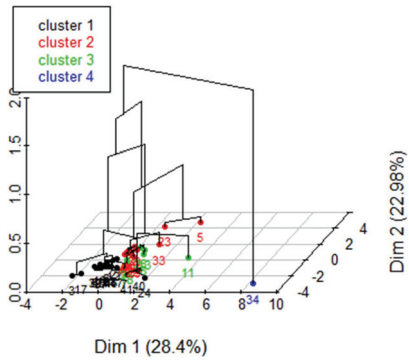

FIGURE 3 Hierarchical Clustering

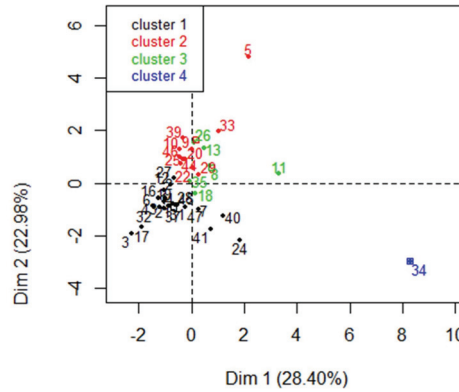

FIGURE 4 Partitioning in K-clusters (1990–2018)

to study the similarities and differences between countries from a multidimensional point of view (Lê, Josse, and Husson 2008; Husson, Josse, and Pages 2010).

The ascending hierarchical clustering is represented graphically by a tree (diagram) called a dendrogram. The number of groups (four in our case) in the hierarchical clustering is the number of PCA components. We use the Euclidean criterion for the distance and the Ward method for the agglomeration to build the dendrogram.

The third method is partitional clustering. Partitioning is used to divide the countries into several groups. A partition is good when countries of the same class are closed, and countries of two different classes are distant. We use the K-means method; as it also uses the Euclidean criterion for the distance. The number of communities determined by PCA is also used to partition the sample into four subgroups.

Using the first two principal components, the factor map represents the four clusters. A square represents the barycentre of each cluster, and the individuals are coloured according to their cluster.

After performing the clustering, we describe each cluster using three approaches: (1) We describe each cluster according to the variables in table 5; (2) We describe each cluster according to the principal components in table 6; (3) We also analyse the distance between each country and the centre of its cluster in table 7.

According to table 6, the four clusters are represented by different components; two clusters chosen randomly do not have the same principal components. It means that the clustering has been done well: countries

TABLE 4 Classification of the countries according to SPI (1990–2018)

Cluster A (blue)	Cluster B (green)	Cluster C (red)	Cluster D (black)
34 Nigeria	8 Central African Republic	5 Burundi	1 Angola
	11 Democratic Republic of the Congo	9 Chad	2 Benin
		10 Comoros	3 Botswana
		20 The Gambia	4 Burkina Faso
		22 Guinea	6 Cabo Verde
	13 Côte d'Ivoire	23 Guinea-Bissau	7 Cameroon
	18 Ethiopia	25 Lesotho	12 Republic of the Congo
	26 Liberia	29 Mali	16 Eritrea
	35 Rwanda	33 Niger	17 Eswatini
		39 Sierra Leone	19 Gabon
		44 Togo	21 Ghana
		46 Zambia	24 Kenya
			27 Madagascar
			28 Malawi
			31 Mozambique
			32 Namibia
			37 Senegal
			40 Somalia
			41 South Africa
			43 Tanzania
			45 Uganda
			47 Zimbabwe

NOTES The hierarchical clustering on the factor map is in figure 3.

have been grouped according to their similarities (intragroup) and according to their differences (intergroup).

We interpret the three tables, 5, 6, and 7, considering the clusters.

Cluster A: The country from cluster A (Nigeria) has a high SPI since the averages of the variables (NKILL, REPRESS, NDEATH, PCOUP3) of this cluster are much higher than the average for all the countries. It means that a lot of killings characterises the SPI of Nigeria: more than 10,000 deaths during the religious conflict in the 1990s, more than 1,500 deaths during community conflict (Ijaw, Itsekeri), and another religious conflict in 2000 with more than 55,000 deaths. The Boko Haram has killed more than 1 million people in Nigeria. Nigeria is represented only by the component 1. The characteristic of component 1 is the killings.

Cluster B: The countries from cluster B have a high SPI since the averages of the clusters' variables (REBOUTEX, ASSASSEX) are much higher than the average for all the countries. It means that the SPI of cluster

TABLE 5 Description of Each Cluster According to the Variables

Cluster A			Cluster B		
(1)	(2)	(3)	(1)	(2)	(3)
NKILL	25250	1763.171	REBOUTEX	1.000	0.146
REPRESS	673	83.683	ASSASSEX	0.500	0.146
NDEATH	48360	4545.585			
PCOUP3	3	0.781			
Cluster C			**Cluster D**		
(1)	(2)	(3)	(1)	(2)	(3)
SCOUP1	1.333	0.512	DURABLE	350.591	283.415
ATCOUP2	3.750	1.610	ASSASSEX	0.000	0.146
PCOUP3	1.500	0.780	PCOUP3	0.409	0.780
AGCOUP	0.250	0.073	REBOUTEX	0.000	0.146
			ATCOUP2	0.318	1.610
			SCOUP1	0.045	0.512

NOTES Column headings are as follows: (1) variable, (2) mean in category, (3) overall mean.

TABLE 6 Description of Each Cluster According to the Component

Cluster A			Cluster B		
(1)	(2)	(3)	(1)	(2)	(3)
1	8.290	$5.26e^{-17}$	3	−2.309	$-2.105e^{-16}$
Cluster C			**Cluster D**		
(1)	(2)	(3)	(1)	(2)	(3)
2	1.648	$-3.808e^{-16}$	1	−0.670	$5.263e^{-17}$
3	0.950	$-2.105e^{-16}$	2	−0.926	$-3.808e^{-16}$

NOTES Column headings are as follows: (1) variable, (2) mean in category, (3) overall mean.

B is characterised by rebellion and assassination of the executive. Considering the distance from the barycentre, the countries which characterise Cluster B are the Central African Republic (rebellion from 2004 to 2013), Rwanda (rebellion from 1990 to 1994; the assassination of the president Juvénal Habyarimana in 1994), Liberia (assassination of the president Samuel Kanyon Doe in 1990), Côte d'Ivoire (rebellion in 2002) and Ethiopia (the ONLF rebellion since 1984). Component 3 is characterised by rebellion and coups d'état (successful or not). The countries of cluster

TABLE 7 Description of Each Cluster According to the Distance between Countries in the Same Cluster

Cluster A					Cluster B				
34					8	35	26	13	18
0					0.407	1.119	1.271	1.311	1.353
Cluster C					Cluster D				
9	39	10	25	46	1	45	31	37	21
0.434	0.554	0.851	0.881	0.941	0.331	0.355	0.403	0.435	0.461

B have their coordinates in component 3 only.

The countries from cluster D are characterised by below-average SPI, since the variables (DURABLE, ASSASSEX, PCOUP3, REBOUTEX, ATCOUP2, SCOUP1) of this cluster are smaller than the average for all the countries. A regime's duration and coups d'état (successful or not) characterise the SPI of cluster D. The countries which characterise cluster D are Angola (38 years of José Eduardo dos Santos in power), Uganda (Yoweri Museveni, with 35 years in office), Mozambique (Joaquim Chissano, with 19 years in office), Senegal (Abdou Diouf, with 17 years in office), Ghana (20 years of Jerry Rawlings in power). The countries of cluster D are represented by the components 1 and 2. The component 2 is characterised by the regime's duration.

Cluster C: The countries from cluster C have a high SPI, since the averages of the variables of the cluster (SCOUP1, ATCOUP2, PCOUP3, AGCOUP) are much higher than the average for all the countries. This means that the SPI of cluster C is characterised by coups d'état (successful or not). The countries which characterise cluster C are Chad (coups d'état in 1990, 2004, 2006), Sierra Leone (coup d'état in 1992), Comoros (coups d'état in 1995, 1999), Lesotho (coup d'état in 2014) and Zambia (coup d'état in 1997). The countries of cluster C are represented by the components 2 and 3.

All these results are confirmed by each country's position on the factor map and the position of the variables on the variables factor map.

MODEL SPECIFICATION

Following Alesina and Perotti (1996), the empirical model is specified in equation (2) as follows:

$$\text{SPI}_{it} = \alpha_1 y_{it-1} + \alpha_2 d_{it} + Z'_{it}\gamma + \theta_{it}. \quad (2)$$

In models where SPI is used, two equations are used to make the es-

timates. In the first equation, the SPI is estimated – through a probit regression or the PCA method –, and in the second equation, we regress the SPI with an economic variable – income, GDP per capita, economic growth and investment (Hibbs 1973; Fosu 1992; Alesina and Perotti 1996; Venieris and Gupta 1986; Gupta 1990; Barro 1991; Ozler and Tabellini 1991; Benhabib and Spiegel 1992; Mauro 1993).

In our research, we use this methodology, which estimates two equations. In the first part of the methodology, we have measured SPI. The equation (1), therefore, constitutes the first equation. For the second equation, we use the model of Alesina and Perotti (1996). In this second equation (equation 2), the dependent variable, SPI, is explained by income inequality (y_{it}), the level of democracy (d_{it}) and a set of control variables constituted by institutional and economic variables (Z'_{it}): GDP growth, Inflation, Ethnic fractionalisation, Natural Resources, Education, and Urbanisation.

Income Inequality (y_{it})

The problem of income inequality data in SSA is the scarcity of available data, the absence of administrative data and that most of the data is based on survey estimates. Household surveys routinely underestimate the income and wealth of individuals at the top of the social ladder. There are many initiatives to build an accurate income inequality database for SSA countries.[7]

We adopt the Gini coefficient of the World Income Inequality Database (WIID) version 4 to measure income inequality for our model for several reasons. Data is obtained from the main available current databases: the World Bank, the Luxembourg Income Study (LIS), PovcalNet and national statistical offices, and from a large range of independent research papers. The 47 countries of our sample are present in the database. In many cases, UNU-WIDER (United Nations University World Institute for Development Economics Research) has recalculated the Gini index to be better comparable.

In models where an economic variable explains a political variable, there is the risk of joint endogeneity because of the bilateral relationship between the two variables. In our case inequality causes SPI, and SPI is also responsible for SPI. This bilateral relationship creates a problem of endogeneity. To overcome the problem of endogeneity, Londregran and Poole (1990; 1991), and Alesina et al. (1996) estimate a system of two equations in which the two endogenous variables are investment/economic

growth and the SPI. To resolve joint endogeneity, we take the lagged values of the income inequality that measure this variable at the beginning of the sample period.

Democracy (d_{it})

We choose the Freedom House Democracy Index to measure the democracy of our sample because its characteristics are necessary for our research. Civil liberties and political rights are two properties which are very important for democracy in SSA countries. The political rights are based on the electoral process, the political pluralism, participation, and government functioning. The indicators which composed the civil liberties are grouped into four categories: the freedom of expression and belief; the associational and organisational rights; the rule of law; and the personal autonomy and individual rights.

We calculate the mean of Freedom House's political rights and civil liberties indices, and we take the difference of the percentage to 100 to obtain the Democracy Index. The higher the index is, the more democratic the country, and vice versa. The index is available for all our sample countries from 1978 to 2018, and it is annual. Freedom House's survey methodology is based on standards applicable to all countries and territories, regardless of geographic location, ethnic or religious composition, or level of economic development. It makes comparisons across countries possible.

Institutional and Economic Variables (Z'_{it})

We expect that SPI decreases with economic development (Håvard and Sambanis 2006). Wealthier countries have more resources at their disposal that could be invested in social insurance and other forms of redistribution to alleviate social tensions. Economic development is measured through GDP growth (Schneider and Wiesehomeier 2008). Since 2000, African countries have recorded high growth rates. Out of the ten fastest-growing countries in the world, six are in Africa (South Sudan 8.2%; Rwanda 8.1%; Côte d'Ivoire 7.3%; Ethiopia 7.2%; Senegal 6.8%; Benin 6.7%; Uganda 6.2%) This growth rate rebounded from 1.4% in 2009 to 3.4% in 2019 (World Bank 2019). This performance should contribute significantly to income levelling and wealth redistribution, thus reducing SPI.

The variables GROWTH, INFLATION, N_RESOURCES and URBANISATION are measured by the GDP growth, Inflation, Total natural re-

sources rents (% of GDP) and Urban population (% of the total population) of the World Development Indicators (hereinafter WDI) of the World Bank.

Weak institutions are fertile ground for SPI. This increases the likelihood of political unrest and encourages citizens to resort to violence rather than focusing on economic and socially profitable activities (Anthony-Orji et al. 2019). Zelao (2000), in his argument on the question, reveals that the moods and rebellions in Africa most often come from weaknesses in the political institutions. To take into account the quality of the institutions in our regression, we insert the variable EDUCATION. The Educational attainment (at least completed lower secondary, population older than 25 years, percentage, cumulative) of the WDI of the World Bank measures the variable EDUCATION.

Esteban and Debraj (1999; 2008) discovered that highly fractionalised societies are prone to conflict. To test the impact of ethnic division on SPI within our sample, we use the ethnic FRACTIONALISATION index of Fearon (2003) based on the Atlas Narodov Mira (Bruk and Apenchenko 1964) dataset. The ethnic fractionalisation variable measures the probability that two randomly selected individuals will not belong to the same ethnolinguistic group. The FRACTIONALISATION index is ranged from 0 to 1.

ESTIMATION OF EQUATION (2) BY OLS

After presenting the model, we proceed to econometric estimates (table 8).

The Estimate (A)

The coefficient of INCOME INEQUALITY is positive and significant. INCOME INEQUALITY has a positive and significant impact on SPI. In the 47 countries that make up our sample, inequality is one of the causes of instability. This finding corroborates Acemoglu and Robinson (2001). It can nevertheless be noted that the impact of inequality on SPI, although significant, is small (0.02). According to these results, the cause of the SPI cannot be fully attributed to income inequality. In addition to inequality, other factors causing SPI should be explored.

The variable DEMOCRACY is significant, and the coefficient is positive: 0.68. This result indicates that in SSA countries, democracy explains SPI. The coefficient for inequality is 0.02, while the coefficient for democracy is 0.68. Democracy, in its conception, promotes elections without vi-

TABLE 8 Estimation by OLS of the Equation (2)

Variable	A	B	C
INCOME INEQUALITY	0.02*** (0.33)	0.02*** (0.00)	−0.07*** (0.37)
DEMOCRACY	0.68** (0.01)	0.44** (0.04)	3.31*** (0.07)
GROWTH		−0.06 (0.28)	0.06** (0.47)
INFLATION		−0.01* (0.09)	−0.01 (0.11)
N_RESOURCES			$-0.3e^{-8}$ (0.15)
URBANISATION			−0.03** (0.33)
EDUCATION			−0.09*** (0.31)
FRACTIONALISATION			0.63 (0.43)
Observations	74	74	70

NOTES Robust standard errors are in parentheses; *** significant at 1%, ** significant at 5%, * significant at 10%.

olence, so theoretically, this coefficient should be negative. Nevertheless, several studies[8] confirmed the result we obtained.

This positive coefficient of the DEMOCRACY variable could be explained in several ways. SSA countries have not yet assimilated democracy, or they have not yet cultivated a culture of democracy. SSA countries are said to be countries of a new democracy. These countries are still learning about democracy, hence stumbling on this path of initiation to democracy.

Another reason for the positive impact of democracy on the SPI could be that SSA countries do not yet have the prerequisite to be democratic. To opt for democracy, you need a minimum of achievements at the economic level (an acceptable level of income per capita, a low poverty rate, etc.) and at the social level (good social cohesion, national unity and a good level of education).

The third reason could be that democracy is not the right system, least not yet, for African countries. Other political systems (dictatorship, monarchy, etc.) could allow SSA countries to reduce SPI.

The Estimate (B)

In this second regression, in addition to INCOME INEQUALITY and DEMOCRACY, we add INFLATION and GDP growth. The coefficients of INCOME INEQUALITY and DEMOCRACY remain significantly positive. When it comes to INFLATION, the coefficient is significant and negative. This negative sign does not conform to economic theory because inflation is supposed to cause unrest and uprisings. GDP growth is not significant.

The Estimate (C)

In this regression, we take into account all the variables of the model. Whereas DEMOCRACY remains positive and significant, INCOME INEQUALITY is negative. The variable INFLATION is not significant. The GDP growth coefficient is positive and significant. The economic growth that is supposed to improve the populations' living conditions increases the SPI in SSA. This result raises questions about the distribution of the fruits of growth. If the distribution of wealth is not done well, it can create income inequality, which causes SPI.

The sign of EDUCATION is negative and significant. Education and training reduce SPI. The higher the intellectual level of a country's population is, the less the SPI. The theoretical and empirical literature does not recommend the negative sign of NATURAL RESOURCES. The Dutch disease theory stipulates that the richer a country is in natural resources, the more unstable it will be. URBANISATION helps to reduce SPI. This could be explained by the fact that urban areas are more docile to the central government and its representatives. The more the villages modernise and the cities grow, the more democracy there is. Huntington (1968) and Berg and Sachs (1988) argue the opposite: urbanisation leads to social demand and increased redistributive politics. The variable FRACTIONALISATION is not significant.

Conclusion

Our research's main objective is to analyse income inequality as a determinant of SPI for a sample of 47 SSA countries over the period from 1990 to 2018. In this study, democracy has been inescapable both theoretically and empirically.

Our econometric approach took place in two steps. In the first step, we used the Hierarchical Clustering on Principal Components approach (PCA plus hierarchical clustering and partitioning) to measure the SPI Index and group the countries according to their similarity in SPI. In the second step, we estimated a linear panel model using the OLS method to analyse income inequality's impact on the SPI.

The SPI analysis allows us to conclude that the killings are not linked to the duration of a regime and that the duration of a regime reduces if coups d'état (successful or not) are rampant. Many killings characterise the SPI of Nigeria. That of cluster B is characterised by rebellion and assassination of the executive. That of cluster D is characterised by a

TABLE 9 Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) SCOUP1	1.000									
(2) ATCOUP2	0.614	1.000								
(3) PCOUP3	0.298	0.196	1.000							
(4) AGCOUP	0.178	0.184	0.243	1.000						
(5) REBOUTEX	−0.007	0.108	−0.181	−0.116	1.000					
(6) ASSASSEX	0.223	0.477	−0.039	0.351	0.351	1.000				
(7) DURABLE	−0.281	−0.310	−0.069	−0.208	−0.210	−0.225	1.000			
(8) NDEATH	−0.067	−0.023	0.134	−0.080	0.197	0.127	−0.152	1.000		
(9) REPRESS	−0.002	−0.071	0.293	0.006	0.048	−0.023	−0.155	0.878	1.000	
(10) NKILL	0.031	−0.047	0.291	0.008	0.029	0.088	−0.186	0.775	0.793	1.000
COMP1	0.136	0.129	0.244	0.091	0.113	0.166	−0.233	0.516	0.522	0.514
COMP2	0.458	0.528	0.114	0.316	0.107	0.404	−0.288	−0.222	−0.236	−0.186
COMP3	0.224	0.006	0.548	0.234	−0.651	−0.349	0.146	−0.146	0.056	0.049
COMP4	−0.438	−0.297	−0.047	0.767	−0.092	0.346	0.033	−0.013	−0.006	0.020

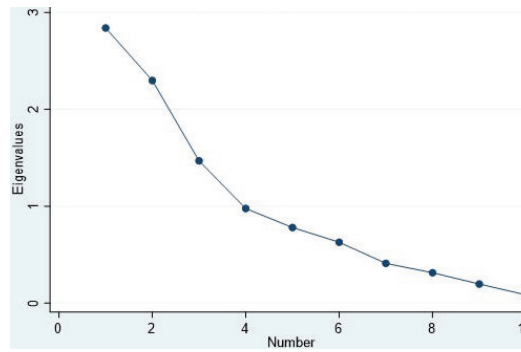

FIGURE 5 Scree Plot

regime's duration in power and coups d'état (successful or not). That of cluster C is characterised by coups d'état (successful or not).

The econometric estimate results indicate that income inequality in SSA countries has a significant and positive impact on the SPI. We find these results in the presence of democracy, inflation and economic growth. Our results also reveal that democracy causes SPI more than income inequality does. Democracy is largely responsible for SPI in SSA countries. Democracy, in its conception, is to reduce SPI. This result could be explained by the fact that SSA countries are new democracies or that these countries are still learning the rules of democracy or democracy is not the right system, least not yet, for African countries. The GDP growth that is supposed to improve the populations' living conditions increases

the SPI in SSA. This result raises questions about the distribution of the fruits of growth. Education reduces SPI.

One of our research results is that democracy positively affects SPI, while in theory, democracy should reduce SPI. Does this result pose the following problem: are SSA countries able to apply the democratic system? Do these countries fulfil all the conditions that apply to democracy? Subsequent research that analyses the determinants of democracy in SSA could answer these questions. Further research could analyse the relationship between SPI and income inequality for SSA countries grouped according to the coloniser's origin.

Notes

1 Defined as those living on less than 1.90 dollar a day (Ferreira et al. 2016).

2 Chancel et al. (2019) said: 'Africa has the highest gap between average incomes of the top 10% and incomes of the bottom 50%: average incomes of the top 10% are about 30 times higher than those of the bottom 50%.'

3 This approach is used by several authors: Venieris and Gupta (1986), Gupta (1990), Barro (1991), Ozler and Tabellini (1991), Benhabib and Spiegel (1992), Mauro (1993).

4 Husson, Josse, and Pages (2010, 2): 'PCA can be viewed as a denoising method which separates signal and noise.'

5 The variables are: ASSASS (the number of politically motivated assassinations); DEATH (the number of people killed in conjunction with phenomena of mass domestic violence, as a fraction of the total population); SCOUP (the number of successful coups); UCOUP (the number of attempted but unsuccessful coups); DEM (a dummy variable that takes the value of 1 in democracies, 0.5 in 'semi-democracies' and 0 in dictatorships).

6 The other elements of the PCA method (the matrix of correlation, the coordinates of the variables, and the eigenvalues) are presented in table 9 and figure 5.

7 The most used in the economic literature are the World Inequality Indicators Database (WIID) of the United Nations University World Institute for Development Economics Research (UNU-WIDER); The Standardised World Income Inequality Database (SWIID); The Luxembourg Income Study Database (LIS); The World Inequality Database (WID) of the World Inequality Report; and the World Development Indicators (WDI) of the World Bank.

8 Keech (1995) talks about the costs of democracy when it has undesirable effects on society. SPI could, therefore, be seen as a cost of democracy. For Alesina and Rodrik (1995), transitional democracies (the period preceding

the democratic period, for example, authoritarian and dictatorial regimes) constitute the most vulnerable types of power (social, political and economic instability). They show that it is the case in Latin American countries.

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A Review of Methodological Choices Relating to Work-Life Boundary Research

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Received: 1 March 2021 · Accepted: 17 March 2021 · Published online: 8 April 2021

A methodological review was performed on work-life boundary-related studies published from the year 2010 to 2018. This review systematically selected 59 journal articles on the work boundary phenomenon. The selection criteria for this review closely followed three previous systematic methodological reviews performed on work-life research. Where possible, comparisons were made to integrate the findings of the current study with these previous systematic reviews. Articles were reviewed based on methodological choices such as research design, sampling strategy, data collection, data analysis, reliability, and validity measures. Findings of the review revealed that researchers had utilised a variety of methodological stances to conduct their studies. The majority of the studies in the field followed a quantitative approach, and most studies relating to work boundary management were field studies with a cross-sectional design. Qualitative studies in the area were primarily based on grounded theory. Significant methodological gaps were identified that could be bridged by future studies. Further, notable suggestions were proposed relating to reliability and validity measures taken by the researchers.

Key Words: work-life boundary management, boundary theory, integration, segmentation, work-life balance, work-life conflict, work-family
JEL Classification: O15, M54

https://doi.org/10.26493/1854-6935.19.73-101

Introduction

Empirical studies on work and family research is not a new phenomenon; in fact, over the last three decades, work-family research has gained much popularity among work and organisational psychology researchers (Allen and Martin 2017). Work-life issues have become a notable rhetoric among the media, business circles, and the political world in the 21st century.

Hence, the development of work-family/life balance policies is a high priority in an organisations' human resource agenda (Chang, McDonald, and Burton 2010). This emphasis has led academics to produce new theoretical and conceptual orientations regarding work-life balance, such as work-life conflict, work-life balance, and work-life boundary management (Eby et al. 2005).

The literature on work-life issues has progressed with changes in the world of work. Most recent literature on work-life issues has focused on demographic changes (e.g. increasing female employment, dual-earner couples, same-sex marriages, single parents) in the workforce and the rapid development of technology (e.g. teleworking, portable work, smartphone use) (Allen and Martin 2017; Gadeyne et al. 2018). These fundamental changes in work and family lives have created more research areas to investigate (Allen and Martin 2017; Chang, McDonald, and Burton 2010). In the recent past, the focus of work-life research expanded to the individual level (Kreiner, Hollensbe, and Sheep 2009). The researchers focused on studying how individuals perceive and manage their work and nonwork roles. As a result, the work boundary theory emerged as a primary theoretical underpinning to discuss individual experiences in managing work and other life roles (Rothbard and Ollier-Malaterre 2015).

This paper intends to evaluate the methodological choices of work boundary research. Despite earlier reviews related to work-life research, no prominent reviews of work boundary management's methodological choices are available. This review will systematically evaluate the validity, reliability, and trustworthiness of the previous empirical studies related to work-boundary management. This review will also help profile the methodological choices in work boundary management research, thereby assisting researchers in understanding the methodological gaps in the field. The rest of the paper is arranged as follows: the next section will discuss the theoretical base related to this study, followed by the methods section. The following section will present the results of the systematic review. In the final two sections, implications will be discussed, with suitable recommendations.

Theoretical Background

WORK BOUNDARY MANAGEMENT

Work boundary management is a subarea of work-life balance research and has emerged as a field of interest in the past two decades (Roth-

bard and Ollier-Malaterre 2015). Boundary management is a broad conceptualisation that describes the multiple life roles of people and how they prefer to manage these relationships. Hence, people create, modify, and maintain mental boundaries between their different life roles to understand and manage their surroundings (Ashforth, Kreiner, and Fugate 2000). This attempt to manage different life roles is often referred to as integration and segmentation preference of life domains. Integration preference (permeable) allows elements from one life domain to flow or mix with another, while segmentation preference (non-permeable) blocks the flow or mix of elements from one life domain to another (Kreiner, Hollensbe, and Sheep 2009).

Work boundary management considers work-life balance or conflict from a different perspective than the traditional conflict-based perspective. Work boundary theory goes beyond the traditional conflict model, which discusses the spillover of work demands to non-work spheres and vice versa (Kreiner, Hollensbe, and Sheep 2009; Clark 2000). According to the work boundary theory, people experience conflict between work and non-work domains when they cannot maintain their preferred boundaries (i.e. segmentation or integration) between work and non-work domains. In other words, work-life conflict occurs when there is incongruence between actual and preferred boundaries, whereas work-life balance occurs when an individual feels that they can enact the boundaries they prefer between work and non-work domains (Ammons 2013). Work boundary management is the decision-making process involved in maintaining preferred boundaries between multiple life domains (Rothbard and Ollier-Malaterre 2015).

The emerging trend of boundary management theories on work-life balance studies rightly coincides with the social and technological changes in the world of work. Due to globalisa-tion and the rapid growth of information communication technologies, people can connect with their workplaces at any given time (Golden and Geisler 2007). This constant engagement with the workplace has promoted the integration of multiple life roles in everyday life, and consequently, these developments have caused many challenges and opportunities for individuals to manage their boundaries between work and non-work lives. In particular, smartphones have blurred the boundaries between work and non-work life domains, and have led people to actively manage their boundaries between work and non-work domains (Derks et al. 2016). Thus far, studies have revealed that the employees' boundary management process could

have a significant impact on productivity, commitment, interpersonal relationships, and wellbeing (Rothbard and Ollier-Malaterre 2015).

Although researchers have shown increased attention to work-boundary theory in the recent past, further empirical studies are required to fully understand how people create, maintain and modify boundaries between work and non-work domains (Rothbard and Ollier-Malaterre 2015; Allen, Cho, and Meier 2014). So far, studies have discussed people's boundary preferences and how it affects their work-life experiences extensively (Allen, Cho, and Meier 2014; Rothbard and Ollier-Malaterre 2015). Further, a separate set of studies focus on how people manage their work-life boundaries using different boundary management strategies (Kreiner, Hollensbe, and Sheep 2009; Kossek et al. 2012). Researchers have also studied the roles of different boundary participants in the boundary management process, such as managers, co-workers, and family members (Kreiner, Hollensbe, and Sheep 2009; Kossek et al. 2012).

However, with the advent of new communication technologies, the process of boundary management has become more challenging to people (Adisa, Gbadamosi, and Osabutey 2017). Hence, researchers need to pay more specific attention to how technology has changed the world of work and thereby challenged peoples' work-life boundaries (Adisa, Gbadamosi, and Osabutey 2017; Ollier-Malaterre, Jacobs, and Rothbard 2019). Moreover, researchers need to conceptualise the non-work lives of people beyond their families, to understand how people manage boundaries between work and other non-work life domains, such as spiritual life, friendship and education (Rothbard and Ollier-Malaterre 2015). Further, many of the studies in this area have focused on western settings; more studies from various social, economic and cultural settings would enhance the current understanding in this area (Ollier-Malaterre, Jacobs, and Rothbard 2019).

METHODOLOGICAL CHOICES IN WORK-LIFE RESEARCH

In any empirical study, the methodological choices are an essential aspect as it provides a proper guideline to understanding the phenomenon under investigation. Most researchers develop their methodological decisions based on the findings and insights provided in previous studies. Hence, researchers must understand the methodological choices relating to their research question. In terms of work-life research, some methodological reviews talk about the methodological foundations followed by earlier studies. Among these studies, Casper et al.'s (2007) review on work-family research methods between 1980 – 2003 provides an excel-

lent summary of different methodological choices and their effectiveness. This study discussed sample characteristics, research design, data collection, triangulation, data analysis, and variable measurements as critical methodological choices (Casper et al. 2007). Chang, McDonald, and Burton (2010) also performed a similar study, reviewing work-life literature from 1987 to 2006. One advancement of the review by Chang, McDonald, and Burton (2010) is that they discussed the differences between work-family conflict and work-life balance, which are two constructs used interchangeably in work-life research.

The chapter written by Lapierre and McMullan (2015) in the *Oxford Handbook of Work and Family* is one of the most recent methodological reviews in this area, focusing on work-family literature published between 2004 to 2013. In this study, they also reviewed methodological choices relating to sampling, research design, data collection, outcome measurement, multiple sources, triangulation, and level of analysis. The review indicated that qualitative and multi-wave studies have increased compared to the review of Casper et al. (2007). Another notable methodological review in work-family research is the methodological paper of Beigi and Shirmohammadi (2017). Here, they analysed the qualitative methodologies adopted in work-family research and found that work-life researchers have ample room in utilising different qualitative methodologies in their research.

This review extends the methodological discussion initiated in previous reviews specifically focusing on the work boundary-related research studies. As there is no notable methodological review on work boundary management, on the one hand, this review compared methodological choices of work-life research with the studies related to work-boundary research. On the other hand, this review critically evaluated the methodological choices in work boundary research. Such discussion will fill the current gap in the literature on methodological choices in work boundary research, which will ultimately advance the methodological rigour of work boundary research.

Method

Literature Selection and Criteria for Study Inclusion

A systematic literature search was conducted to identify peer-reviewed journal articles published from 2010 to 2018. Two manual searches were performed in Google Scholar and the EBSCO discovery service.

Google Scholar search

The first search was performed in Google Scholar using the algorithmic rules provided in Google Scholar. For this search, we needed to find articles that discuss both boundary management and work-life issues. Therefore, the keywords included the main concepts in boundary management and work-family issues. Accordingly, the following advanced keyword search was performed in Google Scholar:

> ('Boundary management' OR 'boundary theory' OR 'border theory' OR 'integration' OR 'segmentation') ('Work-life balance' OR 'work-life conflict' OR 'work-family conflict' OR 'Work-life').

The initial results of the search yielded 19,500 articles from various journals and sources. Secondly, search results were limited to articles published after 2010, which reduced the number of articles to 18,200. This reduction clearly shows that work boundary management has been propelled in work-family research in the last eight years. In order to further refine the search into credible articles, we followed the inclusion criteria utilised by Casper et al. (2007), Lapierre and McMullan (2015), and Beigi and Shirmohammadi (2017). These review papers only selected articles from high impact journals from the industrial and organisational area for their reviews. Usually, high impact journals only accept publications of highly acclaimed and reputed academics in the area of focus, due to their content standards and topical focus. The following journals were selected based on the inclusion criteria:

- *Academy of Management Journal*
- *Administrative Science Quarterly*
- *Group and Organization Management*
- *Human Resource Management Journal*
- *Human Relations*
- *Journal of Applied Psychology*
- *Journal of Business and Psychology*
- *Journal of Management*
- *Journal of Occupational Health Psychology*
- *Journal of Occupational and Organizational Psychology*
- *Journal of Organizational Behavior*
- *Journal of Vocational Behaviour*
- *Organisational Behaviour and Human Decision Process*

TABLE 1 Frequency of Search Results by Journal (Google Search)

Journal title	Frequency
Academy of Management Journal	64
Administrative Science Quarterly	13
Group and Organization Management	0
Human Resource Management Journal	76
Journal of Applied Psychology	102
Journal of Business and Psychology	54
Journal of Management	136
Journal of Occupational Health and Psychology	109
Journal of Occupational and Organizational Psychology	33
Personnel Psychology	58
Journal of Organisational Behavior	115
Journal of Vocational Behavior	164
Organizational Behavior and Human Decision Process	0
Work and Stress	0
Personnel Review	85
Human Relations	121
The International Journal of HRM	301
Total	1,431

- *Personnel Psychology*
- *Personnel Review*
- *The International Journal of Human Resource Management*
- *Work and Stress*

This inclusion criterion will enhance the comparability of the results of this study with the reviews mentioned above. The above-mentioned advanced keyword search was supplement-ed with Source: '«journal name»'

Table 1 presents the results for each journal in the keyword search performed in Google scholar. A total of 1,431 articles were scanned for relevance based on title and abstract. Articles that are not related significantly to boundary management were then excluded, along with literature reviews and meta-analysis papers. Finally, 40 articles were selected for the final analysis (Trefalt 2013; Reyt and Wiesenfeld 2015; Derks et al. 2016; Cruz and Meisenbach 2018; Sanz-Vergel et al. 2011; Liu et al. 2013; Daniel and Sonnentag 2016; Spieler et al. 2017; Methot and LePine 2016; Mc-

Dowall and Lindsay 2014; Golden 2012; Braukmann et al. 2017; Hunter, Clark, and Carlson 2017; Paustian-Underdahl et al. 2016; Lapierre and Allen 2012; Derks et al. 2015; Kinnunen et al. 2017; Koch and Binnewies 2015; Park, Fritz, and Jex 2011; Derks, van Mierlo, and Schmitz 2014; McNall, Scott, and Nicklin 2015; Carlson et al. 2015; Matthews, Barnes-Farrell, and Bulger 2010; Halbesleben et al. 2010; Barber and Santuzzi 2015; Matthews, Winkel, and Wayne 2014; Piszczek 2017; Lapierre et al. 2016; Spieler, Scheibe, and Stamov Roßnagel 2018; Biron and van Veldhoven 2016; Uhlmann et al. 2013; Capitano and Greenhaus 2018; Kossek et al. 2012; Winkel and Clayton 2010; Shockley and Allen 2010; Ammons 2013; Gadeyne et al. 2018; Adisa, Gbadamosi, and Osabutey 2017; Foucreault, Ollier-Malaterre, and Ménard 2016).

EBSCO Discovery Service

The second search used the EBSCO discovery service (EDS) available in the Stockholm University Library. This search engine enables browsing many databases through one gateway. For this study, all databases available in the EDS were included to get an overall availability of studies related to work boundary management.

The advanced search function of the EDS was employed to find related articles for this review. Hence, the following algorithmic statement was run to find articles relating to boundary management and work-life issues:

> (work-life balance OR work-life conflict OR work-family conflict OR Work Life) and (boundary management OR work-life boundaries OR boundary theory OR border theory OR integration OR segmentation).

The initial search of EDS yielded 66,844 articles. However, search results were further refined using the following limiters: published after the year 2010, peer-reviewed articles, and Stockholm university library collection. These limiters reduced the search to 6,404 articles. In the next stage, the search results were narrowed using subject terms available in the EDS for the specified search criteria. All subject terms related to work-life issues and boundary management available in the EDS were included to refine the results. Accordingly, the following subject terms were selected: work-life balance, work, work-life, quality of life, work and family, work environment, quality of work, families, boundaries, work-family conflict, family, labour market, burnout, well-being, working hours, employee attitudes, mental health, leisure, telecommuting, family conflict,

TABLE 2 Frequency of Selected Articles by Journal

Journal title	Frequency
Academy of Management Journal	2
Communication Monographs	1
Community, Work & Family	5
Human Resource Management	1
Human Relations	3
Human Technology	1
Indian Journal of Health & Wellbeing	1
International Journal of Human Resource Management	2
International Journal of Psychology	1
Journal of Applied Psychology	1
Journal of Behavioral & Applied Management	1
Journal of Business and Psychology	4
Journal of College & University Student Housing	1
Journal of Management	3
Journal of Occupational & Organizational Psychology	1
Journal of Occupational Health Psychology	9
Journal of Organizational Behavior	6
Journal of Vocational Behavior	7
New Technology Work and Employment	4
Personnel Review	1
Scandinavian Journal of Psychology	1
Stress & Health	1
Studies in Higher Education	1
Western Journal of Communication	1
Total	59

employment, job stress and integration. Further, to retrieve articles available in the English language only, search results were narrowed down by language (i.e. English). This narrowed down the search results to 285 articles, which were then subjected to a title and abstract scan; consequently, all articles which were not closely related to work-life boundary management were excluded from the search results. Hence, 19 articles were selected from the EDS search for the final analysis of this review (Golden 2013; Hyland and Prottas 2017; Bailyn 2011; Ba' 2011; Nicholas and Mc-

Dowall 2012; Lirio 2017; Leung 2011; Bhattacharyya, Suresh, and Selvaraj 2018; Qiu and Fan 2015; Adkins and Premeaux 2014; Rankin and Gulley 2018; Fonner and Stache 2012; Gold and Mustafa 2013; Yeow 2014; Sayah 2013; Pedersen and Jeppesen 2012; Michel and Clark 2013; Ylijoki 2013; Barrett 2014). Based on the above two searches, 59 articles were included in the final analysis of this review. Table 2 presents the frequency of selected articles in the journal.

Content Analysis and Coding Process

Since this is a methodological review, the content analysis of the selected literature will focus on methodological aspects. We carefully followed the coding schemes used in Casper et al. (2007) and Lapierre and McMullan (2015) to decide the categories and codes for this review. Accordingly, the following categories were used in the coding processes:

- Research design
- Sampling methods
- Data collection methods
- Data analysis methods
- Variable measurement, validity and reliability

Through these, we could effectively understand the research methods used in work-life boundary research. This analysis will act as a guide to understand the current methodological gaps in this research.

RESEARCH DESIGN

Research design provides an essential framework for the researcher to effectively perform his or her research and significantly guide the data collection and data analysis process (Bryman 2012). For this review, methodological choices around research design were coded as follows. First, the study was coded based on whether it used a quantitative methodology or a qualitative methodology. Secondly, the time horizon was coded, based on multi-wave (longitudinal) or cross-sectional. Finally, articles were coded based on study settings, for instance, if it was a field study or a lab study. Here, a lab study means the study used cases, scenarios, or vignettes to measure the perceptions of respondents.

SAMPLING METHODS

The generalisability of an empirical study highly depends on the representativeness of the sample. Eight sampling methods were included

for coding, which covers both probability and non-probability sampling methods. Accordingly, the following sampling methods were used in the content analysis: random, random stratified, random cluster, convenience, snowball, purposive, quota, and respondent-driven. In the case where an article did not provide specific information about the sampling method followed, it was assumed that such studies had used a convenience sampling method (Lapierre and McMullan 2015).

DATA COLLECTION METHODS

In this review, data collection methods were coded as follows: survey, semi-structured interviews, in-depth interviews, diary, focus group, archival data and other. Further, studies were coded based on the number of sources used to collect data. Accordingly, if a study used multiple sources, it was coded as 'multisource,' and if it used a single source, the code was 'single source.'

DATA ANALYSIS METHODS

Casper et al.'s (2007) coding methodology for data analysis was used in this review to code methodological choices around data analysis.

1. Simple inferential statistics (e.g. correlation, t-tests)
2. Techniques to examine one dependent variable (e.g. Multiple regression, ANOVA)
3. Techniques to examine multiple dependent variables (e.g. MANOVA, MANCOVA)
4. Techniques to examine multiple relations (e.g. structural equation models)
5. Techniques to examine the structure of data (e.g. exploratory factor analysis)
6. Repeated measures (e.g. time series, repeated ANOVA)
7. Qualitative analysis (e.g. content analysis)

Also, within the coding process, specific statistical tests or analysis techniques used in the study were recorded.

VARIABLE MEASUREMENTS, VALIDITY AND RELIABILITY

It is essential to judge whether the correct tools are used to measure the concepts relating to the research study. The following codes helped analyse the variable measurements: existing scale, existing scale adapted, and the new scale used. The generalisability of research findings mainly lies

with the validity and reliability of information collected (Bryman 2012). In this review, the availability of validity and reliability evidence were coded separately. If the researchers discussed the validity and reliability issues, the specific strategies used to prove validity and reliability were also captured.

Results

RESEARCH DESIGN

Most investigations in the work boundary management area have used a quantitative approach in their research design (i.e. 70% or 41 out of 59), while 27% of studies (16 articles) utilised a qualitative approach, and 3% (2 articles) used a mixed methodology. Regarding time horizon, 64% (38 articles) used the cross-sectional approach while 36% (21 articles) collected data, more than once, from respondents (i.e. multi-wave). A majority of the work boundary studies were field studies (95% or 56 articles), two articles (3%) used lab settings, and one mixed-method study (2%) adopted both field and lab settings in its work.

SAMPLING METHODS

Most of the reviewed studies discussed the sample and its characteristics. Thirty-seven articles (63%) of the review papers used a convenience sampling method, 19% (11 articles) used non-probability purpose sampling, 12% (7 articles) used the snowball method, and 5% (3 articles) used random sampling.

Further, one mixed-method study used multiple non-random sampling methods for their various studies. No paper in this review employed random cluster, random stratified, or respondent driven methods. Only three papers out of 59 (5%) of the selected studies used the probability sampling method, and out of quantitative studies, 73% (30 papers out of 41) used a convenience sampling method.

DATA COLLECTION METHODS

Sixty-three per cent (37 articles) of the studies in this review employed a survey method as the primary data collection strategy, 17% (10 articles) used a semi-structured interview, and three studies used in-depth interviews.

Further, two selected studies adopted the diary method to collect data. The rest of the studies (10% or 6 articles) used a mix of methods such as

open-ended questionnaires and focus groups. In addition, 92% (54 articles) of the studies collected data from a single source, while 8% (5 articles) used multiple sources to collect data.

VARIABLE MEASUREMENTS, VALIDITY AND RELIABILITY

Out of 59 articles reviewed, 43 (72%) used explicit variable measurement methods. Fifty-one per cent (22 articles) of the studies that used variable measurement utilised existing scales, while 42% (18 articles) adapted the existing scales according to their study purposes, while three studies developed new scales for their research.

In terms of validity evidence, 58% (34 articles) discussed the validity measures taken in the studies, while 42% (25 articles) did not discuss validity measures. Eighty per cent (47 articles) of the papers reported reliability measures taken in the study, while 20% (12 articles) failed to report any reliability evidence. Confirmatory Factor Analysis (CFA) was the most used tool (20 articles or 33%) to show the validity of the measurements.

In terms of reliability consideration, the researchers widely adopted Cronbach's alpha for the reliability test. In studies of quantitative nature, 98% (39 articles out of 41) at least mentioned Cronbach's alpha value as a reliability measure. However, validity evidence was available in 63% (26 articles out of 41) of quantitative studies.

DATA ANALYTIC METHODS

Seventy-three per cent (43 articles) of the reviewed papers utilised a simple inferential statistcs analysis and report data. Mean, standard deviation, and correlation were the popular inferential statistical tools used by the researchers. Techniques such as multiple hierarchical regression and ANOVA were used by 41% (24 articles) of the studies to report the relationships with the dependent variable, while 3% (2 articles) of the studies used techniques to analyse multiple dependent variables such as MANOVA and MANCOVA. Twenty-four per cent of the papers (14 articles) in the review used data modelling techniques to delineate multiple relations.

Moreover, data structure assessment tools such as CFA were utilised by 37% (22 articles) of the studies, whereas repeated measures such as multilevel modelling for repeated measures were employed by 12% (7 articles) of the studies. Finally, 31% (18 articles) of the reviewed investigations used qualitative analysis techniques to answer research questions. Grounded

theory methodology was the most popular qualitative analysis (6 out of 16 articles or 38%) or technique utilised by the researchers.

Discussion

QUANTITATIVE DESIGNS

Similar to the findings of previous systematic reviews (Casper et al. 2007; Lapierre and McMullan 2015) on work-life research, most studies in work-life boundary management have also followed the quantitative approach. These types of positivistic research are widely carried out by researchers, perhaps due to the preoccupied perceptions of such research within the research community (Bryman 2012). The precise measurement of variables, the ability to infer the causality between independent and different variables, and the generalisation and replication of the results are the main preoccupations related to quantitative methodology. These preoccupations are often distinguished as strengths of the quantitative approach.

In the review, it was evident that researchers had attempted to convey these preoccupations to the reader. For example, most of the quantitative studies (40 articles or 97%) used existing scales or adapted existing scales to measure variables related to work-life boundary management, to convey that they had used an acceptable measurement tool in their studies.

Research Design Issues

A significant finding of this review is that the majority of the studies followed the cross-sectional design. Using cross-sectional analysis to validate causal inferences is often challenged in academia (Bryman 2012; Lindell and Whitney 2001). In a cross-sectional design, it is difficult to conclude what causes the other, if two factors are associated (Payne and Payne 2004). Cross-sectional designs are more prone to the common method bias than multi-wave designs (Lindell and Whitney 2001). The common method bias means that variances in responses in a study are not attributed to the participants' real predispositions but to the nature of the instrument (Podsakoff et al. 2003). Typically, this could be more prevalent in a cross-sectional study due to recall bias and non-response (McGonagle 2017). As a solution to this methodological challenge, we can see an increasing trend in multi-wave studies in the work boundary management area. For example, in Casper et al.'s (2007) review on work-life research, only 11% of the reviewed articles used multi-wave or longitudinal research design. However, in the recent review of Lapierre

and McMullan (2015), 22% of the reviewed papers used multi-wave designs. Confirming the increasing trend, 21 out of 59 papers (36%) of the current review employed multi-wave designs, and 44% (21 studies) of the papers which followed a quantitative approach utilised multi-wave designs. However, most of these multi-wave studies were conducted within a short period, such as one week, two weeks, or a few months. Hence, most of the multi-wave studies closely followed the style of a diary study, though it is not explicitly similar to a diary study due to the short time utilised to collect data.

Conversely, common method-bias issues such as social desirability, leniency, harshness, and recall errors could also arise due to the nature of the data collection instrument (McGonagle 2017), and the common method variance is more prevalent in cross-sectional surveys (Podsakoff, MacKenzie, and Podsakoff 2012). In the current review, 63% (37 out of 59 papers) of the studies used a survey method to collect data. Notably, this is the most popular data collection method in quantitative studies (90% or 37 articles). Moreover, the survey method is the cheapest and quickest way to collect data from larger samples (Bryman 2012).

Contemporary researchers often use online surveys to administer their studies. In the current review, several studies adopted online surveys to collect data from respondents (Matthews, Barnes-Farrell, and Bulger 2010; Shockley and Allen 2010; Adkins and Premeaux 2014; Derks et al. 2016). Online surveys are gradually becoming more popular among researchers as they can collect data from a geographically diverse sample within a short period, and online survey software is increasingly becoming more user-friendly and attractive to respondents. Besides, online surveys support the data analysis process through the integration of data into the statistical analysis software. Accordingly, free online survey sites significantly reduce the data collection cost associated with research. However, online surveys also face some challenges, such as the lack of a solid sampling frame and ethical issues (Toepoel 2017).

Most studies in this review collected data from a single source. Work boundary management is a phenomenon created through a complex network of relationships between individuals, supervisors, colleagues, family members, and clients. Perhaps it would be more advantageous if data could be gathered from multiple sources relating to the research questions, and self-administrated questionnaires could also lead to some bias mentioned earlier; however, multiple sources could avoid the adverse effects of such bias (Casper et al. 2007; Lapierre and McMullan 2015).

Lapierre and McMullan (2015) point out that work-life research over-relies on field studies to infer cause and effect. Hence, some of these relationships may not be clear as they are presented in papers. However, there is a unique need for experimental (lab) designs in work-life research to strengthen the relationships identified through fieldwork. In the current review, only two articles utilised experimental-type designs in the work boundary management area. Lapierre and McMullan (2015) suggest that researchers could design field research as a means of experimental design by coupling field studies with organisational interventions on work-family balance.

Sampling Methods

Generalisability means that research findings could be extended beyond the particular context in which the research was conducted (Bryman 2012). In other words, the findings should apply to the entire population rather than the sample (Howell 2013). Positivistic researchers argue that generalisability is a critical strength in their research, but the generalisation of the results highly depends on the representativeness of the sample.

A representative sample should adequately represent all aspects of the population, which could be performed via probability sampling techniques to some extent (Bryman 2012). However, the results of the current review lack conviction, as only two out of all the studies adopted a probability sampling frame for their research.

A significant majority of quantitative studies in this review utilised a convenience sampling frame with an effort to add the representative elements of the population through discussing sample characteristics. Due to the practical implications of recruiting respondents, such as availability, willingness and costs, researchers often use convenience sampling in their studies. Convenience sampling allows the researcher to select a sample of respondents they can quickly and affordably access (Etikan, Musa, and Alkassim 2016). However, the disadvantage of this type of non-probability sampling method is that it limits the generalisability of the results to a broader population. Researchers could reduce this by increasing the variety of sample characteristics; yet it is not a complete solution to the problem (Etikan, Musa, and Alkassim 2016). Nevertheless, studies based on this sampling method could not be rejected based on these grounds. Though the results based on a convenience sample may not be definitive, these studies still provide useful insights on the work boundary management phenomenon.

Managing Global Transitions

Validity and Reliability Measures in Quantitative Studies

Another vital element in positivistic research is the validity and reliability of measurements. The generalisations made out of quantitative researches presume that they are derived through a meaningful and consistent measurement tool (Suter 2012). In the current review, 98% (40 of 41 articles) of the quantitative studies reported reliability measures while 63% (26 of 41 articles) of quantitative papers reported validity evidence. As expected, all studies that discussed reliability had to use Cronbach's alpha level as their guiding tool, as Cronbach's alpha is a good measure of internal consistency under certain circumstances. However, it is not the sole measurement tool available to assess data reliability (Suter 2012; Spiliotopoulou 2009). There were many criticisms on the application of Cronbach's alpha as the sole reliability measure in past studies (Spiliotopoulou 2009; Schmitt 1996; Agbo 2010; Vaske, Beaman, and Sponarski 2017). It is possible to make the criticism that a large number of items in a scale invariably report a higher value of alpha even though data is not consistent in reality.

Further, critics explain that alpha calculation assumes all constructs are unidimensional, which would not be the case in all situations (Spiliotopoulou 2009; Schmitt 1996; Agbo 2010; Vaske, Beaman, and Sponarski 2017). Hence, alpha values could sometimes mask data inconsistencies. Accordingly, critics suggest that researchers should use other tools alongside Cronbach's alpha (Spiliotopoulou 2009; Schmitt 1996; Agbo 2010; Vaske, Beaman, and Sponarski 2017). In terms of validity assessment, most studies that discussed validity evidence have used confirmatory factor analysis (CFA) as the tool to display the validity of their measurement tools. The confirmatory factor analysis is often used to measure the factor structure and the construct validity of a measurement tool (Atkinson et al. 2011). Using CFA first to assess whether the scales are unidimensional or not, and then using Cronbach's alpha test is mostly advised as a good method to test the validity and reliability of a scale (O'Leary-Kelly and Vokurka 1998).

In this review, some studies used exploratory factor analysis (EFA) to check the factorial validity of its scales. However, CFA has a relative strength over EFA as it can assess the overall model fit (O'Leary-Kelly and Vokurka 1998). Only one study among the reviewed articles discussed the criterion validity and discriminant validity of the scales (Kossek et al. 2012). Most studies used existing scales, previously validated, which could

be a significant factor for the absence of an extensive discussion on the validity of measure.

Data Analytic Strategies

For data analysis, almost all the quantitative articles reviewed employed simple inferential statistics such as mean, standard deviation, and correlations. However, we cannot use correlations to infer causal relationships (Bryman 2012). In terms of assessing causal relationships between variables, most studies in this review used multiple hierarchical regression as the analytic tool. Further, researchers frequently used path analysis and structural equation modelling to analyse multiple relations between variables. Multilevel modelling for repeated measures was used in most multi-wave studies as the data analysis strategy. It was evident that multilevel modelling had become more popular recently due to the various advantages associated with the strategy (Kenny, Korchmaros, and Bolger 2003). Unlike traditional repeated measures, multi-level models can manage unequal group sizes effectively.

Further, it can examine the effects of various levels in variables nested datasets. Accordingly, multi-level modelling can adjust to avoid any bias and/or error that could arise from the non-independence of observations (Kenny, Korchmaros, and Bolger 2003). As mentioned above, CFA and EFA were used to analyse the factorial structure of data.

QUALITATIVE DESIGNS

In this review, only 16 out of 59 studies (27%) used a qualitative approach. Unlike quantitative or positivistic approaches, the qualitative approach would argue that reality is a socially constructed phenomenon (Bryman 2012). The meanings of this word are interpreted by the participants who experienced them (Bryman 2012; Beigi and Shirmohammadi 2017). Work-life boundary management is a complex social phenomenon which involves negotiations with many parties, and traditional survey-based quantitative studies would not be ideal for gaining insights into such a phenomenon. The qualitative approach is more emergent and flexible and better suited to uncover a complex phenomenon such as work boundary management (Beigi and Shirmohammadi 2017).

Research Design and Sampling Methods

All qualitative studies (16 articles) of this review have followed field design rather than experimental studies. It is possible to see that researchers

could use an experimental-type design in qualitative studies to test the cause and effect of various relationships in field studies. Further, only three out of nineteen qualitative studies employed a multi-wave method research design. Ideally, qualitative studies could also follow a longitudinal format to understand the changes in people's work boundary experience (Thomson and Holland 2003). In terms of sampling strategy, convenience (7 studies or 44%) and purposive (6 studies or 37%) sampling methods seem to be the most utilised in the qualitative research related to work boundary management. Also, three qualitative studies (19%) have utilised the snowball sampling method to recruit respondents. Since interpretivism research employs small samples, these methods are relatively standard within this research paradigm (Saunders, Lewis, and Thornhill 2009). For instance, purposive sampling allows recruiting respondents based on predefined criteria. For a phenomenon like work boundary management, it is occasionally essential to select who would experience boundary management issues, e.g. married couples (Emmel 2013). Hence, purposive sampling might prove ideal for such a setting.

In terms of data collection, most qualitative studies in the review employed semi-structured interviews. Semi-structured interviews allow the researcher to probe deeper into the depth of a phenomenon already discussed in theories, therefore allowing researchers to uncover new insights into existing knowledge (Given 2008).

Data Analytic Strategies

The grounded theory is the most widely used qualitative data analytic framework (Bryman 2012). In the current review, seven qualitative studies have used a grounded theory approach to analyse data. The grounded theory allows the researcher to develop concepts about the discrete phenomena uncovered through data analysis. These concepts then build into a theory based on the relationships revealed through data. Grounded theory is good at capturing com-plexities of contexts such as work boundary management (Kreiner, Hollensbe, and Sheep 2009). However, there are criticisms of the usage of grounded theory (Bryman 2012). Some critics argue that grounded theory goes against the social constructionist view and tries to objectify people's experiences (Bryman 2012). Accordingly, a new type of grounded theory emerged as a constructivist grounded theory (Mills, Bonner, and Francis 2006). In this review, qualitative articles had used interpretivism techniques, case study approach, and thematic analysis to analyse the collected data. Hence, qualitative re-

searchers have more ample avenues to follow than traditional grounded theory analysis.

Validity and Reliability Measures in Qualitative Studies

A positivist critique of the qualitative approach is that the studies are too subjective and difficult to replicate (Bryman 2012). Qualitative research often follows an open process where the researcher has the flexibility to decide the flow and nature of data collection (Morrow 2005). Positivists argue that qualitative data is the researcher's subjective interpretations of the participant's subjective experiences. Hence, the findings of a qualitative study will be subject to the risk of contamination by the researcher's and the participant's bias.

Further, the flexibility of the design process in the qualitative approach makes it relatively impossible to replicate such a study in another context. Ultimately, this challenges the generalisability of qualitative findings. Often, positivist researchers challenge the generalisability of qualitative findings, arguing that the samples are nonrepresentative and the methodology is unstructured (Bryman 2012; Polit and Beck 2010). These arguments against qualitative studies are further strengthened because qualitative papers do not explicitly mention validity and reliability measures as opposed to quantitative papers. In the current review also, only seven articles among the qualitative studies attempted to discuss the validity or reliability-related methodological explanations.

Some postpositivist or interpretivist scholars have put forward alternative frameworks to increase the rigour and trustworthiness of qualitative studies (Malterud 2001; Morrow 2005; Whittemore, Chase, and Mandle 2001; Polit and Beck 2010; Shento 2004). Hence, qualitative researchers need to be aware of the methodological choices they make in various aspects of their research, such as

- Credibility (similar to Internal Validity)
- Transferability (similar to External Validity)
- Dependability (similar to Reliability)
- Confirmability (similar to Objectivity)

Accordingly, researchers must ensure the credibility of their studies through strategies such as employing well-established research methods, reflective commentary, and random sampling. In terms of transferability, qualitative papers should give a detailed description of the context they have studied. Dependability could be ensured using similar methods

used in related studies. Further, explaining in detail about the methodology adopted in the study also ensures dependability, as it allows others to replicate the study in another context. The qualitative researchers should be reflective of their bias. Reflective discussion on methodological and theoretical choices could avoid, or at least diminish, subjectivity bias in qualitative studies.

MIXED METHODS IN WORK-LIFE BOUNDARY MANAGEMENT

In the current review, two papers followed mixed methodologies. Mixed methodological studies often follow a pragmatic research philosophy (Saunders, Lewis, and Thornhill 2009). For a phenomenon like work-life balance, this could yield a clearer picture of the phenomenon. A mixed-method approach often supports the data triangulation concept where data is validated through several sources (Bryman 2012). This could be an ideal methodological choice in a complex phenomenon such as boundary management, which consists of different stakeholders.

Further, this could combine both qualitative and quantitative approaches by trading off the limitations of each approach. However, this does not mean that mixed methods are methodologically superior to single method research. Mixed method research is more challenging to conduct. It often needs more careful design, more time, and more resources than mono-method studies. Ill-designed mixed-method studies could yield unsatisfactory conclusions similar to the ill-defined mono-method study (Bryman 2012). If the researcher utilises a mixed-method research design, they should be ideally competent in quantitative and qualitative methods. Further, it is crucial to supply a detailed explanation of the methodological choices made in mixed-method research.

Conclusion

This methodological review of studies in the work-life boundary management area provides a clear idea of methodological choices applied by scholars who have studied the phenomenon. This review revealed that researchers used various methodological stances to investigate the work-life boundary phenomenon. However, there are several methodological gaps that future researchers could adopt to develop the work boundary-related research field into a more matured field of inquiry.

Quantitative researchers should focus on sampling issues such as representativeness of the sample they chose in the light of the parametric data analytic strategies they adopt in their studies. Random sampling strate-

gies will be ideal if it is practically feasible to implement. Further, it is recommended to use more multi-wave studies in the field to overcome issues relating to causal inferences in quantitative studies. Quantitative studies in work boundary management should effectively use more multisource approaches, which allow us to find a clearer picture of the complex interactions between different parties in a boundary management context. As suggested by Casper and co-workers (Casper et al. 2007), researchers could employ experimental designs to clarify doubts regarding the relationships uncovered in field studies. It is evident that researchers in the work-life boundary area overly depend on Cronbach's alpha as the sole indicator of reliability. However, researchers must carefully use alpha values to discuss reliability in light of recent criticisms.

Based on this review, qualitative studies have solely used grounded theory as their methodological choice for data analysis. Researchers have ample access to various qualitative methods applicable to analyse qualitative data such as ethnography, interpretative techniques, and narrative analysis. Further, researchers could use multiple data sources such as focus groups to study data rather than overly relying on semi-structured interviews. It is imperative that qualitative researchers clearly explain and justify the methodological choices in their papers. This explanation would help ensure the validity and reliability of the qualitative study. Moreover, researchers could also adopt mixed methodological designs to study the work boundary phenomenon.

This review has several limitations. In order to limit the number of studies reviewed to a feasible number, we chose articles only from top-tier research journals and databases related to the work boundary phenomenon. A more extensive range of journals could have further enhanced the findings of this review. Despite these limitations, this review provides an ideal way forward for future scholars planning to study the work-life boundary phenomenon.

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