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# Global & Local Economic Review

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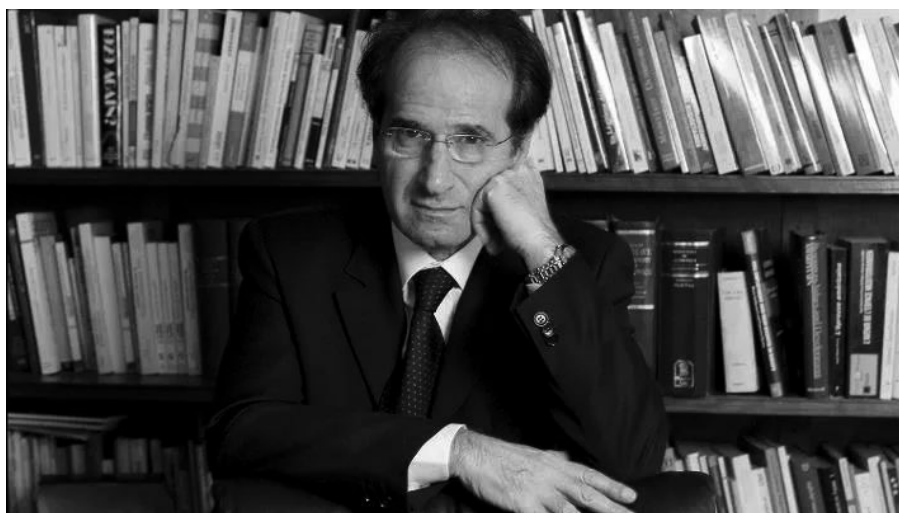
**Jean-Paul Fitoussi**  
*19 August 1942 – 15 April 2022*

K. Vela Velupillai  
Tottvägen 11  
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15 April 2022  
Revised: 17 April 2022



Jean-Paul Fitoussi (henceforth JPF) was born on the 22<sup>nd</sup> of August, 1942 in La Goulette, Tunisia but emigrated to France and studied at Strasbourg University where he earned his doctoral degree, *cum laude*, in law and economics.



Jean-Paul Fitoussi in a typically pensive mood, surrounded by books (downloaded from the Internet edition of *La Stampa*, 15/4/2022)

In 2013, *Sciences Po* – where he was a Professor – organised a day honouring JPF's lifelong research by inviting leading economists, all Nobel Laureates – and critical, in various ways and degrees of the dominant paradigm in macroeconomics, as JPF was of newclassical macroeconomics<sup>1</sup> (though not all were traditional economists by that time) – Joseph Stiglitz,

Edmund Phelps, Amartya Sen, Robert Solow and Kenneth Arrow. It was a memorable occasion where issues that JPF felt were close to his analytic heart, European integration, European democratic deficit, inequality, unemployment – both macroeconomically – and environmental sustainability (as an economic issue), were discussed; closing the day of debate were speeches by Laurent Fabius, minister of foreign affairs in the French cabinet, and François Hollande, the French President at that time.

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<sup>1</sup> Newclassical economists believed in a unified economic theory, encompassing both microeconomics and macroeconomics.

It was an emphasis of JPF's allegiance to men of 'fame' who were critical towards the ruling paradigm in his chosen field and his ability to show uncompromising adherence to ordinary economists – from any and all backgrounds - in choosing them for employment or as his research students. For many years he was the Secretary of the International Economic Association and in this capacity, he was familiar with most contemporary economists of diverse doctrine-historical persuasion. This familiarity did not mean that he was persuaded to adopt their views on the desirability of a ruling economic system.

In his early years, during and immediately after the Strasbourg years, at the European University Institute, in Fiesole, Italy, JPF was enamoured with disequilibrium economics of the Bent Hansen - 'Bill' Phillips variety and therefore Georgescu-Roegen, Clower, Leijonhufvud were important – and so was Hicks. They – and JPF – demonstrated the inadequacy of standard equilibrium analysis and tried to develop alternative notions of equilibrium which enabled one to – at least – consider disequilibrium economics in the reasonably long-run.

He wrote and contributed several important articles, in respected Journals and well-known books; of these his contributions in the *Journal of Money, Credit and Banking* and the *American Economic Review* are worth mentioning because they emphasise the two aspects of his interests: theory and policy.

JPF was the author, singly or jointly of many books and edited several highly regarded books. Of these, I might be forgiven for choosing two: his jointly authored – with Edmund Phelps – 1988, book, *The Slump in Europe: Reconstructing Open Economy Theory* and his edited earlier (1983) book, *Modern Macroeconomic Theory*.

A Festschrift for JPF was published in 2004 with the title *Macroeconomic Theory and Economic Policy* and including contributions by leading economists, among whom were three Nobel laureates and many who may get it in the future. In reacting to a request from the Editor for a contribution in honour of JPF's 60<sup>th</sup> birthday, Edmund Phelps wrote, p.1 (italics added):

'I'm shocked that Jean-Paul is anywhere near 60! Have you ever checked your dates? It was only *a few years ago* that he moved into his 50s.'

His demise now, when 'only a few years ago' he moved into his 70s, caught me – and many of his friends – by genuine surprise.

He was the recipient of numerous honours and prizes; it was unfortunate that the award committee of the *Riksbanken's Prize in Memory of Alfred*

*Noble*, also known as the *Nobel Prize in Economics*, overlooked JPF's fundamental contribution to macroeconomic theory and economic policy. However, amongst the numerous Prizes JPF was the recipient of the Italian one of the *Fondazione Pescarabruzzo NordSud prize for the Social Sciences*.

For many years JPF was the President of the *Sciences Po* based *Observatoire français des conjonctures économiques* (OFCE), which was located very conveniently in 69, Quai d'Orsay; he had his office there, before, during and after his Presidency.

In February 1981 I had just begun my tenure as Director of Studies at Peterhouse (the oldest College in Cambridge) in succession to my teacher, Richard Goodwin, when I had a call from him in Siena to the effect that JPF wanted to interview me with the intention of employing me as his assistant; I gave a seminar at the EUI and was interviewed by JPF, who offered me the job – but stated in unambiguous words:

‘I want you here, in Fiesole – not with Goodwin in Siena.’

Thus began *my* association with JPF, EUI, Tuscany and Italy<sup>2</sup> – *which has never ceased!*

He was of Sephardic Jewish origin but was very sympathetic to all underdeveloped people and treated them with the utmost sympathy; this did not mean he was not critical of the French attitude to Jewish people and equally forceful in his critique of the Israeli state's stance on the Palestinians.

He is survived by his wife, Annie Fitoussi and his daughter and son.

---

<sup>2</sup> JPF ‘confessed’ many times that his years at the EUI in Fiesole were the happiest and he had a particular affection for Italy (he spoke flawless Italian).

Mohamed Mohieldin Abdelrhman Ahmed<sup>1</sup> - Wajid Ali<sup>2</sup>

REGIME DEPENDENT RELATIONSHIP BETWEEN ECONOMIC  
GROWTH AND MILITARY SPENDING IN SUDAN: A MARKOV  
REGIME SWITCHING ANALYSIS

Received: 29 March 2021 / Accepted: 25 April 2022

**Abstract**

The changes in the military expenditure of Sudan (increases or decreases) may be subject to changes in the economic growth of the country. This asymmetric relationship between the two variables can not be tested through linear time series models. The Markov regime-switching model is an alternative technique that is used to investigate the subject asymmetric relationship between economic growth and military spending. The current study utilizes two-state Markov regime-switching models to investigate the impact of military spending on economic growth for Sudan over the period from 1961 to 2019. Two key findings emerged from the analysis. First, the relationship between military spending and economic growth is state dependent. Second, in a high-growth regime (low standard error), the impact of military spending on economic growth is positive, while in a low-growth regime (high standard error), the reverse holds. The findings of the study suggest that in a low growth regime, an increase in military spending is detrimental to economic growth and vice versa.

**JEL CLASSIFICATION:** F4; F43

**KEYWORDS:** MILITARY EXPENDITURE, ECONOMIC GROWTH,  
MARKOV-REGIME SWITCHING, SUDAN

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## **1. Introduction**

In the last few decades, the effect of military spending on the macroeconomic environment in general and on economic growth specifically has received considerable attention in academic and policy-maker circles. Generally, it is argued that economic growth is affected by any changes in military spending (Barro & Sala-i-Martin, 1995; Dunne, 1996). Explicitly, two theoretical views recapitulate the association between military spending and economic growth. Keynesian income multiplier theory and the crowding-out hypothesis. The first theory postulates that military spending and economic growth go side by side, while the latter theory maintains that economic growth is negatively affected by the increase in military spending. According to the first view, the positive effect of military expenditure on economic growth is due to providing technical skills, providing a peaceful environment for investment and production activities, educational training, and engaging resources, particularly the population, in research and development activities, among others (Ando, 2009; Benoit, 1978; Dunne et al. 2002). Others who find evidence in favour that military spending negatively affects the balance of payment, crowding-out private investment, and capital outflows include but are not limited to (Abu-Bader & Abu-Qarn, 2003; Hou, 2010; Shahbaz et al. 2013). Studies also find no evidence of a relationship between economic growth and military spending (Huang & Mintz, 1990; Mintz & Stevenson, 1995).

The effect of official development assistance on economic growth is inconclusive (Collier & Hoeffler 2004, Doucouliagos & Paldam, 2011, Dreher & Langlotz 2015). They argue that aid is fungible, meaning that aid is never used for its intended purposes. Some study findings suggest that aid aggravates corruption, creates dependency on the donor country, and creates civil conflicts along with a reduction in the level of domestic production (Easterly, 2003; Djankov et al., 2008). Other studies maintain that there is no association between foreign aid and the economic growth of recipient countries (Boone, 1996; Rajan & Subramanian, 2008). Moreover, substantial evidence suggests that aid is used by the government in the recipient country to finance mounting military expenditure (Langlotz, & Potrafke, 2019). An important question that comes to mind is whether the economic growth of the recipient country is permanently increased by the inflow of official development assistance. In other words, we examine whether official development assistance affects the economic growth of the recipient country

differently during the expansionary and recessionary phases of the business cycle.

The contribution of this study lies in the fact that it investigates whether military spending has a negative/positive effect on economic growth during low/high growth regimes in Sudan between 1961 and 2019. Attention to the relationship between economic growth and military spending is given to another part of the world and not to African countries in general and Sudan in particular (Desli, Gkoulgkoutsika, & Katrakilidis, 2017; Dunne & Tian, 2016; Krtalic & Major, 2010). However, more attention should be given to the issue of increased military spending in Africa in general and in Sudan in particular not only from the academic perspective but also from the viewpoint of intraregional terrorist activities as well as increased armed conflict. Cross-border terror activities and sociopolitical unrest also give rise to economic instability (Saba & Ngepah, 2019).

The Markov regime switching econometric technique is a data generating process that makes it possible to estimate the parameters of military spending in low- and high-growth regimes. In other words, through this technique, it is possible to investigate the impact of military spending changes on economic growth in high- and low-growth regimes. The low-growth regime is characterized as a regime in which economic growth exhibits high volatility, while in the high-growth regime, economic growth shows high volatility. Therefore, it is natural to say that military spending differs during expansionary and recessionary periods of economic growth. It may not be wrong to say that changes in military spending are driven by the expansionary and recessionary phases of economic growth. In fact, public investment programs around the world are set to counter major recessions (Custers, 2010). Additionally, in China, it is the dynamics of GDP that drive changes in military expenditure (Wood, 2010).

Another advantage of the assumed model is that it will enable us to examine the impact of military spending changes on the transition probabilities associated with the switching of growth states. The policy implications of the state-dependent relationship between economic growth and changes in military spending are that, depending on the state of the economy, policy-makers can decide on military and nonmilitary budgets. For instance, expansionary policies, if the authority aims to boost the economy, could be potent if in a state of recession, military spending changes negatively affect economic growth. Similarly, a cut in military spending may be deemed necessary for an economic boost.

The rest of the study is organized as follows. Section two provides insights from the relevant literature. Section three outlines the detailed methodology used in the paper. Section four focuses on the data and discussions of the obtained results, while section five concludes the study and provides some policy implications.

## **2. Literature Review**

A large amount of both theoretical and empirical literature exists on the relationship between economic growth and military spending. Allocating a higher budget to the military sector than to the civilian sector has two possible effects. On the one hand, it can crowd out private investment, while on the other hand, it can create positive externalities through technological advancements (Ram, 1995) and through infrastructure and human capital formation. High military spending also guarantees the internal and external security of the country, which helps in the promotion of long-term investment plans in the country by attracting potential foreign investors (Sandler & Hartley, 1995).

The seminal work of Benoit (1978) finds a positive relationship between military spending and economic growth. However, afterwards, a number of studies conducted empirical research to challenge his findings. The available studies utilized different econometric methods and tested different theories. The data sample was taken from different geographical areas, and they used different sample periods to examine the subject relationship. In the context of developing countries, it was found that military spending has an insignificant impact on economic growth (Deger & Sen, 1995). However, Kollias et al. (2007) maintain that the same effect is negative in the case of developed countries. Additionally, some studies conclude that there is no apparent relationship between the two variables (Majeski, 1992; Mintz & Stevenson, 1995).

The aforementioned studies are limited to the examination of the relationship between the two variables through linear econometric models. The set of conflicting findings on nature, direction and magnitude can be attributed to the use of very varied sets of specifications/explanatory variables and estimation techniques. Examination of modelling and estimation techniques applied in these studies clearly indicates that much of the literature ignores structural issues. Economic series adapt to different regimes, such as financial crises and unexpected changes in economic policy. The true model

of the relationship between military spending and economic growth in a dynamic economy such as Sudan may be changing over time, leaving the relationship between economic growth and military expenditures varied and difficult to define. Moreover, if not taken into account, the problem of nonlinearity between economic growth and military expenditures may lead to flawed conclusions, as the relationship between the two variables is supposed to be wrongly specified (Pieroni, 2009).

Around the world, ample literature has investigated the nonlinear relationship between economic growth and military spending. A few examples include (Aizenman & Glick, 2006; Stroup & Heckelman, 2001; Kalaitzidakis & Tzouvelekas, 2011). However, examining the subject relationship in a nonlinear context, Sudan as a sample country is missing in the literature. Therefore, to bridge the gap in the literature, in the present study, the asymmetric relationship between economic growth and military spending in Sudan is analysed through a Markov regime switching model. This is an alternative method to the linear time series econometric technique that is used to test the asymmetric relationship between the two variables. Although it is widely known in the literature that the economic growth of any country may be state dependent, the parameters may vary over the states. However, in the context of Sudan, to our limited knowledge, this asymmetric impact of military spending on economic growth in different growth regimes has not yet been investigated. This multiple growth regime is attributable to the sizeable spillover as well as to the dynamics of business cycles (Hamilton, 1989; Azariadis & Drazen, 1990).

Several studies have investigated the nonlinear relationship between military spending and economic growth (Stroup & Heckelman, 2001; Lai et al. 2005; Aizenman & Glick, 2006; Cuaresma & Reitschuler, 2006; Yang et al. 2011; Menla Ali, & Dimitraki, 2014). However, no study has investigated the subject's nonlinear relationship between the two variables in Sudan. Therefore, the contribution of this study is to provide nonlinear evidence on the relationship between economic growth, military spending, and official development in Sudan using Markov-switching specifications.

### **3. Model specification**

Hamilton (1989, 1990) developed the Markov regime-switching model to examine whether economic growth is subject to regime shift. The model is subject to a regime shift in mean and variance and is specifically designed to



know the high growth regime (low volatility) and low growth regime (high volatility). However, Smith et al. (2000) use this model to examine regime shifts in military spending. The specification of the model is as follows:

$$y_t = \mu_{st} + \sum_{i=1}^2 \phi_i y_{t-1} + \beta_{st} x_{t-1} + \lambda' z_{t-1} + \varepsilon_t \quad (1)$$

where the economic growth and changes in military spending are given by  $y_t$  and  $x_t$ , respectively, while  $\varepsilon_t$  is a white noise term. Similarly, the control variable, which is official development assistance in our case, is represented by  $z_{t-1}$ . Persistence in the conditional mean of economic growth is controlled by considering up to autoregressive terms in the model.

In Equation (1), we allow the mean, the variance, and the slope of the military spending subject to change governed by unobservable state  $s_t$  i.e.,  $s_t \in \{1, 2\}$ . This nonobservable state  $s_t$  follows a first-order Markov chain process with constant transition probabilities, algebraically expressed as follows:

$$p_{ij} = \Pr(s_t = j / s_{t-1} = i) \quad (2)$$

where the smoothed probabilities are based upon all sample period information for a regime at time  $t$ , i.e.,  $\Pr(S_t = i / Z_T)$ , while the filtered probabilities are conditional on information up to time  $t$ , i.e.,  $\Pr(S_t = i / Z_t)$ . The plot of the filtered probabilities is responsible for the information in which regime the observed series is most likely to have been at every point in the sampling regime. We also estimate Equation (1) without the exogenous variable that we have in the model, i.e., whether the identified regimes are sensitive to the control variables. official development assistance.

The model parameter is obtained by the expectation-maximization (EM) algorithmic rule proposed by Hamilton (1989, 1990). The EM algorithm rule is aimed at a general class of models where the observed variable is governed by some unobservable random variable such as the regime variable  $S_t$ . This method starts with the initial estimates of the hidden information and iteratively produces a joint distribution that will increase the probability of observed information. Additionally, using OLS, several constant parameter models frequently used in the literature are estimated for comparison purposes. Such models may take the following forms:

A model without exogenous variables

$$y_t = \mu + \sum_{i=1}^2 \phi_i y_{t-i} + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma^2) \quad (3)$$

A model with military spending only

$$y_t = \mu + \sum_{i=1}^2 \phi_i y_{t-i} + \beta x_{t-1} + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma^2) \quad (4)$$

A model with military spending and control variables

$$y_t = \mu + \sum_{i=1}^2 \phi_i y_{t-i} + \beta x_{t-1} + \lambda' z_{t-1} + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma^2) \quad (54)$$

#### 4. Data Description

Annual observations for Sudan from 1961 to 2019 are used to estimate the model. The data, i.e., economic growth (annual %), military expenditure as a share of total GDP, and net official development assistance received (% of GNI) are all retrieved from the World Bank, World Development Indicators. The details of the variables used, with exact definitions and sources, are provided in the table below.

**Table 1. Variables notations, definitions and sources**

Variable	Notation	Description	Data Source
Economic growth (annual %)	EG	Annual percentage growth rate of GDP at market prices based on constant local currency	WDI
Military Expenditure	MEXP	Military Expenditure as a share of GDP	WDI
Net official development assistant received (% of GNI)	ODA	Net official development assistant received (% of GNI)	WDI

A summary of statistics for the relevant variables, i.e., military spending, economic growth, and official development assistance is provided in Table 2

below. The annual mean of all the variables in Sudan is positive and is approximately 3 on average. The volatility in economic growth in Sudan is approximately five times higher than the volatility in military spending and approximately two times higher than the official development assistance. All the variables exhibit neither excess kurtosis nor skewness. Moreover, Jarque–Bera (JB) test statistics suggest normality for economic growth and military spending and nonnormality for official development assistance at more than 5%.

**Table 2. Descriptive Statistics**

	GDPG	ME	ODA
Mean	3.744237	3.486949	3.900000
Median	4.310000	3.510000	3.430000
Maximum	16.67000	5.980000	11.90000
Minimum	-6.280000	0.950000	0.320000
Std. Dev.	5.306569	1.273573	2.745600
Skewness	0.085214	0.114117	0.768582
Kurtosis	2.823155	2.096285	2.842723
Jarque-Bera	0.148286	2.135778	5.869538
Probability	0.928539	0.343733	0.053143
Observations	59	59	59

#### *4.1 Empirical Results*

We perform the Phillips & Perron (1988) unit root test to examine the time-series properties of the concerned variables. It is a nonparametric modified version of the Dickey-Fuller test that corrects for any serial correlation and heteroscedasticity in the errors. For the detection of structural breaks in the data, we apply the minimum Lagrange multiplier (LM) unit root test of Lee and Strazicich (2004). This unit root test has an advantage over the Zivot and Andrews (1992) unit root test in the sense that the LM test is known to have no size distortion and spurious rejections in the presence of a break under the null hypothesis. The results of the unit root test are reported in Table 3 below, which shows that economic growth and changes in military spending are  $I(0)$ .

**Table 3. Unit root test results**

Phillips Peron test		Test statistic	1%	5%	10%
Military spending	With intercept only	-3.05**	-3.54	-2.91	-2.59
Economic growth	With intercept only	-5.04***	-3.54	-2.91	-2.59
Panel B: One-break LM tests					
Economic growth	Statistic	-3.97 (6)	-4.08	-3.48	-3.18
	$T_B$	2011			
	$\lambda$	0.13			
Military spending	Statistic	-7.53	-4.94	-4.44	-4.19
	$T_B$	2011			
	$\lambda$	0.13			

Table 4 reports the results from OLS and maximum likelihood estimates. The table consists of two parts: one state estimate from OLS and two-state estimates from the fixed transition probability Markov regime-switching model. The first three columns (from 1 to 3) represent the results from Equations 3 to 5, respectively. Column 2 represents the results when only military spending was included in the model, while Column 3 represents the results when both military spending and the control variable, i.e., official development assistance was included in the model. Although Columns 1 and 4 both report the estimates of the model without the presence of control variables, Column 4 reports results from the nonlinear model. Similarly, Column 5 reports the results of the Markov-switching relation between military spending changes and economic growth, including control variables and assuming fixed transition probabilities, as in Equation 1.

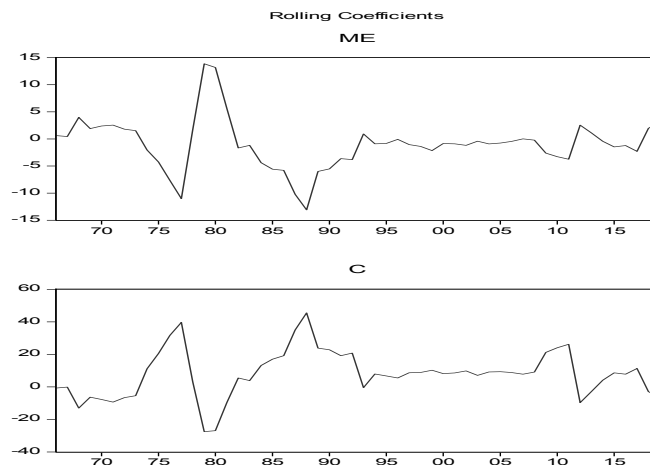
Since the parameters of the second state cannot be determined under the null of a single state, the standard likelihood ratio test cannot be used for the linearity hypothesis against the Markov-switching two-state.

Column 2 in Table 4 shows that economic growth in Sudan is negatively affected by changes in military spending, confirming the crowding-out effect. After incorporating the control variable, i.e., official development assistance in Column 3, the impact remains negative but insignificant. Our results to date are in contrast with the results of Chen (1993), where no causal relationship was found between economic growth and military spending in China.

Similarly, Masih et al. (1997) and Lai et al. (2005) also found a positive effect of military spending changes on economic growth, which is opposite to our results. As for the control variable, it has a positive but insignificant impact on economic growth.

To strengthen the form relationship between economic growth and military spending, a moving window estimate of the form of the OLS model specified in Column 2 of Table 4 is also provided to determine whether the model coefficient evolves over time. The estimated parameters of constant and military spending based on a 5-year window length are displayed in Figure 1. Since the model parameters evolve significantly over time (as evident from Figure 1), modelling the relationship between economic growth and changes in military spending through the nonlinear specification is the correct choice. In this study, we used the Markov-switching model because it has certain advantages over the other nonlinear specifications of break analysis and threshold regression. The dynamics in the business cycle suggest that any break in the business cycle is not permanent, but the break models assumed that every break is permanent. Similarly, Pieroni (2009) observed in his recent paper that the nonlinearity between economic growth and military spending could not be at one point; rather, it is variable and depends on the country-specific perception of uncertainty.

**Figure 1. The estimated slope coefficient associated with military spending changes (upper panel) and constant (lower panel) from moving window regression (window length is 5 years)**



Columns 4 and 5 of Table 4 report the results of the fixed transition probability two-state Markov-switching model. We allow for the shift in mean and variance in our models to determine whether the relationship is state-dependent or not. The results of the serial correlation LM test and White heteroscedasticity test suggest that the models are well defined. The mean and variance parameters are significant, suggesting the correct identification of high and low economic growth using smoothed probabilities.

The results of fixed transition probabilities Markov-switching Models 4 and 5 indicate that state/regime one is characterized by high economic growth with low growth volatility, while state/regime two is characterized by low economic growth with high growth volatilities in the Sudanese economy. Figure 2 displays the smoothed and filtered probabilities of low (high variance) and high (low variance) growth regimes. The nonlinear dependence between economic growth and military spending changes can also be viewed from the fact that economic growth is negatively impacted by military spending changes in state one, while the results are positive in state two. These results confirm the crowding-out effect in the low-growth regime and the Keynesian income multiplier in the high-growth regime. The crowding-out effect in a low growth regime postulates that higher military spending can be financed either via an increase in current taxes or through borrowing. This has an effect of deteriorating the balance of payments if the increase in military spending is financed by borrowing in the low growth regime. Moreover, the increase in spending hurts the expected after-tax return on productive capital as well as on the flow of capital, which in turn erodes economic growth (Knight et al., 1996). What the Keynesian income multiplier theorizes is that an increase in aggregate domestic demand capacity is expected to boost as a result of an increase in military spending in a high-growth regime (Dunne, 1996).

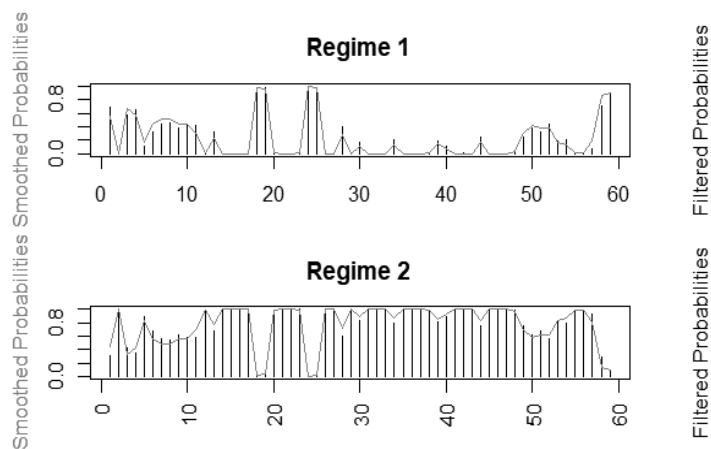
The impact of the control variable is positive and significant, signifying that an increase in official development assistants increases economic growth, but the magnitude of the increase in economic growth as a response to a one-unit increase in official development assistance is merely 0.161.

**Table 4. Evidence from linear and nonlinear model estimation**

	One state			Two state	
	OLS	Extended OLS		FTP	Extended FTP
	(1)	(2)	(3)	(4)	(5)
$\mu_1$	2.60 (0.002)	3.79 (0.069)	3.56 (0.117)	-5.30 (0.000)	-0.46 (0.193)
$\mu_2$				4.04 (0.000)	5.15 (0.006)
$\phi_1$	0.31 (0.018)	0.314 (0.017)	0.306 (0.020)	0.253 (0.034)	0.202 (0.000)
$\beta_1$		-0.34 (0.027)	-1.50 (0.375)		-1.64 (0.000)
$\beta_2$					0.531 (0.043)
$\lambda_1$			0.791 (0.319)		0.161 (0.002)
$\sigma_1$	5.11	5.14	5.13	1.50**	0.26**
$\sigma_2$				4.10***	4.38***
$p_{11}$				0.168	0.32
$p_{21}$				0.129**	0.084**
LogLike	-175.94	-175.73	-175.06	-176.41	-170.28
LM Test	4.29 (0.116)	3.86 (0.145)	2.529 (0.089)	5.61 (0.112)	3.259 (0.189)
White Test	2.46 (0.29)	4.43 (0.489)	7.272 (0.608)	2.33 (0.597)	6.712 (0.427)

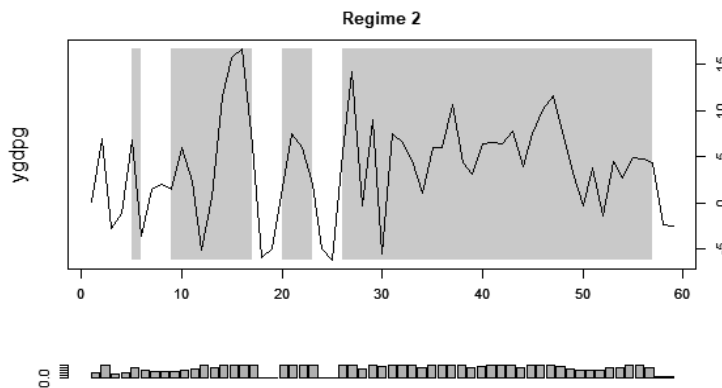
\*\* and \*\*\* indicate significance at 5% and 1%, respectively.

**Figure 2. Smoothed and filtered probabilities of the Markov regime-switching model with fixed transition probabilities of regimes one and two**



The persistence of each regime can also be shown graphically (see Figure 3 below). Figure 3 shows that the periods for each regime have been detected perfectly.

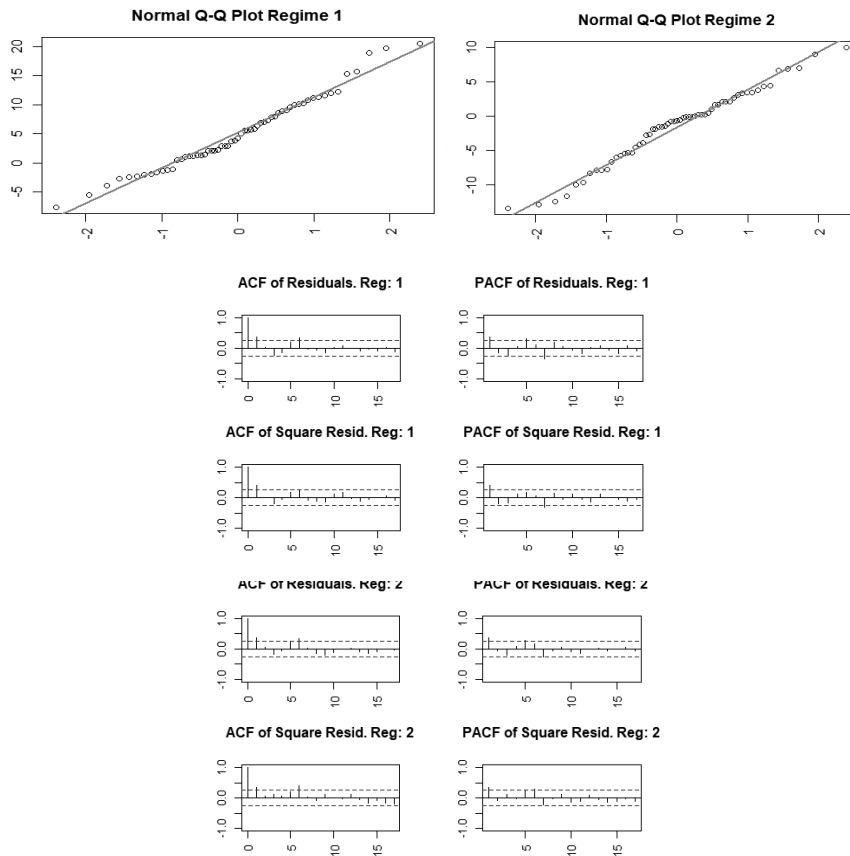
**Figure 3. Response variable indicating which observations are associated with regime 2**



The model results show that the covariate is significant and the data are explained very well by the model. The diagnostic plots for the residuals (see Figure 4) indicate that their autocorrelation is insignificant and thus seems to be white noise and that they have no autocorrelation. The model perfectly detects the periods of each state. The residuals appear to be white noise, and they fit the normal distribution.



**Figure 4. Normal probability plot and autocorrelation function of the residuals in regimes 1 and 2**



## 5. Conclusions

A large amount of work exists investigating the impact of military spending on economic growth, income inequality, and other macroeconomic variables in a linear fashion. However, the literature examining the regime-specific relationship between these two variables is very scarce. Additionally, the literature is limited to countries other than Sudan while ignoring the subject relationship in the context of Sudan. Against this backdrop, this study

investigated the state-dependent relationship between economic growth and military spending using time series data from Sudan over the period from 1961 to 2019. Markov regime switching is used as an empirical analysis for this study to test whether the relationship between economic growth and military spending is state dependent. The results confirm that the dynamic linkages between economic growth and military spending in Sudan are state dependent. Moreover, the results of the fixed transition probability Markov-switching model suggest that military spending affects economic growth negatively in a low growth (high variance state), which is consistent with crowding-out effects, and positively in a high growth regime (low variance state), which is consistent with the Keynesian income multiplier effect.

Several implications arise from the findings of this study. First and foremost is that Sudan should focus on the stability of its economic growth by allocating a balanced budget to military affairs in a low-growth regime to resolve the problem of the state-dependent relationship between economic growth and military spending. Another important area to which Sudan should divert its attention is to build an effective budgetary regulatory framework. Moreover, to determine the optimal policy instrument, i.e., the optimum budgetary allocation to each sector of the economy that strengthens the balanced growth of the country, a coordination reform between the fiscal policy unit and the monetary policy unit is a must.

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Maura La Torre§

THE RELATIONSHIP BETWEEN TOTAL QUALITY  
MANAGEMENT PRACTICES AND PERFORMANCE IS  
MEDIATED BY DATA ANALYTICS KNOWLEDGE. ARE  
UNIVERSITIES READY TO ADOPT CHANGES?

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**Abstract**

Despite the literature's focus on total quality management practices, only a limited number of studies have empirically examined hard total quality management practices in terms of benchmarking, process management and continuous improvement or explored data analytics knowledge as a mediating variable in the relationship between total quality management practices and university performance. This paper investigated the mediating effect of data analytics knowledge on the relationship between hard total quality management practices and university performance to address this research gap. A quantitative approach and PLS-SEM were used, and the empirical findings revealed that benchmarking and process management have significant and continuous improvement relationships with university performance. Moreover, this research indicated that quality is an important factor in the enhancement of university performance and the implementation of data analytics knowledge to boost the performance of universities.

**JEL CLASSIFICATION:** M10, D8

**KEYWORDS:** HARD TOTAL QUALITY MANAGEMENT PRACTICES;  
HIGHER EDUCATION; UNIVERSITY PERFORMANCE; DATA  
ANALYTICS KNOWLEDGE

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## **1. Introduction**

Higher education is vitally important to the progress and development of countries, as the pool of competent people produced by higher education contributes to the wellness of any country (Sadiq Akhter 2020). Quality in the higher education sector not only boosts other sectors but also enhances the performance of universities (Skapinaki, Salamoura et al. 2020). Fatima (2020) highlighted the fact that the lack of a knowledge base economy, poor research cultures and the failure to implement quality protocols have resulted in low performance of universities, resulting in a situation in which no Pakistani university is included among the top 300 universities worldwide (Rehman, 2020; THE, 2022). The quality of education provided by Pakistani universities does not meet global standards, as indicated by their rankings (THE, 2022). In addition, financial constraints such as governmental budget cuts from 82.5 billion to 65 billion have contributed to this low quality, as noted by world economic forums (Haq, 2019; Shahbaz, 2018; Bari, 2021; WEF, 2018). Decreasing quality and performance is observed in Pakistani universities due to their noncompliance with benchmarking, process management and continuous improvement. Due to these factors, both quality and performance are somewhat low, and the higher education commission of Pakistan (HEC) is not able to obtain a strong foundation (Shahbaz, 2018; Noor, 2020). Continuous improvement that is basically aligned with the quality standards is not observed, and students suffer from major jolts, as they do not benefit in either theoretical or practical respects (Ullah, 2019; Ali, 2019; Raza Ifran, 2018). Appropriate facilitation is also missing in universities in Pakistan, as they do not emphasize process management, which demoralizes not only students but also staff (Khan, 2019). In addition, Raja, Iftikhar et, al. (2019) concluded that Pakistani universities do not meet the required quality and performance standards, as most universities do not make efforts to obtain international accreditations that can help increase their quality and performance (HEC, 2021). IR 4.0 has been adopted worldwide, and the world is now moving towards the 5th industrial revolution, which is not only helpful in all fields of life but also contributes to the improvement of quality and performance due to the emergence of data analytics knowledge that helps all stakeholders improve quality and performance (Alton, 2018). Data analytics knowledge and quality management practices have improved these systems as

data analytics knowledge has revolutionized research (Daniel, 2019), but Pakistani universities remain unable to benefit from this improvement. Therefore, in this study, data analytics knowledge is viewed as an important aspect of the achievement and maintenance of university performance. Despite a great deal of research interest (in the business context) and sufficient support for the relationship of interest (Abdullah Tari, 2012; Patyal Koilakuntla, 2017; Anil Satish, 2016; Maistry, Hurreeram, Ramessur, 2017; Almahamid Qasrawi, 2017; Mahmood Ahmed, 2014; Wamba, Gunasekaran, Akter, Ren, Dubey, Childe, 2017; Akter, Wamba, Gunasekaran, Dubey, Childe, 2016; Mikalef, Boura, Lekakos, Krogstie, 2019; Salehan Kim, 2016; Ghasemaghaei, Ebrahimi, Hassanein, 2018), the relevant literature appears to have paid insufficient attention to university performance in relation to hard total quality management practices and data analytics knowledge, particularly in the context of the higher education sector in Pakistan. Thus, it is essential to investigate this neglected research area. According to Zu (2009), Ghasemaghaei, Ebrahimi et al. (2018), and Ghasemaghaei (2018), there are relationships among TQM practices, data analytics knowledge and performance, but very few studies have highlighted the higher education of Pakistan in this context. Moreover, Sadikoglu and Zehir (2010) concluded that TQM can be studied, but TQM can be studied as multidimensional, i.e., in terms of hard TQM practices (Zeng et al., 2017; Ershadi et al., 2019). Therefore, TQM practices, as hard TQM practices, are suitable for implementation with the goal of improving performance (Gadenne Sharma, 2009). Accordingly, in this study, hard TQM practices, data analytics knowledge and university performance are used to comprehend the relevant relationships in the higher education sector of Pakistan. In addition, this study contributes to the creation of a new set of hard TQM practices and a better understanding of data analytics knowledge and university performance. Thus, the study can help higher education of Pakistan, quality departments, and policy-makers and close the gap between academia and industry for the benefit of higher education in Pakistan.

## **2. Theoretical background**

Hard or core TQM practices have been identified by various scholars (Lewis, Pun et al., 2006; Zu, 2009), and hard TQM practices are technical



*The relationship between total quality management practices and performance is mediated by data...*

systems within an organization (Zeng, Phan et al., 2015; Rahman Bullock 2005; Flynn, Schroeder et al., 1995; Vouzas Psychogios, 2007; Youssef Zairi, 1995; Pike Barnes, 1996; Dale, 1999; Yang, 2005; Dow, Samson et al., 1999). This classification is supported by resource-based view (RBV) theory (Penrose, 1959; Barnery, 1991) and sociotechnical systems (STS) theory, which was by Manz and Steward (1997) and elaborated the technical aspect of organization; in addition, previous literature has identified hard TQM practices, as shown in Table 1.

**Table 1. Supporting References in HE fields**

<b>Variable</b>	<b>Supporting References in HE fields</b>
<b>Hard TQM practices</b>	
Process Management	Nadarajah and Kadir (2016), Mosadeghrad (2015), Psomas, Vouzas and Kafetzopoulos (2014), Abdallah (2013), Talib, Rahman and Azam (2011), Zu (2009), Fernandes and Fernandes (2018), Hrabala, Opletalová and Tučekc (2017), Wiechetek, Mędrék and Banaś (2017), Nadarajah and Kadir (2016), Drăgan, Ivana and Arba (2014), Ahmad, Francis and Zairi (2007)
Continuous Improvement	(Bhuyan Baghel, 2005), Karkoszka and Szewieczet (2007), Farrington, Antony and O’Gorman (2018), Oliveira, Sá and Fernandes (2017), Azene (2017), Jurburg, Viles, Tanco and Mateo (2017), Hohan, Olaru and Pirnea (2015), Lam, O’Donnell and Robertson (2015), Jung, Wang and Wu (2009), Zuhairi, Karthikeyan and Priyadarshana (2019), Kahloun and Ayachi-Ghannouchi (2019), Kregel (2019), Carlucci, Renna, Izzo, and Schiuma (2019), Iyer (2018), O’Reilly, Healy and O’Dubhghaill (2018)
Benchmarking	Joo, Nixon and Stoeberl (2011), (Rigby Bilodeau, 2011). Feibert, Andersen and Jacobsen (2019), Al Nuseirat, El Kahlout, Abbas, Adebajo,, Punnakitikashem and Mann (2019), Yaseen, Sweis, Abdallah, Obeidat and Sweis (2018), Ogidi and Inikpi (2014), Sajjad and Amjad (2012), Baba, Deros, Yousaf, Azhari and Salleh (2006), Rübénich, Dorion and Eberle (2019), Azoev, Aleshnikova and Sumarokova (2019), Mehta, Diwakar and Arya (2019), Takashima, Burmeister, Ossenberg and Henderson (2019), Knight, Leigh, Davila, Martin and Krix (2019), Raja, Iftikhar and Shams (2019), Pulatkhon (2007)

Source: own elaboration.

### **3. Literature review**

#### *3.1. Hard total quality management practices*

Nadarajah and Kadir (2016) found that process management is crucial for the implementation of improvement initiatives in any organization, and Mosadeghrad (2015) explained that total quality management focuses on accepting and perfecting the processes of any organization. In addition, Psoman, Vouzas et al. (2014) found that for the implementation of quality improvements, process management should be employed; otherwise, the motivation of an organization to ensure maximum quality in its products could be insufficient. Therefore, it is necessary to implement process management to make quality improvements. Zu (2009) found that process management has a positive impact on the quality performance of an organization. In addition, he explained that process management should be implemented with extra care to ensure that all records are error free and that top management does not incur blame. In their study of the higher education system, Fernandes and Fernandes (2018) found that process management has a direct effect on the quality and performance of higher education institutions. Therefore, the higher the position of and importance attributed to process management, the higher the institution's quality and performance. Hrabala, Opletalová et al. (2017) found that due to noncompliance with process management, university performance is declining, and Wiechetek, Mędrek et al. (2017) found that process management contributes to university performance.

Farrington, Antony et al. (2018) found that continuous improvement has a significant effect on hospitality and tourism. Moreover, they explained that continuous improvements can maximize results in the fields of hospitality and management and close the gap in service delivery logic in this industry. Zuhairi, Karthikeyan et al. (2019) explained that continuous improvement has a significant impact on performance, and Kahloun and Ayachi-Ghannouchi (2019) reported that the quality of continuous improvement is very important for success. In addition, those authors found that continuous improvement in higher education is the need of the hour with respect to both academics and administration. Kregel (2019), in a study about university teaching, found that evaluation in terms of continuous improvements is viewed positively by students, and they provide very good feedback on this approach. Not only is the teaching evaluated but also the course content. Moreover, Carlucci, Renna

et al. (2019) explained that evolution is achieved only by the implementation of continuous improvement. Joo, Nixon and Stoeberl (2011) defined benchmarking as “best practices found in similar industries or even in different industries in order to improve the performance of an organization”. Feibert, Andersen et al. (2019) explained that benchmarking is the most important factor in delivering high-quality services alongside the achievement of benchmarking. Moreover, Yaseen, Sweis et al. (2018) found that benchmarking is used to evaluate processes and mentioned the corresponding weakness in production in industry.

Rübenich, Dorion et al. (2019) highlighted the importance and role of benchmarking in higher education. These authors found that benchmarking plays an effective role in making and contributing to the development of organizational learning at the institute. Azoev, Aleshnikova et al. (2019) studied the process of benchmarking in educational programs for the digital economy. They recommended that more training should be provided for teachers and students. Mehta, Diwakar et al. (2019) discussed the different ways in which an institute can try to implement benchmarking, and those authors provided suggestions such as the improvement of infrastructural facilities. In addition, they noted that focusing on students and emphasizing the improvement of learning and teaching standards are helpful approaches that the institute can take. Takashima, Burmeister et al. (2019) explained that for students, benchmarking is a systematic process aimed at improvement in the field of education. Knight, Leigh et al. (2019) used the benchmarking process as a learning tool for students and found that students who are in touch with and complete the benchmarking process perform better. Moreover, those authors found a relationship between benchmarking and performance.

### *3.2. Data analytics knowledge*

This era is called the data era, and organizations must invest more heavily in data analytics knowledge to make substantial improvements and advancements. Namely, more unstructured data must be analysed for use by organizations (Mikalef, Boura et al., 2019). Data analytics knowledge is now considered to be important in both academia and industry, as both are concerned with obtaining better performance, and researchers are using such knowledge to promote performance more effectively. Moreover, practitioners have also associated innovation, flexibility and productivity with enhancing the performance of any organization (Mikalef, Krogstie et al., 2020). In

addition, Yasmin, Tatoglu et al. (2020) and Sena, Bhaumik et al. (2019) explained that data analytics knowledge is now viewed as the next revolution in management, as it helps with decision-making processes that can enhance performance (Kim, Dibrell et al., 2021). According to Ghasemaghaei, Ebrahimi et al. (2018), data analytics knowledge helps organizations improve their performance by using different tools, techniques, predictive analysis and processes, and Lavelle et al. (2013) explained that the highest performing organization obtains help from data analytics knowledge to enhance and facilitate its performance.

Data analytics knowledge has increased in importance not only in other organizations but also in universities seeking to improve their performance (Dubey et al., 2019), and universities are receiving help from data analytics knowledge to improve their operations and make decisions to improve their performance (Strausser, 2015). According to Kibe, Kwanya et al. (2020), data analytics knowledge has created more ways of improving internal operations ranging from student satisfaction to employee empowerment as well as ways of increasing the capabilities of universities to enhance their performance. Moreover, due to the adoption of data analytics knowledge, universities are able to compete with each other by obtaining adequate information and precise data that can help university performance. Marín-Marín et al. (2019) noted that universities' data in the form of both structured and unstructured data regarding all relevant stakeholders as well as data analytics knowledge can enable university management to extract the relevant information that is necessary for improvements in terms of processes and performance. Moreover, Kibe, Kwanya et al. (2020) emphasized the fact that it is now imperative for universities to focus on in data analytics knowledge to cater to the needs of the future and to make decisions based on the relevant facts and figures that can help increase the performance of universities.

### *3.3. University performance*

All sectors have a vital role to play in the economy of any country, but currently, the service sector contributes heavily to the economies of various countries and has become an integral sector alongside the manufacturing sector. TQM implementation has not only proven fruitful for the manufacturing sector but also provided support that has enabled the service

sector to increase, maintain and sustain performance (Saleh, Sweis et al., 2018). The study conducted by Amin, Aldakhil et al. (2017) in the hospitality sector found that TQM practices facilitate an increase in performance by providing scales that have proven to be vital for the hospitality sector. Mehralian, Nazari et al. (2017), in their research about the health sector, concluded that TQM practices are helping the health sector maintain and improve performance. In addition, those authors found that TQM practices have influenced the performance of the health sector. TQM practices have been proven to be important for the performance of pharmaceutical companies; for example, a study conducted by Al-buhisi, Abdallah et al. (2018) found that to attain the maximum level or a higher level of financial performance, it is helpful to implement TQM practices to satisfy all stakeholders. To continue the discussion about TQM practices and performance in the service sector, Sadikoglu and Olcay (2014) explained that TQM practices improve the performance of the service sector and that the service sector attains the maximum advantage by implementing TQM practices. Moreover, TQM practices have influenced university performance; Sakthivel, Rajendran et al. (2005) found that TQM practices can increase the performance of students, which ultimately enhances their university performance, and Al-Salim (2018) explained that university performance is dependent upon the implementation of TQM practices in the form of continuous improvements, benchmarking and process management. Moreover, it has also been reported that the failure of the implementation of TQM practices in its genuine spirit may cause negative performance for universities. Sciarelli, Gheith et al. (2020) also reported that TQM practices have a major influence on the performance of universities and that the implementation of such practices is necessary for the sustained and growth performance of universities. Alzeaiden (2019) found that TQM practices have a significant effect on the success and survival of universities and play a critical role in increasing their performance. TQM practices are also used as tools to promote the excellence of any organization, including universities, and some authors found that the implementation and development of TQM practices are necessary to promote performance (Dawabsheh, Hussein et al., 2019). In addition, Zwain, Lim et al. (2017) explained that to survive in the market, universities must be encouraged to adopt the TQM practices to attain the maximum level of performance and found that TQM practices have a direct influence on such performance. Avila (2018) found that by implementing TQM practices, the performance of the institute can be

increased, and when such practices are ignored, a decline in performance has been observed.

#### **4. Research hypotheses and theoretical framework**

Flynn et al. (1995), Kaynak (2003), and Rahman and Bullock (2005) found a relationship between hard total quality management practices and performance, and Zu (2009) found that hard total quality management practices help facilitate the attainment of performance. In addition, Sciarelli, Gheith et al. (2020) studied the relationship between hard total quality management practices and university performance in the context higher education; however, no such study has investigated higher education in Pakistan. Accordingly, the following hypotheses are proposed.

##### *4.1. Benchmarking and university performance*

Malik and Mann (2020) found that benchmarking has a significant relationship with performance, as it contributes to overall growth. In addition, Ashiru and Whitfield (2022) claimed that benchmarking has an impact on performance, as it creates value in the minds of potential customers. Moreover, Mann and Adebajo (2020) found that benchmarking has a relationship with performance. Thus, Daultani and Dwived (2021); Siti-Nabiha and George (2021); Kafaji (2020); Guseva and Kalashnik (2022); and Cossani and Codoceo (2022) explained that benchmarking has a relationship with performance. These arguments led us to propose the following hypothesis:

*H1: Benchmarking has a significant relationship with university performance.*

##### *4.2. Continuous improvement and university performance*

There is a significant relationship between continuous improvement and performance, as explained by Bura (2021), as such improvement contributes to the overall prosperity of universities. In addition, Fernandes (2021) and Galeazzo and Furlan (2021) explained that continuous improvement and university performance exhibit a significant relationship only due to their importance and interconnection, as these two factors are mutually vital and

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represent a way of enhancing performance. Moreover, Shokraiefard (2020), Wickramasinghe and Chathurani (2020), and Aboodi (2019) found that continuous improvement has a significant relationship with performance. These arguments led to us to propose the following hypothesis:

*H2: Continuous improvement has a significant relationship with university performance.*

#### *4.3. Process management and university performance*

Processes are essential to attain performance, and their management is also important. Lobo and Samaranayake (2021) found that process management has a significant relationship with performance. In addition, Sahibzada and Jianfeng (2020) and Kirjua and Kimencu (2020) claimed that due to effective process management, an organization's capacity to manage overall operations ultimately affects the organization's performance. Therefore, those authors also found that process management has a significant relationship with university performance. These arguments led to propose the following hypothesis:

*H3: Process management has a significant relationship with university performance.*

#### *4.4. Benchmarking and data analytics knowledge*

Benchmarking is important for any organization to prosper and gain relative importance in the market by improving its performance in both financial and nonfinancial terms. Data analytics knowledge helps organizations set specific standards to achieve certain benchmarks and thus make themselves prominent among other organizations. Therefore, data analytics knowledge helps organizations achieve those benchmarks (Bilal Oyedele, 2020). Data analytics knowledge provides the required tools and procedures for the implementation of benchmarking in organizations. Benchmarking and data analytics knowledge are interrelated and vital to organizations. Thus, with the help of data analytics knowledge, benchmarking can be implemented (Oliveira, Guimaraes, et al., 2019). The data explosion has emphasized the importance of analytics, and data analytics knowledge helps organizations cope with this explosion to obtain the maximum benefits. It is also notable in this context that data analytics can guide organizations to

obtain the exact information and ignoring that they need. Moreover, at present, data analytics knowledge helps organizations achieve the benchmarks that are necessary for them to perform well (Ghazal, Rabl, et al., 2013). This discussion led us to propose the following hypothesis.

*H4: Benchmarking has a significant relationship with data analytics knowledge.*

#### *4.5. Continuous improvement and data analytics knowledge*

Continuous improvement is not only essential in daily life but also important for organizations' ability to update themselves and receive attention in the market. Continuous improvement can be possible when information is retrieved from the data analytics. In addition, continuous improvement and data analytics knowledge are related to each other (Cochran, Kinard Bi, 2016). Processes are important for any organization, as they represent a guide to the actions adopted by the organization to cope and satisfy all stakeholders. Organizations are now receiving help from data analytics to retrieve the statistics that are required to make effective decisions. Moreover, data analytics also help organizations make processes easy and efficient (Sakr, Maamar, Awad, et al., 2018). The collection, organization, analysis and presentation of data are performed with the help of data analytics knowledge, and organizations can save money by using data analytics and improving their performance. In addition, the system can be expanded in terms of the requirements for organizations to cope with the current war of data to help them make the right decisions at the right time (Ismail, 2016). This discussion led us to propose the following hypothesis.

*H5: Continuous improvement has a significant relationship with data analytics knowledge.*

#### *4.6. Process management and data analytics knowledge*

As explained by Aljumah, Nuseir et al. (2021), process management and data analytics help each other promote prosperity and performance in organizations. In addition, data analytics knowledge allows the processes of an organization to be evaluated and serves as a guide to the flaws that result



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in decreased performance. Therefore, it is important for processes to be managed according to the results of the data analytics in a manner that benefits the organization. Bala and Venkatesh (2017) found that when health care organizations seek to innovate their processes, they ultimately look for such tools to help them accomplish this task. Data analytics knowledge helps such organizations obtain the necessary results and guides the sector in terms of how to incorporate the process in a manner that benefits the sector. Moreover, it is important to note that all changes in process should be implemented according to the directions and results extracted using data analytics knowledge, and process and data analytics knowledge have substantial relationships with each other. The digital world and data analytics are new to organizations, and they now compel such organizations to accept this new approach to promote increased and higher performance. The digital world is a supplier of data, and such data are large in every sense of the term. Only with the help of data analytics knowledge is it possible to extract the required outputs. Process management is also very important in organizations, but in the current era, it is vital for processes to be designed according to the decisions made after carefully evaluating the data. Therefore, process management and data analytics knowledge are interlinked (Capurro, Fiorentino, Garazella Giudici, 2021). This discussion led us to propose the following hypothesis.

*H6: Process management has a significant relationship with data analytics knowledge.*

*4.6.1. Data analytics knowledge (DAK) mediates the relationships among benchmarking, continuous improvement and process management and university performance.*

The relationship between TQM practices and performance has been discussed and endorsed by researchers, but the questions of how TQM practices can increase performance and what the best way of explaining this relationship is remain unanswered. In addition, the literature on TQM and performance is inconclusive with respect to these relationships (Jimoh, Oyewoob, et al., 2019). Moreover, Ahmad, Zakuan, et al. (2012), Koc (2012), Mahmud and Hilmi (2014), and Abu-Mahfouz (2019) highlighted certain mediators between TQM and performance. Therefore, data analytics knowledge has been used to answer these questions. In the current study, this

factor is proposed to mediate the relationship between TQM practices and performance. Moreover, the study conducted by Hussania, Rehmanb, et al. (2021) found that data analytics have a significant relationship with performance. Therefore, data analytics knowledge plays a mediating role in the relationship between TQM practices and improved performance. Thus, the following hypothesis is proposed:

*H6a: Data analytics knowledge mediates the relationship between benchmarking and university performance.*

*H6b: Data analytics knowledge mediates the relationship between continuous improvement and university performance.*

*H6c: Data analytics knowledge mediates the relationship between process management and university performance.*

#### *4.7. Data analytics knowledge (DAK) and university performance (UP)*

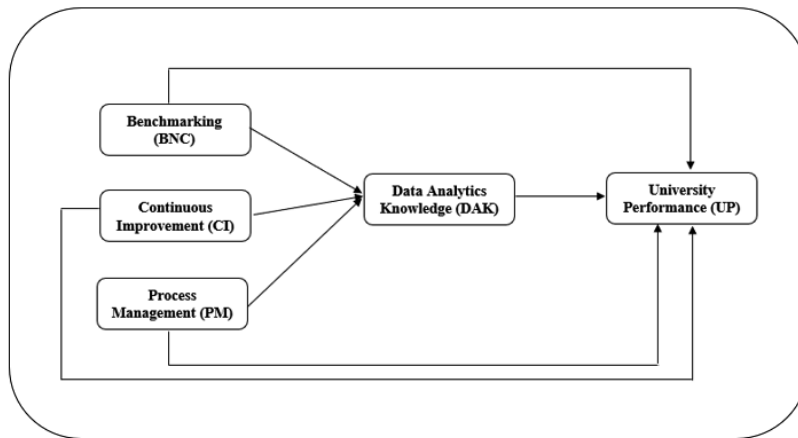
Researchers have found that data analytics knowledge has a positive association with university performance (Gupta George, 2016; Garmaki, Boughzala, Wamba, 2016). Sheng, Amankwah-Amoah and Wang (2017) found that the positive impact of data analytics knowledge promotes and increases university performance. According to the literature, there is a relationship between data analytics knowledge and university performance (Wixom, Yen, Relich, 2013; Waller Fawcett, 2013). Sharma, Mithas and Kankanhalli (2014) concluded that data analytics knowledge creates value and has a relationship improved university performance. Data analytics knowledge can help organizations make good decisions and thus achieve the desired results; it thus has a positive impact on university performance (Kohli Devaraj, 2004; Mithas, Ramasubbu, Sambamurthy, 2011). There is a positive relationship between data analytics knowledge and performance, as when decision-making improves, it affects the performance of a university (Brynjolfsson, Hitt, Kim, 2011). Data analytics knowledge has an impact on performance due to the corresponding improvement in decision-making. Therefore, data analytics knowledge has a positive relationship with university performance (Brynjolfsson, Hitt, Kim, 2011). Popovič, Hackney, et al. (2018) reported a positive and significant relationship between data analytics knowledge and university performance. Data analytics knowledge

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thus has a positive and significant relationship with university performance, and it helps universities improve their performance by providing them with timely and better evaluations of critical data and thereby helps them make good decisions (Shah, Irani, et al., 2017; Andrews, 2013; Wixom, Yen, et al., 2013; Bharadwaj, El Sawy, et al., 2013). These arguments led us to propose the following hypothesis.

*H7: Data analytics knowledge (DAK) has a significant relationship with university performance (UP).*

**Figure 1. Research Framework**



Source: Own elaboration.

## 5. Methodology

### 5.1. Questionnaire and measurements

Hard total quality management practices, i.e., benchmarking, were measured using 04 items, continuous process was measured using 05 items adapted from (Sayeda, Rajendran et al., 2010) and process management was measured using 05 items adapted from (Mohammed, Taib et al., 2016). In addition, data analytics knowledge was measured using 10 items adapted from

(Ghasemaghaei, Ebrahimi, et al., 2018), and university performance was measured using 12 items adapted from (Caruana et al., 1998 1999; Abubakar, Hilman et al. 2018). According to Sekaran (2005), to determine whether the construct is qualified for measurement, face validity should be used. For the current study, three experts from Malaysia and two experts from Pakistan assessed the fit of the construct. The items included in the questionnaire are reported in Appendix (A), and the questionnaire was sent to top, middle, and lower middle management of the universities via email.

### 5.2. *Sampling and data collection*

Seven-point Likert scales drawn from the relevant literature were used for data collection (Saunders et al., 2009). Simple random sampling was used in this study; this method has previously been used by Noor (2018); Jabeen (2014); Shabbir (2017). The percentage of questionnaires that were sent to respondents that were returned during the data collection process is known as the response rate (Jobber, 1989). A total of 329 questionnaires were distributed, of which 255 questionnaires were returned, for a response rate of 77.51%. After the initial screening, 26 questionnaires were unusable, as they contained a large number of uncompleted items, and questionnaires some were filled with straight-line answers. After the initial screening, the number of usable questionnaires was 229, for a valid response rate of 69.60%. The current research thus achieved a sufficient (Bartlett, Kotrlik et al., 2001; Hair et al. 2010) response rate of 68.09%. Hence, the 224 returned and usable questionnaires were found to be sufficient for further analyses because the recommended response rate for model analyses is at least 50% (Lindner Wingenbach, 2002).

During the preliminary data analyses and data screening as well as during the assessment of missing values, no questionnaires were deleted. After missing values and outliers were checked, the current study identified 05 responses as outliers, which were thus deleted from the dataset. After assessment of outliers and the determination of the final usable number of responses, 224 responses were used for further data analyses and assessment of the measurement model. Further details regarding the respondents are shown in Table 2.

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**Table 2. Demographic Profiles (N=224)**

<b>Profile</b>	<b>Frequency</b>	<b>Percentage</b>
<b><i>Designation</i></b>		
Registrar	22	9.82
Deputy Registrar	50	22.32
Director QEC	87	38.84
Deputy Director QEC	49	21.88
Director ORIC	16	7.14
<b><i>Gender</i></b>		
Male	185	82.59
Female	39	17.41
<b><i>Overall working experience</i></b>		
1-5 years	115	51.34
6-10 years	95	42.41
11-15 years	14	6.25
16-20 years	0	0.00
20-Above years	0	0.00
<b><i>Working experience in current position</i></b>		
1-5 years	44	19.64
6-10 years	69	30.80
11-15 years	111	49.55
16-20 years	0	0.00
20-Above years	0	0.00
<b><i>Education</i></b>		
Ph.D	190	84.82
M.Phil./MS	29	12.95
Masters	5	2.23
<b><i>Provinces</i></b>		
Punjab	94	41.96
Sindh	58	25.89
KPK	34	15.18
Baluchistan	10	4.46
Gilgit Baltistan	2	0.89
Azad Jammu Kashmir	8	3.57
Islamabad (Federal Territory)	18	8.04

Source: own elaboration.

**Table 2. Demographic Profiles (N=224) (continued)**

<b>Profile</b>	<b>Frequency</b>	<b>Percentage</b>
<b><i>Type of higher education institutes</i></b>		
Public Sector	153	68.30
Private Sector	71	31.70
<b><i>Age of the institutes</i></b>		
1-5 years	26	11.61
6-10 years	81	36.16
11-15 years	73	32.59
16-20 years	20	8.93
20-Above years	24	10.71
<b><i>Student enrolments of the institutes</i></b>		
1-1000	72	32.14
1001-5000	92	71.07
5001-10000	34	15.18
10001-above	26	11.61

Source: own elaboration.

In the final designation, there were 22 registrars, i.e., 9.82% of the total, 50 deputy registrars, i.e., 22.32%, 87 QEC directors, i.e., 38.84%, 49 QEC deputy directors, i.e., 21.88%, and 16 ORIC directors, i.e., 7.14%. In terms of gender, there were 185 male respondents, i.e., 82.59% of the total, and 39 female respondents, i.e., 17.41%. In terms of overall working experience, 115 respondents had 1-5 years' experience, i.e., 51.34% of the total, 95 respondents had 6-10 years of experience, i.e., 42.41%, and 14 respondent had 11-15 years of experience, i.e., 6.25%; no respondents had either 16-20 years of experience or more than 20 years of experience. Moreover, with regard to respondents' working experience in their current organization, 44 respondents had 1-5 years of work experience, i.e., 19.64% of the total, 69 respondents had 6-10 years of work experience, i.e., 30.80%, 111 respondents had 11-15 years of experience, i.e., 49.55%; however, no respondents had either 16-20 years of experience or more than 20 years of experience in their current organization. With regard to their level of education, 190 respondents had PhDs, i.e., 84.82% of the total, 29 respondents had MPhil/MS degrees, i.e., 12.95% and 5 respondents had master's degrees, i.e., 2.23%. With regard to the province from which they were drawn, 94 respondents were from Punjab

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i.e., 41.96% of the total, 58 respondents were from Sindh, i.e., 25.89%, 34 respondents were from KPK, i.e., 15.18%, 10 respondents were from Balochistan, i.e., 4.46%, 2 respondents were from Gilgit Baltistan, i.e., 0.89%, 8 respondents were from Azad Jammu and Kashmir, i.e., 3.57%, and 18 respondents were from Islamabad (Federal Territory), i.e., 8.04%. In terms of the type of institute from which they were drawn, 153 respondents were from public sector institutes, i.e., 68.30% of the total, and 71 respondents were from private sector institutes, i.e., 31.70%. In addition, with regard to the age of the institutes from which they were drawn, 26 respondents were from institutes that had been built in last 1-5 years, i.e., 11.61% of the total, 81 respondents were from institutes that were built 6-10 years ago, i.e., 36.16%, 73 respondents were from institutes that were built in the last 11-15 years, i.e., 32.59%, 20 respondents were from institutes that were built in last 16-20 years, i.e., 8.93%, and 24 respondents were from institutes that were built more than 20 years ago, i.e., 10.71%. In terms of student enrolment, 72 respondents were from institutes with an enrolment of 1-1000 students, i.e., 32.14% of the total, 92 respondents were from institutes with an enrolment of 1001- 5000 students, i.e., 41.07%, 34 respondents were from institutes with an enrolment of 5001-10000 students, i.e., 15.18%, and 26 respondents were from institutes with an enrolment of 10000 students or more, i.e., 11.61%.

## **6. Research findings**

### *6.1. Measurement model testing*

Researchers have recommended that items with factor loadings less than 0.50 should be deleted from data, which leads to an increase in composite reliability and average variance extracted (Hair et al., 2010). With regard to the CI factor, Items 3 and 5 were eliminated from the analysis because they had low loadings (<0.4), while for the UP factor, Item 8 was eliminated because its loading was also less than 0.4. Table 3 provides the factor loadings of the individual items, Cronbach's alpha values, composite reliability (CR) and the average variance extracted for the variables. Internal consistency reliability can be measured using two approaches: Cronbach's alpha and composite reliability (CR) (McCrae, Kurtz, et al., 2011; Peterson Kim, 2013). The current research opted to focus on composite reliability over Cronbach's alpha when assessing internal consistency reliability because CR offers a lower base estimate of reliability than Cronbach's alpha because CR coefficients highlight the true point that each item has a different loading,

which can be extracted from the measurement model, unlike Cronbach's alpha, which posits that all items exhibit equal loadings (Gotz, Liehr-Gobbers et al., 2010). The second reason for our choice of CR over Cronbach's alpha was that Cronbach's alpha can over- or underestimate the reliability of the instrument, while CR takes into account differences in the loadings of the items that can be under- or overestimated when elucidated by alpha. Internal consistency reliability can be interpreted based on the rule of thumb that the ideal CR value should be equal to or greater than 0.70 (Bagozzi Yi 1988; Hair et al. 2011). An alpha range of 0.67 to 0.90 is considered to be acceptable (Bontis et al., 2011; Cavalier Lombardi, 2001; Hackman Greg, 1975). The Cronbach's alpha and CR results regarding reliability are presented in Table 3. The current study found Cronbach's alpha values ranging between 0.626 and 0.915. The CR values in the current research ranged 0.793 and 0.930. Hence, the current research achieved sufficient reliability scores in terms of both Cronbach's alpha and CR. Table 3 provides the measures of construct reliability and convergent validity.

**Table 3. Measures of Construct Reliability and Convergent Validity**

Construct	Loading	Alpha	CR	AVEs
<i>Benchmarking</i>				
B1	0.776			
B2	0.815	0.780	0.859	0.604
B3	0.793			
B4	0.721			
<i>Continuous Improvement</i>				
CI1	0.689			
CI2	0.843	0.626	0.793	0.562
CI4	0.708			
<i>Process Management</i>				
PM1	0.848			
PM2	0.830			
PM3	0.883	0.850	0.895	0.633
PM4	0.775			
PM5	0.614			

Source: Own elaboration

Two items, from continuous improvement, i.e., CI3 and CI5, and one item from university performance, i.e., UP8, were deleted due to low factor loadings.



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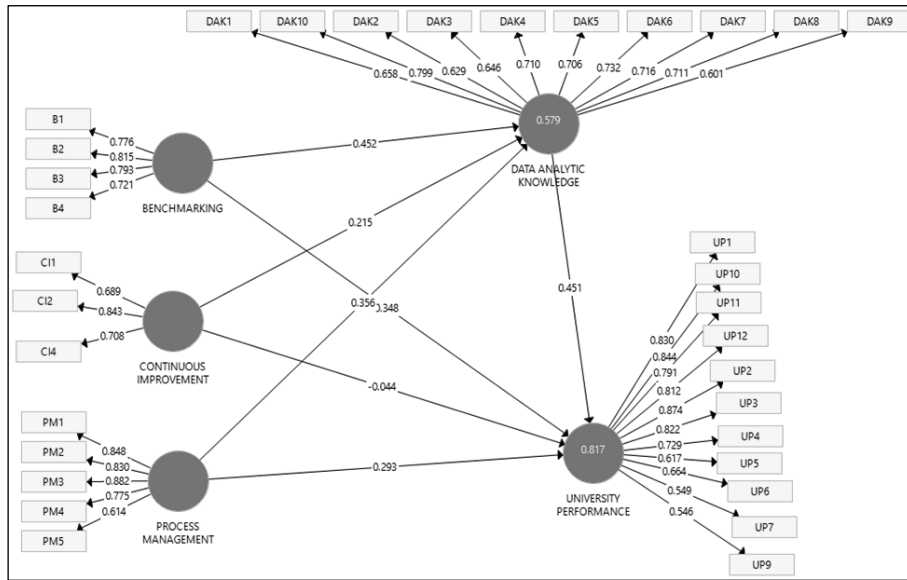
**Table 3. Measures of Construct Reliability and Convergent Validity (continued)**

<b>Construct</b>	<b>Loading</b>	<b>Alpha</b>	<b>CR</b>	<b>AVEs</b>
<i>Data Analytics Knowledge</i>				
DAK1	0.658			
DAK2	0.633			
DAK3	0.645			
DAK4	0.708			
DAK5	0.703	0.879	0.902	0.480
DAK6	0.729			
DAK7	0.716			
DAK8	0.711			
DAK9	0.604			
DAK10	0.801			
<i>University Performance</i>				
UP1	0.832			
UP2	0.873			
UP3	0.820			
UP4	0.726			
UP5	0.618			
UP6	0.666	0.915	0.930	0.553
UP7	0.547			
UP9	0.543			
UP10	0.846			
UP11	0.795			
UP12	0.813			

Source: Own elaboration.

Two items, from continuous improvement, i.e., CI3 and CI5, and one item from university performance, i.e., UP8, were deleted due to low factor loadings.

**Figure 2. Measurement Model**



Source: Own elaboration.

When one construct differs from another construct at a particular point, this situation is known as discriminant validity; alternatively, the point of distinction between two variables is known as discriminant validity (Duarte Raposo, 2010; Henseler, Ringle, et al., 2015). Discriminant validity can be explained using two recommended approaches: square root of the AVE, famously known as the Fornell and Larcker criteria (Fornell, and Larcker 1981), and the heterotrait-monotrait ratio of correlations (HTMT), a newly recommended approach (Henseler, Ringle, et al., 2015). Some scholars have recommended that the threshold for HTMT should be set at 0.85 (Clark and Watson 1995; Kline 2011), while other scholars have recommended a maximum value of HTMT of 0.90 (Gold et al. 2001; Teo et al. 2008). If the HTMT value exceeds 0.90, it indicates a lack of discriminant validity. The current research used both approaches, i.e., the square root of AVE and HTMT values, to assess the level of discriminant validity. The results regarding the

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square root of AVE are presented in Table 4, and the HTMT values are presented in Table 5.

**Table 4. Square Root of AVE**

	<b>Benchmarking</b>	<b>Continuous Improvement</b>	<b>Data analytics knowledge</b>	<b>Process Management</b>	<b>University Performance</b>
Benchmarking	0.777				
Continuous Improvement	0.163	0.759			
Data analytics knowledge	0.627	0.389	0.693		
Process Management	0.392	0.281	0.594	0.796	
University Performance	0.738	0.269	0.826	0.685	0.743

Source: own elaboration.

**Table 5. HTMT Criteria**

	<b>BNCH</b>	<b>CI</b>	<b>DAK</b>	<b>PM</b>	<b>UP</b>
B	■				
CI	0.223	■			
DAK	0.753	0.497	■		
PM	0.477	0.396	0.681	■	
UP	0.866	0.341	0.917	0.787	■

Source: Own elaboration.

## 6.2. Structural model testing

Researchers The current research proposed seven direct relationships, of which six were accepted and one was rejected based on a p value greater than 0.05. The path coefficient between benchmarking and university performance indicated a positive relationship, BI → UP ( $\beta = 0.348$ , SD, = 0.039, t value =

8.938,  $p$  value = 0.000); hence, the hypotheses regarding the relationship between benchmarking and university performance were accepted. The path coefficient between continuous improvement and university performance indicated a negative relationship,  $CI \rightarrow UP$  ( $\beta = -0.044$ ,  $SD = 0.033$ ,  $t$  value = 1.993,  $p$  value = 0.181); hence, the hypotheses regarding the relationship between continuous improvement and university performance were not accepted. The path coefficient between process management indicated a positive significant relationship,  $CI \rightarrow UP$  ( $\beta = 0.293$ ,  $SD = 0.048$ ,  $t$  value = 6.066,  $p$  value = 0.000); hence, the hypotheses regarding the relationship between process management and university performance were accepted. Alongside direct relationship assessment, the current research also assessed the mediating effect of data analytics knowledge on the relationships of process management, continuous improvement, and benchmarking to university performance. A total of three mediating hypotheses were proposed in the current research. Data analytics knowledge exhibited a significant mediating effect according to the findings of the current research. With regard to the mediating effect of DAK on the relationship between continuous improvement and university performance, we found positive significant path coefficients,  $CI \rightarrow DAK \rightarrow UP$  ( $\beta = 0.044$ ,  $SD = 0.033$ ,  $t$  value = 1.339,  $p$  value = 0.181). The direct relationship between continuous improvement and university performance was not accepted, but when the mediating effect of DAK was tested, the relationship between continuous improvement and university performance became positive and significant, indicating that DAK fully mediates the relationship between continuous improvement and university performance; thus, the proposed relationship was supported. Similarly, with regard to the path coefficient of the mediating effect of DAK on the relationship between process management and university performance, the current study found a significant mediating effect with a path coefficient of  $PM \rightarrow DAK \rightarrow UP$  ( $\beta = 0.161$ ,  $SD = 0.029$ ,  $t$  value = 5.580,  $p$  value = 0.000). Although a direct relationship between process management and university performance was supported, after mediation, this relationship changed to exhibit a significant effect, indicating that DAK fully mediates the relationship between process management and university performance. Hence, the proposed mediating effect on the relationship between process management and university performance was supported. In addition, according to the current research, DAK also significantly mediates the relationship between

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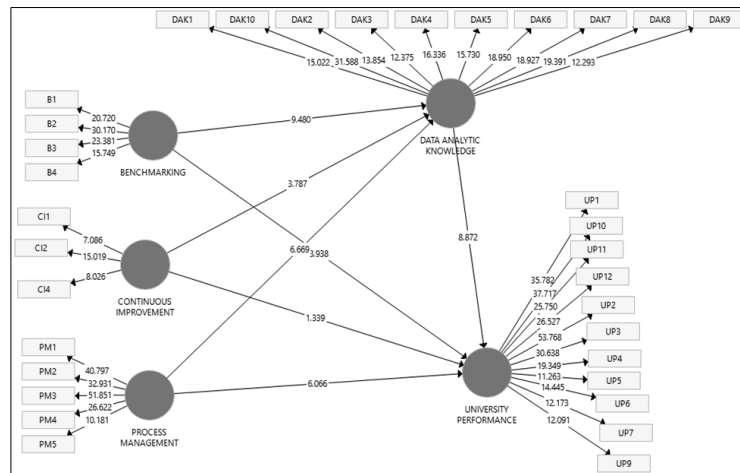
benchmarking and university performance, BI→DAK→UP ( $\beta= 0.204$ , SD= 0.033, t value= 6.166, p value= 0.000), resulting in mediating effects that indicated improvement over the direct relationship. Beta in the path BI → UP was 0.348, which was then reduced to BI→DAK→UP (0.204), indicating that DAK partially mediates the relationship between benchmarking and university performance; thus, the proposed relationship was supported. The path coefficients of the direct and mediating effects are presented in Table 6.

**Table 6. Assessment of the Structural Model**

Path	t-value	p-value	Decision
Benchmarking →University Performance	8.938	0.000	accepted
Continuous Improvement →University Performance	1.339	0.181	not accepted
Process Management→University Performance	6.066	0.000	accepted
Benchmarking →Data Analytics Knowledge	9.480	0.000	accepted
Continuous Improvement → Data Analytics Knowledge	3.787	0.000	accepted
Process Management→ Data Analytics Knowledge	6.669	0.000	accepted
Data Analytics Knowledge→University Performance	8.872	0.000	accepted
Benchmarking → Data Analytics Knowledge→University Performance	6.166	0.000	supported
Continuous Improvements→ Data Analytics Knowledge→University Performance	3.314	0.001	supported
Process Management→ Data Analytics Knowledge→University Performance	5.580	0.000	supported

Source: Own elaboration.

**Figure 3. Structural Model**



Source: Own elaboration.

## 7. Discussion

The current study aims to explore TQM in terms of benchmarking, process management and continuous improvement and university performance; TQM practices and data analytics knowledge are included as mediators. Therefore, a quantitative approach was used to gather data by surveying the middle and lower middle management of both public and private universities in Pakistan. In addition, mediation analysis was conducted to explore the data thus collected. The current study revealed that the impacts of BI and PM on UP were significant, but the effect of CI on UP was not significant. Moreover, DAK mediated these relationships; the relationships with BI and PM were partially mediated, and the relationship with CI was fully mediated by DAK. This finding is in line with the studies conducted by Mehta, Diwakar et al. (2019); Takashima, Burmeister, et al. (2019); Knight, Leigh, et al. (2019); Flynn et al. (1995); Samson and Terziovski (1999), who found significant relationships among BI, PM and UP, while Khan, Ali, Honggi (2018) found a nonsignificant relationship between CI and UP. In addition, Sahu (2020), Portela and Santos (2019), Goncarovs and Garbis (2017), Mclean (2017), Gali and Ocampo (2019), Aljumah, Nuseir et al. (2021), and Garzella and Giudici

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(2021) found significant relationships among BI, PM, CI and DAK. Moreover, Dmour, Saad and Amin (2021) and Mello and Martins (2019) found a significant relationship between DAK and UP. Based on the findings mentioned above, the Pakistani context, middle and lower middle management believed that benchmarking and process management contributes to the performance of universities but that continuous improvement may not contribute to the performance of universities. In addition, when data analytics knowledge played a mediating role in this context, this factor contributed positively in terms of TQM practices and university performance in Pakistan. Moreover, to use data analytics knowledge to enhance university performance, it is necessary for universities to be ready to adopt the corresponding changes that can ultimately increase their performance.

## **8. Conclusions**

The performance of HEIs remains a primary, important and vital agenda for leadership in academia, faculty, researchers, students, provincial and federal governments, the higher education commission and society. The findings of the current study suggest that TQM practices and data analytics knowledge are significantly important for the improvement, enhancement and promotion of university performance. The current study contributes to our understanding of the relationships among TQM practices, data analytics knowledge and university performance, and the results of the current study indicate that TQM and data analytics knowledge are important for the extraction of university performance. In addition, TQM practices, i.e., benchmarking, continuous improvement and process management, contribute significantly to university performance. Moreover, the results suggest that data analytics knowledge mediates the relationship between TQM practices and university performance. The findings of the current study make both theoretical and practical contributions. Therefore, the theoretical contributions of the current study are in line with earlier results and consistent with the extant theories and literature, and the empirical evidence reported in the current study improves our knowledge in the fields of total quality management practices, data analytics knowledge and university performance. From a practical perspective, the findings of the current study contribute to the implementation of total quality management practices aimed at the improvement of university performance. Moreover, TQM has a significant

relationship with data analytics knowledge, which in turn increases university performance. In addition, data analytics knowledge plays an important role in the improvement of university performance, as the current era demands technological improvements and change. Thus, the findings of the current study contribute to the performance of HEIs and suggest various implementations for the higher education commission and quality departments of the university.

Researchers have recommended that items with factor loadings less than 0.50 should be deleted from data, which leads to an increase in composite reliability and the average variance extracted (Hair et al., 2010). With regard to the CI factor, Items 3 and 5 were eliminated from the analysis because they had low loadings (<0.4).

### *8.1. Theoretical implications*

The current study highlights the spectacle of total quality management practices in terms of hard total quality management practices. Previous research has featured a lack of clarity and provided less explanation in terms of total quality management practices, university performance and data analytics knowledge. This research presents a framework based on previously developed theories that enables us to understand the relationship among total quality management practices, data analytics knowledge and university performance. This study thus expands the literature in the field of total quality management practices, i.e., benchmarking, continuous improvement, and process management as well as data analytics knowledge and university performance. Moreover, this study also contributes to resource-based view theory and sociotechnical system theory in the context of total quality management practices, data analytics knowledge and university performance.

### *8.2. Practical implications*

The findings of the current study have several implications that are relevant for the higher education commission (HEC) of Pakistan and the management of the faculty and students of both public and private sector universities of Pakistan. In addition, hard total quality management practices, i.e., benchmarking, process management and continuous improvement, are essential for performance. Furthermore, the HEC should help universities



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improve their processes and issue various grants to ensure the continuity of performance improvement. Therefore, the HEC should also contribute to the task of obtaining different international accreditations for universities, as it can also help such universities improve their performance. Moreover, the findings of this study indicate that data analytics knowledge is vital for the performance of universities, as technological aspects always ease the process and lead to effective and efficient results. In addition, data analytics knowledge not only facilitates the process but also helps universities and the higher education commission understand the facts and figures, current trends, techniques, and latest scenarios, thus improving their understanding and performance. Therefore, the HEC and universities should employ part of their data analytics knowledge as a technique when making different decisions. Thus, the implementation of data analytics can enable them to take positive steps towards the achievement of high performance in universities. Data analytics knowledge also contributes to the hard total quality management practices described in the current study, as it can boost their ability to obtain good results and better performance. The results of the current study can be used by the HEC, which is responsible for maintaining quality in universities. Moreover, the management of the universities can also benefit from the results of the current study with regard to the quality improvement that leads to superior performance, as it highlights the importance of different total quality management practices and data analytics knowledge in terms of their relationships with performance.

### *8.3. Limitations and directions for future research*

The current study reports beneficial and valuable findings that contribute meaningfully and significantly in theoretical, practical and methodological respects. Similar to other studies, the current study has some limitations that can be usefully addressed by future researchers. Moreover, these limitations are due to various constraints, such as money, time, scope and the relevant boundaries, and these few limitations suggest directions for future research and extensions into the fields of total quality management practices, data analytics knowledge and university performance. The first limitation of the current research was that it focused on an examination of the relationships among total quality management practices (i.e., benchmarking, process management, and continuous improvement), data analytics knowledge and university performance. The findings of the current study are limited to the

aspects discussed above. Future studies may investigate other aspects and factors that may be related to total quality management practices. Moreover, nonsignificant factors such as continuous improvement and process management can be discussed in the future so that they can significantly influence the relationship between total quality management practices and university performance. Second, the current research model measures the direct relationships among benchmarking, process management, continuous improvement and university performance in light of the mediation of data analytics knowledge. In future studies, other moderating or mediating variables can be explored with regard to the relationships among top management, human resources, customer focus, benchmarking, process management, continuous improvement and university performance. Third, the current study employed a cross-sectional design, which entails certain limitations because of the dataset. In addition, the respondents were surveyed within a particular time frame, and collecting their responses within a different time frame may provide a different perspective on the results. Therefore, future researchers can conduct longitudinal studies to obtain more information about the relationship- among total quality management practices, data analytics knowledge, and university performance. Fourth, the current study was conducted by reference to data drawn from the middle and lower middle levels of management of both public and private universities in Pakistan, which is a developing country. Therefore, precautions must be taken when generalizing the results of this study, and they can only be generalized to a similar environment such as that of another developing country. In addition, future recommendations can be made by collecting data from the faculty of the same universities and from other countries to study the cross-cultural effects. Moreover, future studies should also include other total quality management practices should to explore more such relationships. Finally, total quality management practices, data analytics knowledge and university performance were discussed using a quantitative approach, which represented an extension of previous work on this topic. However, such quantitative research may not provide an adequate understanding and support for the findings. Therefore, future research can employ a mixed-method design or use triangulation to explore the unexplored parts of total quality management practices, data analytics knowledge and university performance in further detail by combining both quantitative and qualitative data. Moreover, future

researchers may also use this approach to test total quality management practices in other fields, e.g., hospitals, small and medium enterprises, and the hotel industry, to explore the relationships among these variables in further detail.

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### Appendix A

CONSTRUCT	ITEMS
Process Management	<p>University carefully considers quality, costs, productivity and new technology in making new processes.</p> <p>Before applying new procedures, university conducts comprehensive tests to assure quality.</p> <p>University continuously improves its processes, to enhance service quality.</p> <p>University is evaluating services-based cost efficiency and timelines.</p> <p>Work procedures and possible outcomes are explained in advance to students.</p>
Continuous Improvement	<p>University keeps track of the demands of industry with proactively responds accordingly (e.g. revision of courses and syllabi to address the emerging and recent trends and technology)</p> <p>University strives continuously to improve the overall performance of the students.</p> <p>University strives continuously to improve the overall performance level of the staff.</p> <p>University always taken steps to update the library, laboratory facilities following the current advancement.</p> <p>University is continuously looking to update the competence level of the staff.</p>
Benchmarking	<p>University use comparative information as benchmark to enhance the expertise level of staff to benchmark the university.</p> <p>University use comparative information as benchmark to satisfy staff about the policies.</p> <p>University use comparative information as benchmark for student's placements.</p> <p>University use comparative information as benchmark for student's performance in curricular/co-curricular/extra-curricular activities.</p>

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### Appendix A (continued)

CONSTRUCT	ITEMS
Data Analytics Knowledge	<p>Our staff are consistent when they examine data analytics tools.</p> <p>Our staff maintain advance level of data analytics expertise.</p> <p>Our staff are multi skilled at using data analytics tools.</p> <p>Our staff are more intelligent when it examining tools of data analytics.</p> <p>In my university, we use tools that enhance our competence in information processing.</p> <p>In my university, we use tools that support data modelling.</p> <p>In my university, we use tools that support data simulation.</p> <p>In my university, we use tools that supply real time value of data.</p> <p>In my university, we use tools that detect problems.</p> <p>In my university, we use tools to examine the various options.</p>
University Performance	<p>Overall performance of university in the last five years has been.</p> <p>Performance of university in creating students' satisfaction in the last five years has been.</p> <p>The level of student services provided by university in the last five years has been.</p> <p>Progress of university in relation of resources committed in the last five years has been.</p> <p>Level of cost effectiveness achieved by university in the last five years has been.</p> <p>The overall ability of university to raise funds in the last five years has been.</p> <p>The overall ability of university to obtain research grants in the last five years has been.</p> <p>Performance of university to retain students as majors in the last five years has been.</p> <p>Performance of university to increase graduation rates as majors in the last five years has been.</p> <p>Performance of university to recruit students as majors in the last five years has been.</p> <p>Performance of university in providing training to Govt. and private organization in the last year has been.</p> <p>The overall performance of university to provide adequate staff in last five years has been.</p>

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THE EFFECT OF ECOLABELLING ON THE EXPORT  
PERFORMANCE OF TEXTILE FIRMS IN PAKISTAN

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**Abstract**

With greater competition and an increased demand for environmental compliance, Pakistan needs to focus on sustainable practices to boost its textile exports. Since textiles are one of the most important sectors in Pakistan's economy, the effect of ecolabelling on the export performance of textile firms was analysed in this study. For this purpose, export intensity was used as a proxy for export performance. The study utilized panel data on 136 textile firms listed on the Pakistan Stock Exchange (PSX) covering the period from 2009 to 2019. Empirical estimation was conducted by using the fixed effect model (FEM), random effect model (REM) and common effect model (CEM). The results of the study show that ecolabelling programmes have a significant positive effect on the export performance of textile firms. Finally, policy recommendations for industrialists and governments regarding the improvement of their export performance through the adoption of ecolabels for their products are presented.

**JEL CLASSIFICATION:** D21; Q56; Q37

**KEYWORDS:** ECOLABELLING; EXPORT PERFORMANCE; TEXTILE FIRMS; PANEL ESTIMATIONS

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## **1. Introduction**

Concerns about industrial pollution are nothing new. In the late 1960s, nations realized that the present system of production is not very sustainable due to production being conducted at the cost of environmental deterioration. Therefore, these nations have introduced green taxes and other regulatory measures to control pollution (Galarraga 2002). In the race for higher economic growth and development, there is huge pressure placed on natural resources that could compromise their availability to sustain future generation. Human beings are living beyond their means because two-thirds of the world's resources have already been used up. The population is undergoing rapid growth, and there will be 9.7 billion people by 2050. Feeding this huge population would require 30% more water and 45% more energy that currently available. Further, the manufacturing demand for water and energy will increase by 400% by that time. These facts all indicate that there is a greater need for sustainable and environmentally friendly practices in production as well as in consumption.

Traditionally, direct systems (command and control systems) have been used to address environmental problems, but recently, these systems have been widely criticized for being able to solve the complex problems that a society faces regarding environmental degradation (Annandale et al. 2004). In the past, policy-makers mainly focused on legislative and regulatory restrictions for environmental protection, but recently the focus has been shifting from mandatory approaches to voluntary agreements between the polluter and regulator as an alternative to the mandatory approach (Segerson and Miceli 1998). Regulatory restrictions have protected the environment to a certain extent, but these command-and-control regulatory approaches have certain limitations, such as their large expense, protracted development, enforcement process, jurisdictional constraints and a tendency toward inflexibility over formality. Together, all these limitations lead to end-of-pipe pollution control rather than the prevention of pollution while imposing heavy costs on firms and regulators (Henriques and Sadorsky 2008). Therefore, after seeing the impact and results of involuntary initiatives, policy-makers have begun to focus on voluntary initiatives for environmental protection. In recent years, the government has been keen in encouraging institutions to implement voluntary environmental protection programs; for example, in the US, the

Federal Environmental Protection Agency has introduced numerous voluntary programs that have attracted thousands of businesses who have pledged to improve their environmental performance (Bork and Coglianese 2009).

It has been widely observed by researchers that, in some cases, voluntary environmental programs have been more effective than command and control programs in terms of environmental protection (Leon and Riveria 2007). Many businesses and regulators around the world are looking to replace the current rigid command-and-control mode with more flexible and adaptable programs for environmental protection (Toski and prakash 2002). The intensive use of voluntary environment initiatives in recent years poses a significant challenge to traditional economic theories. Many studies in recent years have identified the fact that voluntary environmental programs lead to more efficient productive activities (Paton 2000). Recently, voluntary environmental initiatives have gained more importance and are being recognized as the most effective tool for environmental protection. Ecolabels are one of the most important schemes within these voluntary environmental protection initiatives (Hayat et al., 2017). Green consumerism, or the demand for green products, can be defined as a situation in which purchase decisions are made under consideration of sustainable production practices. In this regard, consumer satisfaction, social values and self-identification of the product are the most important exogenous determinants of green consumerism. There is greater concern about the trade effect of ecolabelling. In the case of many developing countries, there is either no market access or firms have to bear the cost of recycling. In most developing countries, these industries include the paper, footwear, forest and textile industries (Glarraga 2002).

An eco-label is a seal of certification awarded to environmentally friendly products that meets the criteria specified by the eco-label issuance authority (UNOPS, 2009). Ecolabels provide information to consumers to help them distinguish between environmentally good and bad products and services. If consumers are environmentally conscious, then it may be of great benefit for firms to adopt ecolabelling programs to extend their market share. However, at the same time, there are some problems in adopting ecolabels, such as transparency in the assessment of the life cycle and the high cost of adopting ecolabels (Tomasz 2015). In 1978, Germany was the first country in the history of the world to introduce a national ecolabelling scheme, which was

called “Blue Angel”. It was approved by the Ministry of Environment on the advice of the Minister of the Interior. Following Germany, many other countries have introduced their own national ecolabelling schemes, such as the EU Flower by European countries, Energy Star by the USA, and Eco Mark by Japan. Recently, many Asian countries have also introduced their own ecolabelling schemes. The initial motive behind this introduction of ecolabels was to protect the natural environment and promote sustainable production and consumption (Hayat 2017). In the U.S., Ecolabels began to be issued in the 1990s as a result of the United Nations Conference on Environment held in 1992. The Environmental Protection Agency (EPA) developed an eco-label called Eco Star for sustainable production and consumption, which had covered more than 40000 products across the world by 2010 (Atkinson 2014). The European Union started its own eco-label named EU Flower in 1989 to indicate the fulfilment of common standards in the region. Currently, a wide variety of ecolabels exist, representing different criteria and standards. There are five main drivers behind the adoption of EU Flower: (1) a common strategy, (2) public management, (3) the local income per capita, (4) sustainable public procurement criteria, and (5) international trade incentives (Prieto et al. 2019). Currently, there are 463 ecolabels that have been adopted by 25 industries in 199 countries around the world. There are three major types of ecocertification schemes: Type I (ISO 14021), Type II (S 14024), and Type III (ISO 14025). The standards for ISO 14021 are set by governments, and these are referred to as national ecolabelling schemes. The criteria for ISO 14024 are set by different collaborating firms, which is why these criteria are referred to as private ecolabelling schemes. The standards for ISO 14025 are set by international organizations, and these certifications are also referred to as third-party ecolabelling schemes (Hayat et al., 2019).

Therefore, considering the above background, this paper investigates the effect of ecolabelling on the export performance of textile firms. The research question addressed in this paper is “Do ecolabels improve the export performance of textile firms”? The null hypothesis to be tested is “Ecolabels positively affect the export performance of textile firms” against the alternative hypothesis that “Ecolabels negatively affect the export performance of textile firms”.

## **2. Literature review**

It has been widely observed by researchers that, in some cases, voluntary

environmental programs have been more effective than command and control programs for environmental protection (Leon and Riveria 2007). Many businesses and regulators around the world are looking to replace their current rigid command-and-control mode of operation with more flexible and adaptable programs for environmental protection (Toski and prakash 2002). The intensive use of voluntary environment initiatives in recent years poses a significant challenge to traditional economic theories. Many studies in recent years have identified the fact that voluntary environmental programs lead to more efficient productive activities than mandatory programs (Paton 2000). Recently, voluntary environmental initiatives have gained greater importance and are being recognized as the most effective tool for environmental protection. Ecolabels are one of the most important schemes of these voluntary environmental protection initiatives (Hayat et al., 2017). The motive behind this introduction of ecolabels was to protect the natural environment and lead to sustainable production and consumption (Hayat 2017). It is evident that about the information provided by ecolabels is important and has positive effects on consumer attitudes, thus the provisioning of information about different environmental standards as reflected by ecolabels can boost their production and sales (Taufique 2016). With growing consumer awareness about ecolabelled products, the sale of organic food has increased by 20 percent worldwide since 1990, which is approximately four times more than that of conventional food products. It is predicted that the market for these products will extend to 3.5 trillion by 2017 (Cai et al., 2017). For ecolabelling programmes to be successful, institutions must emphasize well-designed and coordinated ecolabelling schemes (Testa et al., 2013). The main purpose of introducing an ecolabelling scheme is to influence consumer behaviour so that consumers are more likely to purchase environmentally friendly products. In recent years, the market share of ecolabelled products has increased many-fold (Abe et al., 2002). The use of ecolabels positively and significantly affects firms' environmental and financial performance (Hayat et al. 2020). Wen and Lee (2020) concluded that environmental labelling significantly improves the financial performance of firms and increases their productivity. Environmental performance positively affects the export performance of firms (Ghwayeen 2018). Antonietti and Mazrucchi (2014) found that green investment strategies significantly affect total factor productivity and that this increase in total productivity stimulates export performance, especially in



more stringent environmentally regulated markets. Knowledge, attitude, the perceived credibility of ecolabels, level of education, income level, past green purchases and the presence of an elder in the house all positively affect green product initiatives (GPIs) (Cai et al., 2017).

### *2.1 Theoretical Framework*

To provide a theoretical background for this study, we follow the theoretical framework of Bicakcioglu et al. (2019), which utilizes resource-based theory. According to resource-based theory, a firm can achieve both sustainability and competitive advantage in domestic and international markets with the help of its strategic resources, such as its assets, capabilities, and attributes, which are heterogeneously distributed among firms in the market. This means that firm resources are utilized in such a way as to increase their efficiency and effectiveness. In other words, the firm must have the necessary resources and capabilities to improve its export competitiveness and performance through the use of green business strategies.

However, previous research studies have highlighted that a single environmental strategy is not appropriate for all firms because both their available resources and their organizational structures are different from each other. Therefore, every firm should develop its own green strategy based on its internal and external factors, conditions and circumstances. Moreover, the main objective of implementing a green business strategy is achieve production through the use of ecofriendly technology. This indicates that manufacturing, supply chains, finances, human resources and international marketing should be conducted under consideration of the natural environment.

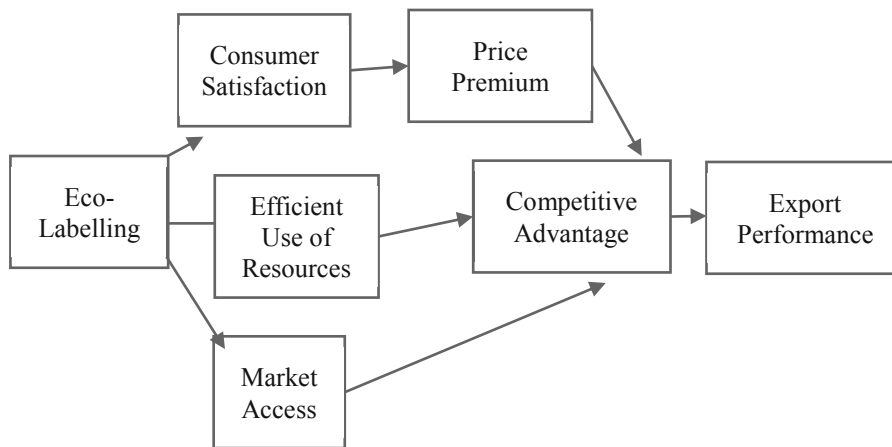
A number of studies have advocated that ecofriendly production techniques boost exports and the financial performance of a firm because these techniques are cost efficient, serve as demand boosters and lead to a competitive advantage in the international market. In addition, some studies have shown that environmentally conscious consumers, especially those in developed countries, put pressure on firms to adopt ecofriendly certificates such as ecolabels. Ecolabelled certified products clearly have a competitive advantage over noncolabelled certified products, and in most cases, they receive a price premium that boosts overall firm-level export performance.

To bridge the link between the adoption of ecolabels and the export performance of the firms used for this study, I follow resource-based theory

and analyse the effect of ecolabelling on both the export performance and export potential of the selected textile firms, which are listed at PSX.

In the following sections, two models are presented for pursuing the two objectives. The first model addresses the effect of ecolabelling on the export performance of textile firms, and the second model addresses the fact that the adoption of ecolabels increases the export potential of the products of textile firms.

**Figure 1. Overall Theoretical Framework derived from Resource-Based Theory**



Source: Authors' own source

*2.1.1 The effect of ecolabelling on the export performance of textile firms*

To analyse the effect of ecolabelling on the export performance of textile firms, we follow the panel data model of Galdeano (2010). The specification of the model is given as follows:

$$EF_{it} = \alpha_i + \lambda_t + e_{it}\beta + x_{it}\gamma + \varepsilon_{it} \tag{2.1}$$

$i = 1, \dots, N, \quad t = 1, \dots, T$

where  $EF_{it}$  is the export performance of the firm derived by dividing the export sales of the firm by its total sales, and  $e_{it}$  is a dummy variable that is equal to 1 if the firm has adopted ecolabels and 0 otherwise.  $x_{it}$  is the set of time-variant explanatory variables including firm productivity, firm profitability (return on equity is used as a proxy for firm profitability), firm size (number of employees at the firm), firm age (number of years the firm has been in operation), the capital intensity ratio of the firm, the debt equity ratio of the firm, (variable is used as a proxy for firm financial leverage), and the labour costs of the firm.  $\varepsilon_{it}$  is the random error term,  $\beta$  and  $\gamma$  are parameters to be estimated,  $i = 1, \dots, N$  represents firms, and  $t = 1, \dots, T$  represents the time period. Finally,  $\alpha_i$  represents the firm fixed effect, and  $\lambda_t$  represents the time/year fixed effect.

### **3. Data and Methodology**

#### *3.1 Data and its sources*

In this study, panel data on 136 textile firms listed on the Pakistan Stock Exchange (PSX) from 2009 to 2019 are utilized. Of these 136 firms, 70 firms export their products, 37 firms do not export their products, and 29 firms partially export their products. To achieve the study objective, I use the data of 70 firms, which means that this study only considers those firms that export their products. This is because our dependent variable is exports intensity (EI), which is used as a proxy for exports sale/total sales. Data for this study was collected from the State Bank of Pakistan (SBP), the annual reports of the firms, and corporate websites. Moreover, after processing and checking the annual reports of the firms, 77 firms were retained for this study. In these 77 firms, 15 firms use an eco-label, while 62 have no ecolabels the year in which they adopted an ecolabel cannot be confirmed. In addition, information on the ecolabelling of firms was taken from the ecolabelling index website.

#### *3.2 Variable construction*

##### *Dependent variable*

The export intensity as the sale/total sale of exports

##### *Explanatory variables*

Firm productivity (output volume/input volume)

Firm profitability (return on equity is used as a proxy for firm profitability)

*Return on equity* as Net income/average shareholder equity  
 Firm size (number of employees of the firm)  
 Firm age (number of years the firm has been in operation)  
 Capital intensity ratio as the total assets/sales  
 debt equity ratio as total liabilities / shareholder equity  
 Labour expenditures of the firm

### 3.3 Econometric models

The following econometric model is used for empirical estimation.

$$EI = \beta_0 + \beta_1 Ec + \beta_2 FS + \beta_3 PR + \beta_4 AG + \beta_5 DE + \beta_6 LE + \beta_7 CI + \beta_8 RQ + \varepsilon_i \quad (3.1)$$

where export intensity is the dependent variable denoted by EI, and Ec, FS, PR, AG, DE, LE, CI and RQ are eco-label, firm size, productivity, firm age, debt equity ratio, labour expenditures, capital intensity and return on equity, respectively.

### 3.4 Estimation techniques

The aim of this study is to examine how export intensity is affected by ecolabels, firm size, productivity, firm age, the debt equity ratio, labour expenditures, capital intensity and the return on equity of textile firms. For this purpose, panel data estimation techniques have been used due to their higher variability, high degree of freedom, high efficiency, lower chance of collinearity and ability to control individual heterogeneity. For empirical estimation, we used a fixed effect model (FEM), random effect model (REM) and common effect model (CEM). To estimate these models, we also verified the stationarity of the dataset by using panel root tests such as the Levin-Lin-Chu test, Im, Pesaran-Shin (IPS) test and Fisher-type test. These tests indicate that export intensity, firm size, productivity, debt to equity ratio, labour expenditure, capital intensity and return on equity are stationary at this level while only firm age is not stationary at this level, but rather stationary at the level of first difference (see table in appendix)

## **4. Results and Estimation**

### *4.1 The common effect, specific fixed effect and random effect using export intensity as the dependent variable*

The effect of export intensity on the other explanatory variables can be analysed on the basis of well-known methods: the common effect model (CEM), fixed effect model (FEM) and random effect model (REM). To choose between CEM, FEM and REM, the Hausman test was applied. The hypothesis in the Hausman test states that a “random effect is preferred over a fixed effect model”. If the probability of the test is less than 0.05, then the null hypothesis is rejected.

### *4.2 Effect of export intensity*

The effect of export intensity on the independent variable of textile firms can be categorized into four parts to check the reliability of these different variables against each other. First, the effect of the dependent variable, export intensity, on eco-label and firm size is analysed. Similarly, by adding two additional variables, the effect of export intensity on age and the debt equity ratio is investigated. In the third equation, two further independent variables, labour expenditure and capital intensity, are added. In the last equation, the impact of export intensity on two additional independent variables, capital intensity and return on equity, is studied. The results of these models are presented in the above table. There are 11 years of data ranging from 2009 to 2019 contained in 77 groups and 847 observations.

The F-statistics indicate the overall goodness of fit for linear regression. The null hypothesis states that the model is not a good fit and is used as a counterfactual against the claim that the model is a good fit. The dependent and independent variables included in the model are both a good fit and their inclusion has improved the overall significance of these models. If the estimated value is greater than the F-statistic, then the null hypothesis is rejected. For interpretation of the results, we have considered F-statistics, which are generally derived from the P value.

To choose between the fixed effect model (FEM) and random effect model (REM), we observed that the P value was less than 0.05, so the null hypothesis was rejected, and the alternative hypothesis that the fixed effect model (FEM) is preferred over the random effect model (REM) was accepted. Additionally, to inform the selection of models, this study employed the Hausman test. The

results of the Hausman test, that is, the P Value of the F-Statistics, are highly significant, so we have rejected the null hypothesis that the difference in coefficients is not systematic against the alternative that the difference in coefficients is systematic. In short, the results of the Hausman test show that the fixed effect model (FEM) is relatively better than the common effect model (CEM) and the random effect model (REM) in all cases.

Table 1 shows the results for the common effect model (CEM), fixed effect model (FEM) and random effect model (REM). However, to interpret these results, fixed effects are considered over random effects because, according to theory, most coefficients are statistically significant. The fixed effect model shows that firm size, firm productivity, debt equity ratio and return on equity are statistically significant and have a positive effect on the export performance of textile firms. Firm has a coefficient of .0000124, which means that a unit change in firm size leads to a 0.0000124 change in export performance. Similarly, the results of firm productivity indicate that firm productivity has a significant positive effect on export performance. This can be confirmed from its coefficient, which is 0.1051103. This means that a unit change in firm productivity leads to a 0.1051103 change in export performance. In the same way, the debt equity ratio and return on equity can significantly affect export performance, as shown by their coefficients of .000583 and .0000871, respectively. Therefore, this clearly indicates that a one unit change in the debt equity ratio and return on equity leads to 0.000583 and 0.0000871 changes in export performance, respectively.

**Table 1. Common effect, specific fixed effect and specific random effect with export intensity set as the dependent variable.**

<b>VARIABLES</b>	<b>Common Effect Model</b>	<b>Specific Fixed Effect</b>	<b>Specific Random Effect</b>
<b>Ecolabel</b>	0.0058	-0.0252	0.00589
	0.0293	0.03088	0.02938
<b>Firm Size</b>	0.000027***	0.000024***	0.000027***
	0.000011	0.000011	0.0000111
<b>Productivity</b>	0.0998507***	0.09732***	0.0998***
	0.021873	0.0233	0.02187
<b>Firm Age</b>	-0.00139	-0.00238	-0.0013
	0.00135	0.0019	0.00135
<b>Debt to Equity Ratio</b>	-0.0005***	-0.0005***	-0.00056***
	0.00008	0.000085	0.0000859
<b>Expenditure</b>	5.39e-0	-5.96e	-5.39e-0
	4.31e-08	4.29e-0	4.31e-0
<b>Capital Intensity</b>	0.0000159	0.0000169	0.000015
	0.0000125	0.000012	0.000012
<b>R on equity</b>	0.0000893***	0.000087***	0.000089***
	0.000015	0.000015	0.000015
<b>Constant</b>	0.4009	0.4451	0.4009
	0.054733	0.0693	0.05473
No of observations			
F-stat [Wald $\chi^2$ ]	120.16	14.06	120.16
P Value	0.0000	0.0000	0.0000
<b>Diagnostic Tests</b>			
<b>Hausman test</b>			
H <sub>0</sub> : The random effect model is preferred over The fixed effect model			
	25.38	24.53	24.38
	0.0000	0.0001	0.0002

## **5. Conclusion**

This study has discussed the environmental problems that the world is currently facing or will be facing in the future. With the passage of time, the world population is increasing at a rapid rate, posing complex economic and environmental challenges to human lives. There are two approaches to combatting environmental problems: the first is implementing a command and control system and the second involves the implementation of voluntary environmental initiatives. Ecolabelling programs fall under the category of voluntary environmental initiatives. Therefore, this research focuses on the pros and cons of adopting an ecolabelling scheme. Various countries are currently using this scheme for the protection of local manufacturers and to increase the difficulty of others exporting their products. It has also been found that the adoption of an ecolabelling program may improve the levels of firm financial and export performance in certain cases. This paper mainly focuses on the following research question: “Do ecolabels improve the export performance of textile firms”?

The study applied a model that uses export intensity as the dependent variable and eco-label, firm size, productivity, firm age, debt equity ratio, labour expenditure, capital intensity and return on equity as independent variables. To analyse these variables, a fixed effect model was used, which was confirmed to fit the data better than the random effect model on the basis of the Hausman test. The results illustrate that eco-label, firm age, labour expenditure and capital intensity all have a nonsignificant impact on export intensity, while productivity, debt equity ratio, firm size and return on equity all have a highly significant impact on export intensity. It is also found that only the debt equity ratio has a negative impact on export intensity, whereas productivity, firm size and return on equity all have a positive effect on export intensity. It is further suggested that firm size has a positive effect on export performance. Therefore, industrialists and governments need to increase the size of firms. For this purpose, they provide firms with soft loans. The study results also indicate that to realize the benefit of extending the size of international markets, firms need to adopt ecolabelling. Such adoption ensures better access to environmentally stringent markets. Ecolabelling is positively related to firm environmental and financial performance. To increase textile exports, an increasing number of firms need to adopt ecolabelling.



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IMPLICATION OF THE EASE OF DOING BUSINESS FOR  
FOREIGN DIRECT INVESTMENT: A PANEL DATA ANALYSIS  
OF ASIAN COUNTRIES

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**Abstract**

This study examined the behaviour of businesses in 46 Asian republics from 2004 to 2019 that were ranked high on the business index of the World Bank. The study uses the ten parts of the commercial index as independent variables. The interest rate, rise in general price level, per capita GDP, and population are the focus variables of the research. The variables' values were derived from the WDI and Doing Business Index. The goal of this research is to determine why Asian countries receive the most foreign direct investment (FDI). The study used fixed effect, random effect and instrumental variable techniques for estimation. According to the findings, factors of the Doing Business Index, such as business startup, obtaining electricity, obtaining building licences, and property registration, have analytically substantial implications for foreign direct investment when the business is relocated. Similarly, obtaining financial assistance, defending minority investors, resolving commercial disputes, and enforcing contracts revealed significant affirmative impacts on FDI influx. Only two factors, paying taxes and cross-border trade, have a strong negative relationship with FDI influx. The study's findings can aid policymakers in improving the commercial atmosphere in terms of the

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characteristics that affect the Doing Business Index. On the other hand, according to the report, to considerably increase FDI inflows in the future, there is a significant need to increase reliability in the enforcement of contracts, to improve the equitability of electric utilities, to improve tax procedures, and to properly deal with construction permits.

**JEL CLASSIFICATION:** F02

**KEYWORDS:** EASE OF DOING BUSINESS INDEX; FOREIGN DIRECT INVESTMENT; GDPPC, INFLATION, ASIAN COUNTRIES

## **1. Introduction**

Since 1967, Asia has been a dynamic region in terms of FDI and international commerce (Morris & Aziz, 2011). Asian countries have gone through a series of economic integration stages. A business-friendly climate and effective entrepreneurship are the driving forces behind Asian countries' competitiveness and appeal to multinational enterprises (MNEs) (Vogiatzoglou, 2016). Firms and entrepreneurs obey several business regulations linked to beginning and ending a private enterprise, permissible registering, and hiring employees. Because of the differences in the business environment, the quality of this regulation may vary greatly (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2002).

Controlling ownership of commercial enterprises in local states by a company headquarters in a foreign state is termed FDI. Controlling the proprietorship of a business enterprise in the domestic country by a company headquartered in a foreign country is considered FDI. FDI is not the same as international financial assets (Winder, 2006). Portfolio investment is described as an investment in the host country's commercial sanctuary, such as public stocks and bonds (Goldstein & Razin, 2006). In recent years, Asian countries have been dubbed the world's top FDI-attracting countries (Xing & Wan, 2006).

Horizontal, vertical, and conglomerate are the three types of FDI. Horizontal investment refers to an investor's establishment of the same sort of business in the host country as in their home country. Vertical FDI refers to associated but distinct commercial procedures undertaken by investors in a foreign country. The home country, in contrast to the previously listed kinds, investigates completely unconnected homemade commercial events across the

state border, often recognized as composite FDI. This sort of investment involves investors that have no prior business experience in a new industry (Aizenman & Marion, 2004).

Simon Djankove investigates the concept of an ease of doing business index (Business, 2009). This index assesses countries based on their economic performance or regulatory framework. The higher a country's economic ranking is, the better its business regulatory performance will be. Essentially, the discrete average notch of the component of the EDB Index determines the economies ranking. The mark ranged from 0 to 100, with economies nearing one hundred (100) addressing the efficient business climate. Beginning a trade, obtaining licences of building construction, obtaining energy, recording ownership rights, obtaining finance, investor protection, repaying duties, overseas business, implementing agreements, and solving commercial disputes are indicators of a doing business index. These indicators have gained prominence in recent years, particularly in Asian countries. The Asian countries with the uppermost marks in the easiness of business startup have a number of qualities in common (Asongu, 2019), such as the usage of an automated arrangement, wired registering property, and tax procedures based on digitalization. All Asian regions that have the highest score in straightforwardness of startup show operative innovative movement (Business, 2019; Ermias Moges Ebero & Mustiary Begum, 2016; Shahadan, Sarmidi, & Faizi, 2014).

Hymer (1960), known as the "Ancestor of Global Trade," operated on FDI for a time. Prior to his FDI thesis, every investment was viewed as a form of cross-border capital mobility. The differential in interest rates across countries determined this capital migration. In reaction to criticism of macrolevel theory, Hymer developed his own microlevel theory. Multinational corporations are chosen over market-size institutions, according to his FDI theory, since multinational firms efficiently manage economic operations, set prices, and convey knowledge. Financial portfolio and foreign direct investment, he said, are two different things. Portfolio investment is only based on interest rate differentials between countries, whereas firms regulate business activity across country borders through FDI. According to Hymer, FDI would flow into any country if the market structure of that country was flawed enough to offer advantages. Hymer examined the two factors that influence FDI. The first element is the elimination of competition, while the other is the advantage that only infrequent businesses have in their particular operations (Djankov, McLiesh, & Klein, 2004; Popovici & Călin, 2014).

There are numerous alternative investment theories; among them, the effective concept was elaborated upon by Dunning in 1979 and is termed the electric paradigm model. This comprises three dimensions: location, industrialization and ownership. Foreign enterprises in host nations face challenges due to their nonnative status (not understanding the national language and having poor awareness of host consumer demand). As a result, enterprises with special competitive advantages relocated abroad to counter this disadvantage. The greater the competitive advantages of ownership is, the greater the investment firm's production in host countries is. Cheap raw materials, a low salary rate, a skilled work force, and lower taxes on trade are all rewards of the location, which is the second component of the electric paradigm. In the most recent research, Porter's diamond model is utilized to determine location advantages. Internationalization, which includes licensing, is the final benefit of the OLI framework (Denisia, 2010). Management wants to be able to scheme its invention autonomously, regulate their procedures, and participate in foreign direct investment. This milestone is achieved by enterprise collaboration or a Greenfield venture (Kersan-Skabic & Orlic, 2007).

Aside from the Hymer and Dunning theories of foreign direct investment, there are numerous more ideas that are divided into microeconomic and macroeconomic perspectives. Macroeconomically specific aspects such as nationwide wages, country evolution rates, trade, and rising price levels are highlighted in macroeconomic-based FDI theories. Microbased FDI theories, on the other hand, focus on business ownership, industrial economics, and market imperfections (Makoni, 2015).

Ramond Vernon devised the four-stage theory of production in 1966 as a consequence of the letdown of the Heckscher-Ohlin framework, generally known as the H-O model, in international trade. According to this notion, the product and the work associated with it must originate in the region in which the product was invented. The stages of this hypothesis are introduction, growth, maturity, decline, and surplus. New invented goods are first introduced in the market at the stage of introduction. To stimulate demand, the producer creates an announcement to encourage sales. The return generated by the manufacturer on the auction of an invention at the outline stage is lower, but there is an improvement in the arrangement of reduced market rivalry.

The second phase of this hypothesis begins when client demand for the product increases, lowering the production's expenses and increasing the producer's revenue. The third stage demonstrates that the invention is in high

demand on a big range and that manufacturers are facing market saturation. The maturity phase is the name given to this stage. During this period, inventors sell their products to high-income countries and at profit handsomely. The final phase, the diminishing phase, implies that the product will be discontinued due to excessive production costs (Ayal, 1981; Denisia, 2010; Jensen & Thursby, 1986).

### *1.1. Objective of the study*

The main objective of the study is to investigate the individual impact of ease of doing business factors on the inflow of foreign direct investment (FDI) to Asian countries. These factors are starting a business, obtaining electricity, obtaining credit, trading across borders, resolving insolvency, protecting investors and dealing with construction permits. Furthermore, another purpose of the research is to recommend the appropriate policy that helps the government to adopt suitable business reforms that play a significant role in attracting FDI.

## **2. Literature review**

Substantial research work exists on the association between FDI and easiness of business procedures. Considerable analysts, entrepreneurs, and enterprises have elaborated the bond between venture and the EDB Index as per their own viewpoint. The study's goal is to look at more effective business policies and tactics for attracting FDI inflow. The EDB Index with the highest ranking (lower numerical value) has stronger rules and regulations for business changes. However, the EDB Index was unable to account for distinctive factors, including infrastructure, scale of the market, corruption, and stability of institutions.

Piwonski (2010) investigated the relationship between administration achievement and foreign direct investment inflows using doing business measures as proxy variables. He opted for 145 countries during 2009 and 2010. As independent variables in the model, the study used EDB Index indicators. He concluded that DBI and FDI were highly connected.

Elements that affect business and investment in African and Asian countries are investigated by (Morris & Aziz, 2011). The mockup consisted of fifty-three states, thirty-three of which were Saharan, while the remaining were Asian, from 2000 to 2005. They concluded that MNEs invest in Asian and African countries because of market size rather than the



convenient business climate.

Kang and Jiang (2012) investigate the trait that fascinates Chinese multinational corporations and draws them to invest in a different place. They examined two traditional economic and institutional factors that can motivate multinational businesses to invest in other countries. Apart from macro and micro growth determinants, technology, sales volume, skilled labour, and effective start-up business all play a role in attracting investors.

Pinheiro-Alves and Zambujal-Oliveira looked at the easiness of commercial factors as an instrument for determining where to invest (2012). For comparative analysis of variant states on the ground of commercial activities, they used 41 variables amassed in 10 distinct categories. Using the Cronbach alpha approach, they discovered that some variables reveal unproductive contributions that involve regeneration and renewal to increase their reliability and consistency.

Olival (2012) examines the differences in attracting FDI using organized variables of commercial convenience. This study's empirical analysis is grounded on 177 states, of which 33 are established and the other 144 are emerging states, from 2004 to 2009. He concluded that the procedures for starting a business, registering assets, overseas commercial activities, shutting down the enterprise, and reimbursing duties all contribute significantly to attracting FDI.

권혁주 (2013) explored the relationship between the convenience of commercial activities and the influx of FDI in 41 Sub-Saharan African nations. Between 2005 and 2011, data were gathered from the Doing Business Index. This study concluded that expenditures on business initiatives and time prerequisites for exports and imports showed an irrelevant influence on FDI. Varyingly, the price of record-keeping assets process exposed a noteworthy optimistic effect on FDI.

Bayraktar (2013) looked at the association between ease of commerce and FDI during and after the disaster, which lasted from 2004 to 2010. This study's data were gathered from the World Bank Business Index. The study also examined the global FDI trend and the relationship between macroeconomic variables and FDI. Upgrades to selected doing business indices increased FDI inflows to developing nations while decreasing FDI inflows to developed countries, according to the study.

The influence of the EDB Index on net inflows of foreign direct investment was studied by Shahadan et al. (2014). They worked on six Asian states for

the period of 2004 to 2013. Except for obtaining credit, property registration, and cross-border trade, the remaining seven EDB Index factors were found to be adversely connected with FDI.

Singh (2015) explored the connection between convenience start-up activities and foreign direct investment in India by derived statistics from the WDI. The independent factors of the study are business startup, obtaining power, recording assets, construction agreement affidavit, paying duties, and enforcing contracts. After using the VAR model for estimation, he came to the result that there is no association among dependent and independent factors in the short run, while there is a long-term association among the variables of the study.

Corcoran and Gillanders (2015) explored the link between FDI and EODB from 2004 to 2009. They used data from the World Bank and the Bureau of Economic Analysis to compile their report. The subcomponent of the calmness of the commercial, comprising beginning commercial activities, building licences, receiving financial assistance, the process of ownership transformation, tax liabilities, protecting investors, and contract enforcement, are used as explanatory variables. The ease of the commercial startup phenomenon revealed a noteworthy influence on foreign investment. Vogiatzoglou (2016) examined the link between the commercial index and overseas investment in Asian states. The variables are taken from the worldwide EDB Index, also from the Heritage Foundation for the period 2003-2013. Business startup, building construction affidavit, recording the ownership of the asset, paying duties on trade, contract enforcement and commercial disputes are the highly linked factors with FDI, according to him.

Kaur (2016) wrote a review paper on the difficulties associated with investing in BRICS states in terms of ease of startup and its subindices from 2015 to 2016. India's comparisons with the BRICS states were demonstrated in this paper, and the evaluation is built on the position and grade of the index report. The process, duration, and expense of conducting enterprises are all high, which has lowered FDI's appeal.

For Ethiopia over the period 2010-2014, E MogesEbero and M Begum (2016) scrutinized the affiliation between liability commerce and foreign direct investment. They used ten commercial factors as independent aspects, and FDI was explained. By using ANOVA, they determined that protecting smaller depositors, submitting duties, and enforcing contracts promoted FDI, while the remaining factors discouraged FDI.

Mahuni and Bonga (2017) discovered the association among commerce

subindices and FDI for Zimbabwe over the period 2009-2016. To check the stationary data, they employed the augmented Ducky fuller technique. In addition, they employed the trend stationary technique to create a new set of variables. They concluded that business components such as contract enforcement, paying taxes, and procuring power have a major negative influence on FDI, whereas dealing with construction licences has a good impact.

Muli and Aduda (2017) looked at the impact of commercial easiness in mediating the link between fiscal assimilation and FDI in the African communal from 2001 to 2015. According to the findings of this study, a more effective commercial atmosphere among the African communal drives high levels of FDI into that region.

In ex-socialist nations, Jovanovic and Jovanovic (2018) studied the link between the easiness of building enterprises and FDI from 2004 to 2011. Study concluded that requiring financial assistance has no unremarkable impression on FDI. Shielding businessmen, paying duties, overseas business, contract enforcement, and commercial solvable disputes had substantial effects on the influx of FDI.

In a study of 44 Sub-Sahara African nations, Nangpiire et al. (2018) looked at the relationship among commercial indices and overseas direct venture influx. According to them, the time, cost, and quantity of procedures affect dealing with licences, beginning of the enterprises, enforcing contracts, and recording information. In developed countries, the ease of DBI has rapidly changed in comparison to developing countries.

The effect of painless enterprise startup on FDI was investigated by Hassan and Basit (2018). Over the period 2011-2015, they chose 177 nations. The explanatory variables used in this study were beginning commercial enterprise, attaining financial assistance, giving duties, recording ownership, and contract enforcement. They concluded that beginning commercial enterprise and applying agreements had a negligible impact on FDI.

Malik and Jyoti (2018) wrote a review article to investigate the association between the affluence of commercial index pointers and FDI. They claimed that to attract foreign investors, governments around the world have implemented reforms such as tax modifications, finance transformations, trade improvements, and lawmaking changes, invoking states' commercial thriving.

### 3. Methodology

The ease of doing business is a key predictor of FDI influx. The impact of the EDB Index on FDI inflow has been investigated by a number of scholars. The influence of the EDB on FDI could be beneficial, negative, or unclear in nature. With the help of literature, the current study examined the relationship between FDI and the EDB Index. In the economic literature, various empirical models have been developed to determine the primary factors of FDI. According to the studies reviewed above, good business institutional quality is an essential factor in predicting FDI influx.

#### 3.1 Econometric model of the study

In the following regression equation "Eq. (3.1)", we add all the doing business indicators separately. During estimation, we regress each explanatory variable on FDI separately as well as collectively.

$$FDI_{it} = \beta_0 + \beta_1 SB_{it} + \beta_2 CP_{it} + \beta_3 PT_{it} + \beta_4 TAB_{it} + \beta_5 GC_{it} + \beta_6 PI_{it} + \beta_7 GE_{it} + \beta_8 EC_{it} + \beta_9 RI_{it} + \beta_{10} RP_{it} + X' \theta + V_i + \delta_t + \mu_{it} \quad (3.1)$$

#### 3.2 Final model

This is the dynamic econometric model's final form.

$$FDI_{it} = \beta_0 + FDI_{it-1} + \beta_1 EDB_{it} + X' \theta + V_i + \delta_t + \mu_{it} \quad (3.2)$$

Where:

$$i=1, 2, 3, \dots, N, t=1, 2, 3, \dots, T$$

$V_i$  represents individual-specific characteristics across countries

$\delta_t$  denotes individual specific characteristics over time

$FDI_{it}$  reveals the Ease of Doing Business Index

$FDI_{it-1}$  exhibits the lag of foreign direct investment

$X' \theta$  is the number of interactive terms

**Table 1. Description of the variables and their data source**

<b>Independent variables</b>			
1	Starting a business	Starting a business involves many activities related to organizing the organization. The process includes generating of an idea for the enterprise (called concept development), researching the idea's potential for success, and writing a business plan. Someone who is starting a new business is called an entrepreneur	World bank doing business index
2	Dealing with construction permits	This variable tracks the procedures, time and cost to build a warehouse including obtaining the necessary licenses and permits, submitting all required notifications, requesting and receiving all necessary inspections and obtaining utility connections.	World bank doing business index
3	Getting electricity	The getting electricity indicators measure the procedures, time and cost required for a business to obtain a permanent electricity connection for a newly constructed warehouse.	World bank doing business index
4	Registering property	This variable examines the steps, time, and cost involved in registering a property. In addition, the variable measures the quality of the land administration system in each economy.	World bank doing business index
5	Getting credit	The legal rights of borrowers and lenders with respect to secured transactions. The strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending is observed under the getting credit variable.	World bank doing business index

**Table 1. Description of the variables and their data source (continued)**

<b>Independent variables</b>			
6	Protecting investor	Corporations are the instruments of entrepreneurship and growth. They can also be abused for personal gain. Doing Business measures the strength of minority shareholder protections against directors' misuse of corporate assets for personal gain.	World bank doing business index
7	Paying taxes	This variable measures the total tax and contribution rate. The time needed to comply with the major taxes (profit taxes, labour taxes) and the number of tax payments.	World bank doing business index
8	Trading across border	The trading across borders indicator set records the time and cost associated with the logistical process of exporting and importing goods every year.	World bank doing business index
9	Enforcing contracts	To enforce means to mandatory compliance with a contract. Parties mutually approve the agreement and sign a contract, are obliged to adhere to the rules contract law, by performing as promised.	World bank doing business index
10	Resolving insolvency	Insolvency is a state of financial distress in which someone is unable to pay their bills. In recovery of debt insolvency, recovery rate is calculated based on time, cost and outcome of insolvency proceeding in each economy.	World bank doing business index
10	FDI	A foreign direct investment (FDI) is an investment in the form of a controlling ownership in a business in one country by an entity based in another country.	WDI
11	GDPPC	GDP per capita is a measure of a country's economic output that accounts for its number of people. It divides the country's gross domestic product by its total population	WDI
12	Population	Whole number of people and inhabitants in the country.	WDI

**Table 1. Description of the variables and their data source (continued)**

		<b>Independent variables</b>	
13	Inflation	Persistent rise in general price level of all the goods and services in an economy over the period of time.	WDI
14	Interest rate	A real interest rate is an interest rate that has been adjusted to remove the effects of inflation to reflect the real cost of funds to the borrower and the real yield to the lender or to an investor.	WDI

Source: <http://www.doingbusiness.org/> - <http://worldbank.tumblr.com/>,  
<https://databank.worldbank.org/source/world-development->

#### **4. Estimation techniques**

When OLS is not applicable due to the presence of endogenous independent aspects in the model, another technique, known as the instrumental variable (GMM), is utilized. Several estimation techniques have been used in earlier literature, including two-stage least squares, three-stage least squares and instrumental variable techniques, to tackle the problem of endogeneity among data (Taylor, 1981). Instrumental techniques contain variables that are strictly exogenous, time-invariant, and uncorrelated with effects (Ogaki, 1993). This strategy was utilized to address the issue of endogeneity. This method is based on two assumptions: (i) instruments should be strong, and (ii) endogenous regressors should be correctly correlated, while the error term should be independent (Blundell and Bover 1998).

#### **5. Interpretation of the statistical estimation**

Many scholars have examined the EDB Index's impacts on foreign investment. Few studies have found an optimistic correlation between the ease of the startup business and the inflow of FDI, while others have found a negative correlation. The underpinning study gives empirical results and eventually constructs a scenario of the association among the explanatory and regressive factors. The interpretation of the current study's results is in line with the previous literature. Moreover, we will interpret the results of the study in a concise and precise manner.

**Table 2. Descriptive statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
Foreign direct investment	644	4.744	10.396	-43.463	198.074
Ease of doing business	374	60.731	11.289	32.94	91.71
Starting a business	573	74.692	17.038	11.55	97.84
Dealing construction permits	507	62.735	15.453	17.33	87.58
Obtaining electricity	371	70.53	15.632	16.61	99.92
Registering property	532	67.878	17.408	0	99.95
Obtaining credit	531	44.461	22.6	5	100
Protecting investor	514	52.315	16.916	10	93.33
Paying taxes	514	71.227	18.401	20.61	100
Trading across borders	504	60.851	24.11	0	96.84
Enforcing contracts	575	54.969	15.519	2.08	93.36
Resolving insolvency	498	39.97	17.939	2.01	96.56
Population	675	1.966	2.315	-9.081	17.511
Gross domestic product	659	8.481	1.389	5.809	11.152
Inflation	533	24.571	2.036	19.83	29.02
Interest	515	5.327	9.8	-20.129	78.917

Outliers in the sample are detected using descriptive analysis. In the table above, the standard deviation shows how far the data for the control and focus variables deviate from their mean or average values or how dispersed the data are. The Ease of Doing Business Index has an arithmetic mean of 60.731 and a standard deviation of 11.289. The EDB's standard deviation value does not indicate much variability in the data. The standard deviation of the interacting regressors does not indicate a high degree of scattering or variability in the data. The explained variable in this study has an average of 4.744 and a dispersion of 10.396, indicating a small fluctuation.

Multicollinearity is a difficulty with data where explanatory variables are interrelated. A large standard error, small t-ratio, larger confidence interval, and high R<sup>2</sup> are all issues that researchers confront when using this test (Mansfield & Helms, 1982). We are unable to obtain the desired study outcome just because of multicollinearity in the statistics. As a result, it must be detected and removed from the data.



**Table 3. Matrix of correlation**

<b>Variab les</b>	<b>ED B</b>	<b>SB</b>	<b>DC P</b>	<b>GE</b>	<b>RP</b>	<b>GC</b>	<b>PI</b>	<b>PT</b>	<b>TA B</b>	<b>EC</b>	<b>RI</b>
EDB	1.00 0										
SB	0.48 8	1.00 0									
DCP	0.59 1	0.27 0	1.00 0								
GE	0.67 1	0.08 9	0.34 2	1.00 0							
RP	0.58 1	0.28 4	0.38 3	0.32 4	1.00 0						
GC	0.61 2	0.31 0	0.16 7	0.19 8	0.30 5	1.00 0					
PI	0.66 6	0.29 8	0.25 8	0.23 8	0.27 4	0.56 0	1.00 0				
PT	0.53 7	0.09 9	0.27 3	0.52 7	0.27 7	0.08 4	0.12 6	1.00 0			
TAB	0.65 3	0.00 9	0.47 5	0.62 6	0.17 9	0.26 3	0.32 6	0.41 7	1.00 0		
EC	0.71 1	0.52 6	0.35 2	0.39 0	0.60 4	0.39 0	0.48 0	0.23 4	0.18 0	1.00 0	
RI	0.63 1	0.34 3	0.26 1	0.37 1	0.06 3	0.36 1	0.50 0	0.20 6	0.36 0	0.40 1	1.00 0

The statistics in Table 3 reveal a one-to-one connection that is always equal to one. The association among regressors is represented by the vector off the diagonal figure. As its numerical value (0.488) is smaller than (0.7), there is no nexus between EDB and SB. The figure of the diagonal reveals that the interactive term has a low correlation. Moreover, correlation is a sufficient but not necessary requirement for multicollinearity to exist (Gujarati, 2009).

**Table 4. Multicollinearity by variance inflating factor**

<b>Variables</b>	<b>VIF</b>
EDB Index	1.79
GDPPC	1.93
POPU	1.37
INF	1.18
INST	1.10
<b>Mean VIF</b>	<b>1.47</b>

When multicollinearity rises, VIF rises as well, indicating that variance is significantly further from the initial figure. VIF equals 1 when the correlation coefficient approaches zero. When the value of VIF is more than ten (10), it is assumed that there is a problem of multicollinearity among the regressors (Gujarati, 2009). Therefore, there is no multicollinearity in Table (4).

**Table 5. Breusch–Pagan heteroskedasticity test**

<b>Chi-Square</b>	<b>P value</b>
204.99	0.0000

In 1979, this test was introduced by Trever and Adrian Pagan and is often termed the chi-square test of heteroskedasticity. Here, if the probability value is less than 0.05, we reject the null hypothesis of homoscedasticity (Breusch & Pagan, 1979). Because  $0.0000 < 0.05$  at the 5% level of significance, the current study's variance is not constant, as seen in the table above. Cross-sectional and time-series difficulties are no longer an issue with panel data (Koenker, 1981).

Table 6. Dynamic GMM results

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)
	FDI	FDI	FDI	FDI	FDI	FDI	FDI	FDI	FDI	FDI	FDI
L.FDI	0.456*** (0.0138)	0.548*** (0.00611)	0.545*** (0.0112)	0.510*** (0.0147)	0.511*** (0.00766)	0.568*** (0.0126)	0.520*** (0.0205)	0.563*** (0.00829)	0.554*** (0.00534)	0.510*** (0.0153)	0.569*** (0.0167)
Population	0.247*** (0.0198)	0.131*** (0.0324)	0.152*** (0.0252)	0.256*** (0.0525)	0.188*** (0.0273)	0.0925*** (0.0317)	0.0430*** (0.0480)	0.0666*** (0.0516)	0.128*** (0.0338)	0.150*** (0.0280)	0.0134* (0.0676)
Standard error	-0.0564*** (0.00574)	-0.0380*** (0.00536)	-0.0254*** (0.00833)	-0.0626*** (0.00502)	-0.0712*** (0.00478)	-0.0395*** (0.00406)	-0.0493*** (0.00619)	-0.0286*** (0.00724)	-0.0381*** (0.00561)	-0.0338*** (0.00417)	-0.0620*** (0.0107)
Interest rate	-0.284*** (0.0419)	-0.177** (0.0860)	0.00643 (0.105)	-0.148*** (0.0440)	-0.193*** (0.0598)	-0.222*** (0.0345)	-0.426*** (0.0902)	-0.0780 (0.0521)	-0.0516 (0.0680)	-0.356*** (0.0928)	-0.441** (0.172)
Inflation	0.351*** (0.0739)	0.252*** (0.0564)	0.379*** (0.104)	0.0521*** (0.0103)	0.136** (0.0849)	0.125** (0.0520)	0.611*** (0.121)	0.341*** (0.0997)	0.250* (0.139)	0.795*** (0.0537)	0.206** (0.199)
Gross domestic product	0.103*** (0.0114)										
Ease of doing business											
S.E											
Starting a business		0.0160*** (0.00413)									
S.E											
Construction permits			0.0250*** (0.00881)								
S.E											
Getting electricity				0.0186*** (0.00487)							
S.E											
Registering property					0.0592*** (0.00800)						
S.E						0.0241*** (0.00600)					
Getting credit							0.0355*** (0.0133)				
S.E											
Protecting investor								-0.0210* (0.0124)			
S.E											
Paying taxes											
S.E											
Trading across border									-0.0125* (0.00673)		
S.E										0.0650*** (0.00905)	0.4219*** (0.1280)
Enforcing contract											12.61*** (4.669)
S.E											
Resolving insolvency											
S.E											
Constant	6.521*** (0.462)	3.048* (1.826)	0.382 (2.284)	4.302*** (1.028)	2.298* (1.250)	5.317*** (0.959)	9.993*** (2.503)	2.365*** (0.891)	2.081* (1.125)	6.929*** (2.046)	512 44
Observations	512 44	512 44	512 44	512 44	512 44	512 44	512 44	512 44	512 44	512 44	512 44

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

1. \*\*\*, \*\*, \* represent 1%, 5% and 10% level of significance.

2. Numerical value in parenthesis denote the standard error.

3. Numerical value without parenthesis represent the coefficient value of the ease of doing business sub-indices and FDI.

## 6. Analysis of the GMM estimation outcomes

Here, the aforementioned table's (6) results are explained step by step. The issue of correlated regressors is addressed using instrumental variables techniques. The variables that are endogenous in nature are replaced with a different instrument, GDPPC is connected by explanatory factors in the econometric equation, namely, the interest rate, population, and persistent rise in general price level. To address the problem of endogeneity, this study employs the previous figures of the real interest rate, inflation, population and GDPPC as proxy factors.

### 6.1 Impact of the EDB Index on FDI

In Model (1), the EDB Index revealed a strong optimistic consequence on FDI inflow, as shown in Table (6). The Ease of Doing Business Index has a coefficient value of 0.103\*\*\*, indicating a considerable positive impact on FDI inflow. This substantial figure indicates that FDI inflows increase in the economy when a conducive business environment exists. As a result, to stimulate FDI inflows, the country must implement business reforms. This outcome is in line with the theories of (Mahuni & Bonga, 2017; Shahadan et al., 2014; Singh, 2015). FDI inflows into Asian countries climbed by 3.9 percent to US\$512 billion in 2018, according to UNCTAD's 2018 World Investment Report.

### 6.2 Impact of the EDB Index on FDI

The regression outcome of initiating the business has revealed the substantial impact on FDI in all Asian states. The current era of business initiation has exposed great importance as its statistics (0.0160\*\*\*). This outcome is aligned with the studies by (Nangpiire, Rodrigues, & Adam, 2018; Piwonski, 2010), (Mahuni & Bonga, 2017) and (Shahadan et al., 2014). In Asian states, the most common area of doing business is to build commercial enterprises. This effective outcome is only due to the various commercial reforms that encourage the interest of foreign investors.

### 6.3 Impact of construction permits on FDI

The effect of obtaining construction permits on FDI is shown in Model (3). As its coefficient value is 0.0250\*\*\*, this region of conducting business has revealed a considerable favourable significance for FDI in Asian countries. The results showed that the probability figure of building licences was larger

than the tabulated value of 0.05, so we accept the alternative hypothesis. The outcomes of this segment of the business resemble the studies by (Asongu, 2019), (Lawless, 2013), and (Mahuni & Bonga, 2017). Part of the work evaluates the method, time and expense of working through the construction-related paperwork as well as standards of quality and safety.

#### *6.4 Impact of obtaining electricity on FDI*

At the 1% level of connotation, the estimation outcome receiving energy validated in Model (4) has proven crucial momentous repercussions for FDI influx. The coefficient value of obtaining electricity is 0.0186\*\*\*, indicating that adequate electrical facilities greatly attract FDI. In Asian countries, FDI is positively correlated with launching a firm and obtaining construction licences, as indicated in the table above. The result of this component of the commercial index is in line with the study (Singh, 2015). Asian countries digitize the entire procedure and offer a lower rate for first-hand energy connections. In several Asian kingdoms, such as Pakistan, one-stop shops in which customers may get all of their needs met in one location have been built (Business, 2019). As a result, Asian countries receive a large share of global FDI inflow.

#### *6.5 Impact of registering property on FDI*

The regression findings of registering property in Model (5) reveal a strong decisive impact on FDI in Asian nations. The registering property's coefficient value is 0.0592\*\*\*, which is larger than 0.01 at the 1% degree of importance, indicating that the null hypothesis is prohibited. This theme of doing business is used to assess the nature of land administration. The land administration index includes infrastructural reliability, media transparency, geographical assessment and an equal rights strategy (Business, 2019). The conclusions of this Doing Business Index component are related to the works of (Jovanovic & Jovanovic, 2018), (Morris & Aziz, 2011), and (Singh, 2015), which particularly investigate the aspect of commercial business catalogues and have established optimistic associations with FDI.

#### *6.6 Impact of obtaining credit on FDI*

Obtaining credit has proven to be a strong optimistic prospective strength for FDI attraction in ASIAN states in Model (6). At the 1% significance level, the regression of the elasticity measuring factor of obtaining financial assistance is 0.0241\*\*\*, which is larger than 0.01 and is strongly correlated

with FDI arrival. The estimation outcome of attaining financial support is more compatible with the earlier study by (Vogiatzoglou, 2016), in which he concluded that privileges of the creditor and debtor with respect to protected transactions and further financial knowledge impact external stakeholders' judgement to capitalize. According to the study by (Muûls, 2015), effectual financial support and lower credit limits encouraged businesses to export and import.

#### *6.7 Impact of shielding smaller investors on FDI*

Protecting smaller stockholders is another element of business indices that revealed a beneficial influence on FDI inflow under Model (7). In this condition, the null hypothesis is rejected, as shown by the coefficient figure of this component, which is (0.0355\*\*\*), and this figure is greater than the probability figure at the 1% significance level. The outcomes of this element of commercial indices resemble the earlier literature work by (Jovanovic & Jovanovic, 2018), (Piwonski, 2010), and (Hassan & Basit, 2018b), which revealed that protecting the rights of investors is the major reason for attaining higher FDI influx. A study by (Claessens, Ueda, & Yafeh, 2014) effectively explains investor's interest and how they analyse the expense of financing, especially for growing enterprises. There is a link between investor protection and greater FDI in Asian states.

#### *6.8 Impact of paying taxes on FDI inflow*

Table 6 shows the estimation outcomes of paying duties that reveal an undesirable relationship to FDI. According to the statistics (-0.0210), paying duties has an adverse influence on FDI influx. The consequences of this element are linked by the research work (Hassan & Basit, 2018a), (Muûls, 2015), and (Djankov et al., 2004), who investigated whether FDI is undesirably affected by repaying duties to the government. The current part of commercial enterprises calculates the paying duties by smaller firms as well as other tax burdens borne by the government and the employer. This part of the EDB includes capital gain payable duties, taxes on ownership transfer, expenses on financial transactions, automobile and building taxes, other fees, and small surcharges (Devereux & Freeman, 1995).

#### *6.9 Impact of trading across borders on FDI*

At the 10% significance level, the results in Model (9) imply that overseas

trade has a considerably diverse influence on FDI influx. The prerequisite of excessive time duration and expenditure on trading goods suppressing the FDI influx to Asian states is represented by the statistics of oversee trade, which is (-0.0125). These results are similar to the investigation by (Jovanovic & Jovanovic, 2018), (Nangpiire et al., 2018) and (Mahuni & Bonga, 2017) as well as (Hassan & Basit, 2018b). The documentary process/agreement, tariff and nontariff duties are involved in the entire process of overseas trade. Furthermore, expenditure on paperwork and excessive time is also a matter of great importance, which also displays the ease of business startup. According to the latest report, Uzbekistan and Pakistan improved commercial activity by enhancing cross-border trade<sup>4</sup>.

#### *6.10 Impact of enforcing contracts on FDI*

At the 1% rate of alpha, the result shown in Model (10) demonstrates that enforcing contracts revealed a considerable optimistic impact on FDI influx. Enforcing a contract, which is one of the ten elements of the Doing Business Index, has a coefficient value of 0.0650\*\*\*, which shows that efficient governance institutions, particularly those that include judiciary aspects, expedite the arrival of FDI. The conclusion of contract enforcement is supported by other studies (Jovanovic & Jovanovic, 2018), (Singh, 2015), (Piwonski, 2010), (Corcoran & Gillanders, 2015), and (Vogiatzoglou, 2016), according to which FDI is stimulated by appropriate law and the order condition of the respective states. Ease of business reveals the effectiveness of the law and order condition that provides appropriate plans to explore further judiciary reforms for the purpose of settling commercial disputes (Ahlquist & Prakash, 2010).

#### *6.12 Impact of rectifying indebtedness on FDI arrival*

The consequence of resolving liabilities exposed a statistically substantial optimistic effect on FDI influx into Asian countries. At the 1% significance level, this section of business indices has shown a considerable helpful effect on FDI. The findings of this study are consistent with the findings of the (Jovanovic & Jovanovic, 2018) study. The first type of insolvency is cash-flow insolvency, while the second type is balance-sheet insolvency. Insolvency is a problem that arises when a corporation's or a business owner's

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<sup>4</sup> <http://www.doingbusiness.org>.

liabilities exceed the firm's assets (Bayraktar, 2015).

### *6.13 Interpretation of the GMM results of interactive terms*

The second interacting term, population, has a substantial influence on FDI inflow. At the 1% significance level, the population coefficient values presented in models (1, 2, 3, 4, 5, 6, 9, and 10) revealed a momentous positive influence on FDI influx. The estimated figure of the population exposed a reasonably substantial impression on the influx of FDI at the 5% and 10% significance levels. This stunning finding is in line with the research by Aziz & Makkawi (2012), who revealed that a higher population encourages FDI inflow. Recent studies on FDI determinants show that emerging nations should work hard to attract far-off stockholders by refining macroeconomic indicators such as GDPPC, lowering inflation, and implementing sound monetary and fiscal policies (Aziz & Makkawi, 2012).

The next interactive phrase is the real interest rate. The above table shows that the regression consequence of the interest rate from Model 1 to 11 showed a statistically highly significant negative effect on FDI inflows to Asian nations at the 1% level of significance. These considerable undesirable effects on FDI resemble the research work by (Cavallari & d'Addona, 2013), in which they found that the interest rate, whether nominal or real, induces a probability of risk, which deters FDI inflow into targeted nations. This has demonstrated that one of the most important determinants of FDI in Asian countries is a low interest rate. The idea that a lower interest rate in domestic states delivers a budget improvement for overseas investors is used to attract FDI (Culem, 1988).

At the 1% level of significance, the consequence of the persistent rise in the general price level mentioned in models (1, 4, 5, 6, 7, and 10) showed a significant adverse impact on FDI influx in Asian nations. At the 5% significance level, the inflation consequences in models (2, 11) showed a substantial shock on FDI invasion, but the results in the remaining models showed a detrimental influence on FDI. The argument (Li & Liu, 2005; Omankhanlen, 2011; Singhanian & Gupta, 2011) that shows that inflation rate instability has an undesirable impression on FDI inflows encourages inflation. Inflation rates in Asian countries reflect financial stability, internal pressures, and the ability of the bank and the government to balance the economy's financial plan. Inflationary pressures in the target countries would reduce the value of investment businesses' returns in local currency (Buckley, Devinney,



& Louviere, 2007).

The final interactive explanatory factor is the per capita growth rate (GDP), which is one of the major driving forces for attracting FDI to Asian republics. At the 1% significance level, the results in models (1, 2, 3, 4, 7, 8, and 10) displayed a favourable effect on FDI influx. Similarly, at the 5% significance level, the estimated consequence of GDPPC reported in models (5, 6, 9, and 11) has revealed a fairly substantial constructive impact on FDI influx. These findings are corroborated by a study (Boateng, Hua, Nisar, & Wu, 2015; Hakizimana, 2015) that claims that GDPPC is a potential force to attract FDI. GDPPC has a large theoretical impact on FDI influx since it reflects the consumer's high pay and purchasing power (BénassyQuéré, Coupet, & Mayer, 2007).

## **7. Conclusion**

Following a detailed analysis of the data, the conclusion is that 46 Asian economies out of one hundred ninety countries listed on the World Bank Doing Business Index are efficient in attracting a large quantity of FDI through business sector institutional reforms. Asian nations have made doing business easier and have a large local market structure, large population, affordable raw materials, and large amounts of natural resources, all of which contribute to attracting the majority of FDI influx. However, apart from the ease of doing business and its factors, the majority of investors pay close attention to the other variables in host countries, including domestic market competition, institutional firmness, the scale of the expanding commercial sector, financial stability and judiciary aspects (Business, 2009).

## **8. Policy Recommendation**

- As per the outcome of Models (1, 2, 3, 4, 5, 6 and 7), Asian governments should focus on business reform in the areas of ease of doing business, obtaining credit, obtaining construction permits, starting enterprises, obtaining energy, registering property, and protecting investors.
- In accordance with Models 10 and 11, contract enforcement and insolvency reclamation boost FDI. As a result of the study, the government should establish a specialist commercial court to resolve all company issues.
- According to the results of Models 8 and 9, the administrations of Asian states should digitize all business-related operations and emphasize

lowering the expenditures connected with cross-border commerce.

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## Appendix

Here is the list of 45 Asian countries listed on the World Bank Doing Business Index. <https://doi.org/10.1515/revecp-2018-0001>.

On the basis of the business regulatory environment, this study compared developed and developing countries. As per the World Bank's country classification, low-income countries are those with a per capita GNI of \$1025.

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Asian states					
Afghanistan	China	Japan	Maldives	Russia	Turkey
Armenia	Cyprus	Jordan	Magnolia	Saudi Arabia	United Arab Emirates
Azerbaijan	Georgia	Kazakhstan	Myanmar	Singapore	Uzbekistan
Bahrain	India	Kuwait	Nepal	Sri Lanka	Vietnam
Bangladesh	Indonesia	Kyrgyzstan	Oman	Syria	Yemen
Bhutan	Iran	Lao PDR	Pakistan	Tajikistan	
Brunei	Iraq	Lebanon	Philippines	Thailand	
Cambodia	Israel	Malaysia	Qatar	Timor-Leste	

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The lowest middle-income countries are those with GNI per capita of approximately \$1026 and \$3995, whereas the highest middle-income countries have GNI per capita between \$3996 and \$12375. The GNI per capita of high-income economies is \$12376 or above. These categorizations of the countries on the basis of GNI per capita are made by the World Bank (Bank, 2017). The World Bank updated these countries' classifications each year on 1<sup>st</sup> July [<http://blogs.worldbank.org/-2019-2020>].

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**Developed countries**

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**Twenty-Six Developed Asian Countries**

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Armenia	Cyprus	Jordan	Malaysia	Sri Lanka	UAE
Azerbaijan	Georgia	Japan	Maldives	Saudi Arabia	
Brunei Darussalam	Iran	Kuwait	Oman	Singapore	
Bahrain	Iraq	Kazakhstan	Qatar	Thailand	
China	Israel	Lebanon	Russian Federation	Turkey	

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<http://blogs.worldbank.org/-2019-2020>

**Developing countries**

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**List of 17 developing countries**

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Afghanistan	Nepal	Philippines	Vietnam
Bangladesh	Kyrgyz republic	Syrian Arab rep	Yemen
Bhutan	LAO PDR	Timor-Leste	
Cambodia	Myanmar	Tajikistan	
India	Pakistan	Uzbekistan	

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<http://blogs.worldbank.org/-2019-2020>

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FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH  
IN SOUTHEASTERN EUROPEAN COUNTRIES: AN  
ASYMMETRIC APPROACH

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**Abstract**

This paper aims to examine whether there is an asymmetric impact from foreign direct investment (FDI) stock on the economic growth of Southeastern European countries (SEE). This study includes a sample based on seven SEE countries (Bulgaria, Croatia, N. Macedonia, Montenegro, Romania, Serbia and Slovenia) and uses the nonlinear autoregressive distributed lag (NARDL) model as well as annual data for the period 1997-2019. The results have shown, in the long run, that the change in the positive FDI stock and the change in the negative FDI stock is significant and has an asymmetric impact on the economic growth of Romania and Slovenia, while the change in the positive FDI stock is significant and has an asymmetric impact on the economic growth of Montenegro. Additionally, in the long run, we found that human capital has a significant impact on the economic growth of Montenegro, Romania and Slovenia, while R&D has a significant impact on the economic growth of Romania and Slovenia, which confirms the presence of absorption capacity.

**JEL CLASSIFICATION:** F21, F43, C23.

**KEYWORDS:** ASYMMETRY, SYMMETRY, ECONOMIC GROWTH, FOREIGN DIRECT INVESTMENTS.

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## **1. Introduction**

As the 1980s drew to an end, the socialist regime in Southeast Europe (SEE) countries collapsed. What followed was a transition from a centrally planned economic system to a market-oriented economic system (Kurtović et al. 2020). Economic reforms were carried out with the aim of the privatization of state property and the restructuring of the economy, trade liberalization, and economic and integrative processes. Trade liberalization led to the strengthening of international trade and foreign direct investment (FDI) flows. At the end of the 1980s and the beginning of the 1990s, the priorities of SEE economies were FDI inflow. This has been the main source of financial inflow (De Mello, 1999; Kurtović et al. 2020) and technology transfer.

We chose these economies based on the fact that they were behind in transitional reforms, due to inherited political and economic states and the wartime events that took place in former Yugoslavia in the early 1990s, causing lower FDI inflow and lower economic growth in comparison with other transitional Central and Eastern Europe (CEE) economies.

The previous empirical literature has mainly examined the linear impact of FDI on economic growth and found mixed results. In that regard, we would like to point out some of the most important studies, such as Blomstrom et al. (1994), Balasubramanyam et al. (1996), Borenstein et al. (1998), De Mello (1999), Campos and Kinoshita (2002) and Li and Liu (2005). They used the aggregate approach and panel data analysis. In these studies, the authors have investigated the impact of FDI on the economic growth of developing countries, the Organisation for Economic Co-operation and Development (OECD) and CEE countries. The authors note that FDI has a stronger impact on economic growth in cases where there is a minimum threshold of accumulated human capital, a high level of fixed investments, a sufficiently large market and export activity. On the other hand, Mencinger (2003), Carkovic and Levine (2005), Herzer et al. (2008) and Curwin and Matthew (2014) emphasized a negative impact from FDI on the economic growth of developed and developing CEE countries.

This study differs from the aforementioned studies in that it evaluates, at the disaggregated level, the asymmetric impact of FDI on the economic growth of the seven SEE countries (Bulgaria, Croatia, N. Macedonia, Montenegro, Romania, Serbia and Slovenia) and uses the nonlinear autoregressive distributed lag (NARDL) model. In addition, this study uses the annual data from the period 1997-2019. Asymmetry is a state in which a

variable disturbs the symmetry and is not equivalent in any of its transformations. Shin et al. (2014) proposed the application of a nonlinear ARDL model that ensures that the directions in FDI are decomposed in relation to the partial sum of both negative and positive changes. This model allows for the assessment of the impact of positive and negative changes in FDI on economic growth. A positive change represents an increase, and a negative change represents a decrease in FDI. Finally, the nonlinear ARDL model provides information on whether the positive changes in FDI have a more significant impact than the negative changes in FDI on economic growth. If economic growth responds more significantly to the positive changes in FDI compared to the negative changes in FDI, it can be a good indication that FDI inflow increases with the strengthening of the competitiveness of the economy.

Because the asymmetric impact of FDI on the economic growth of SEE countries has been insufficiently investigated, this study has two objectives: a) to examine whether there is an asymmetric impact of inward FDI stock on the economic growth of the host country and b) to examine whether there exists an absorption capacity in the host country.

Compared to previous empirical studies, this study has yielded new results and verified previous results in certain aspects. We found that FDI has an asymmetric impact on the economic growth of Romania, Slovenia and Montenegro. In addition, we found there to be a stronger impact due to FDI on the growth of developed countries in comparison with less developed SEE countries. Finally, this study has verified the results of previous empirical studies indicating that host countries with more developed markets achieve a greater FDI inflow and that growth depends on the country of origin and the host country of the FDI. We also found evidence of an absorption capacity due to the significant impact of human capital on the economic growth of Montenegro, Romania and Slovenia, and likewise for research and development (R&D) on the economic growth of Romania and Slovenia. This means that these countries have the real potential to achieve an even greater inward FDI stock, which will have a positive impact on economic growth since they have a skilled workforce (human capital) and an increased level of investment in R&D.

This study is structured as follows. Section 2 presents an overview of the literature. Section 3 presents the theoretical background. Section 4 provides a presentation of the research results, and Section 5 summarizes the conclusions.

## **2. Literature review**

In the theoretical and empirical literature, neoclassical and endogenous growth theory provides conflicting arguments when explaining the impact of FDI on economic growth. Neoclassical growth theory (Solow, 1956) states that FDI is merely an additional source of capital relative to the level of available domestic capital. Moreover, this theory emphasizes that FDI has a positive impact on economic growth only in the short term due to the increased scope of investment. In the long run, the return on capital decreases, and the FDI impact on economic growth becomes negative. The neoclassical growth models are therefore considered to be anachronistic.

Neoclassical growth models have been replaced by exogenous growth theory (Solow, 1956), which states that growth per capita cannot be achieved in the long run through the accumulation of physical capital alone. Fixed investment growth, without an increase in human capital, leads to short-term growth. Accordingly, technical progress is considered to be the main source of long-term growth. Technical progress is better known as the Solow residual (knowledge, efficiency and ideas), which considers technical progress to be exogenous. The Solow-Swan exogenous growth theory was then challenged by the new endogenous growth theory (Lucas, 1988; Romer, 1990). This theory considers the relationship between FDI and economic growth to be essential for explaining growth. FDI has a positive impact on the level of output per capita and the rate of growth through technological transfer (Lucas, 1988; Romer, 1990). The technical progress is endogenous and results from activity by humans and physical capital. This leads to a greater return rate per capita through productivity growth, increased FDI inflow and externalities (technological spillover and knowledge spillover, employee training, learning from others, etc.) (Lucas, 1988; Romer, 1986; 1990).

Previous empirical studies have mainly examined the linear impact of FDI on economic growth, while the assessment of the nonlinear impact of FDI on growth has remained insufficiently investigated. The results of the empirical studies on the linear (symmetric) impact of FDI on growth are mixed. Blomstrom et al. (1994) examined the impact of FDI on economic growth in 78 developing countries using regression over the period 1970-1989. They found evidence that there is a positive link between FDI and growth in higher-income developing countries and that trade contributes significantly to growth. This finding is supported by Balasubramanyam et al. (1996), who examined the impact of FDI on the economic growth of 46 developing

countries using regression over the period 1970-1985. They also found evidence of a positive link between FDI, economic growth and trade. Countries with higher FDI inflows and exports are experiencing positive growth and vice versa. On the other hand, Borenstein et al. (1998) examined the impact of FDI on the economic growth of 69 developing countries using regression over the period 1970-1989. They found evidence that FDI spillovers of technology and knowledge have a positive impact on economic growth. They also found evidence that FDI influences growth more strongly than domestic investment. This finding is supported by Campos and Kinoshita (2002) and Kornecki and Raghavan (2011), who examined the impact of FDI on the economic growth of CEE countries and former Soviet Union transition countries. They used panel analysis and found evidence that FDI spillovers of technology and knowledge have a positive impact on economic growth. Contrary to the findings of the studies by Borenstein et al. (1998), Campos and Kinoshita (2002) and Kornecki and Raghavan (2011), De Mello (1999) examined the impact of FDI on the economic growth of the Organisation for Economic Co-operation and Development (OECD) and non-OECD countries using panel analysis over the 1970-1990 period. He found evidence that FDI has a positive impact on economic growth. The positive impact on growth is not the result of FDI spillovers of technology and knowledge. Instead, it is due to the existence of a complementarity between FDI and domestic investment. This finding was not supported by Nath (2009), who examined the impact of FDI on the economic growth of 13 CEE and Baltic countries using pooled regression over the period 1991-2005. He found evidence that FDI negatively impacts economic growth due to increased imports and a substitutionary impact on domestic investment. Similarly, Carkovic and Levine (2002) examined the impact of FDI on the economic growth of 68 developed and developing countries using the general movement model (GMM) over the period 1960-1995. They found evidence that FDI negatively affects the economic growth of both groups of countries. The negative impact on growth is attributed to the exogenous component of FDI, regardless of the level of economic growth, education, trade openness, etc.

We also found studies that associated economic growth with the development of the host countries and the characteristics of the country of origin of FDI. In this sense, Alfaro et al. (2004) examined the impact of FDI on the economic growth of 71 developed and undeveloped countries using panel analysis over the period 1975-1995. They found evidence of a positive link between FDI and growth. The level of economic growth was stronger

when the local market was more developed. Similarly, Hansen and Rand (2006) examined the impact of FDI on the economic growth of developing countries using panel analysis. They found evidence of a positive relationship between FDI and growth and that economic growth depends on the country of origin of FDI as well as the host country of FDI. This finding is supported by Solomon (2011) and Iamsiraro and Doucouliagos (2015), who examined the impact of FDI on the economic growth of developed and developing countries using the GMM model and meta-analysis. Both studies found there to be a stronger and more positive impact of FDI on economic growth in less developed countries relative to developed countries. Similarly, Prochniak (2011) and Hlavacek and Bal-Domanska (2016) examined the impact of FDI on the economic growth of CEE countries using regression and panel analysis. They found evidence that less developed countries recorded a stronger impact following FDI on economic growth than developed countries and that there was a strong cointegration between economic and investment growth.

In contrast, Mencinger (2003) examined the impact of FDI on the economic growth of eight transition countries using the Granger causality test over the 1994-2001 period. He found evidence of a negative impact of FDI on economic growth when FDI inflow was in the form of acquisitions and when the company increased its imports. Likewise, Curwin and Matthew (2014) examined the impact of FDI on the economic growth of 29 CEE countries and Eurasian postsocialist transition countries using panel analysis over the period 1990-2010. They found evidence that strong FDI inflows negatively impact economic growth due to the underdeveloped institutional environment and insufficient absorption capacity. Finally, Miteski and Janevska Stefanova (2017) examined the impact of FDI on the industrial, service and manufacturing sectors of 16 CESEE countries. They used panel data analysis for the 1998-2013 period and found evidence that FDI inflows in the industrial and service sectors have a positive impact on economic growth, while FDI inflows into the manufacturing sector negatively impact economic growth. CESEE countries have achieved the largest FDI inflows into the industrial and service sectors in the last three decades, which has had a positive impact on their growth.

The impact of FDI on economic growth is related to the existence of the absorption potential (R&D and human capital) of the host country. Ulku (2004) examined the impact of FDI on the economic growth of 20 OECD and 10 non-OECD countries using panel analysis over the period 1981-1997. She found evidence that R&D has a strong impact on the economic growth of

twenty more developed OECD countries. This finding is supported by Yazgan and Yalçinkaya (2018), who examined the impact of FDI on the economic growth of OECD countries using panel analysis over the period 1996-2015. They divided the OECD countries into two groups: 20 OECD and 9 OECD countries. They found evidence that R&D strongly impacts the growth of the twenty OECD countries because these countries have better developmental and reliable performance, in addition to twice the income of the nine OECD countries. These findings are supported by Liu (2016), who examined the impact of FDI on the economic growth of 92 countries using panel analysis over the period 1970-2007. He found evidence that an investment in R&D represents a strong growth driver in countries with a higher income. On the other hand, these findings were not supported by Cetenak and Oransay (2017) and Liu and Xia (2018), who examined the impact of FDI on the economic growth of 76 developing countries and China using the Granger causality test and vector autoregression model. Both studies found evidence that R&D negatively impacts economic growth due to lower investment. In contrast, Szarowska (2018) examined the impact of FDI on eight CEE countries using dynamic panel analysis over the period 1995-2016. She found evidence that government and business investments in R&D have a positive impact on economic growth.

Conversely, the relationship between human capital and growth for 78 developing countries was examined by Blomstrom et al. (1994). They found evidence that these countries have a low absorption capacity due to an insufficient quality of human capital. In contrast, Borenstein et al. (1998) found evidence for the existence of an absorption capacity in 69 developing countries. They pointed out that for the existence of absorption capacity, a minimum level of human capital must be met. This finding was supported by Hermes and Lensink (2003), who examined the impact of human capital on the economic growth of 67 developing countries using regression analysis over the period 1970-1995. They found evidence that a minimum level of human capital is required for absorption capacity to exist. Likewise, Li and Liu (2005) and Miteski and Janevska Stefanova (2017) found positive evidence of the impact of human capital on the absorption capacity of 84 countries and 16 CESEE countries. Both studies point out that educated and high-quality human capital can contribute to the positive impact of FDI on economic growth. This finding was not supported by Simionescu (2018) and Anetor (2020), who examined the impact of FDI on the economic growth of CEE countries and sub-Saharan African countries using panel analysis. Both

studies found evidence that human capital does not have a positive impact on growth due to the insufficient quality of the educated human capita and the resulting inability to transform FDI into positive growth.

### **3. Methodology and data**

#### *3.1. Theoretical framework*

This study is based on the endogenous growth model provided by Borenstein et al. (1998), according to which FDI contributes to economic growth through absorption variables (human capital, technical progress, R&D, etc).

Empirical assessment is based on the application of the nonlinear ARDL model, which is an asymmetric extension of the linear autoregressive distributed lag (ARDL) (Shin et al. 2014; Kurtović et al. 2021b). The linear model of ARDL in the unrestricted asymmetric error correction model will be presented in the following form (Kurtović et al. 2021b):

$$\Delta x_t = \mu + \tau x_{t-1} + \vartheta y_{t-1} + \sum_{i=1}^v \beta_i \Delta x_{t-i} + \sum_{i=1}^m \alpha_i \Delta y_{t-i} + \epsilon_t \quad (3.1)$$

where  $\Delta$  is the first difference operator,  $x_t$  is the dependent variable in period  $t$ ,  $\mu$  is the intercept,  $y_t$  is a  $k \times 1$  vector of regressors,  $\tau$  and  $\vartheta$  denote the long-run coefficients,  $\beta_i$  and  $\alpha_i$  are the short-run coefficients,  $v$  and  $m$  are the lag orders of variables and  $\epsilon_t$  is the error term in period  $t$  (Kurtović et al. 2021b).

Before we present the complete nonlinear ARDL model in the unrestricted asymmetric error correction model, we will present the following asymmetric long-run regression (Shin et al. 2014):

$$x_t = \lambda^+ y_t^+ + \lambda^- y_t^- + \epsilon_t \quad (3.2)$$

where  $\lambda^+$  and  $\lambda^-$  are the asymmetric long-run parameters,  $x_t$  and  $y_t$  are scalar I(1) variables, and  $y_t$  is decomposed as  $y_t = y_t^+ + y_t^-$ . where  $y_t^+$  and  $y_t^-$  are partial sums of positive and negative changes in  $y_t$  (Shin et al. 2014; Kurtović et al. 2021b):

$$y_t^+ = \sum_{i=1}^t \Delta y_i^+ = \sum_{i=1}^t \max(\Delta y_i, 0), \quad y_t^- = \sum_{i=1}^t \Delta y_i^- = \sum_{i=1}^t \min(\Delta y_i, 0) \quad (3.3)$$

We included  $y_t^+$  and  $y_t^-$  in Eq. (1), and thus, we obtain the unrestricted asymmetric error correction model (Kurtović et al. 2021b):

$$\Delta x_t = \mu + \tau x_{t-1} + \vartheta^+ y_{t-1}^+ + \vartheta^- y_{t-1}^- + \sum_{i=i}^v \beta_i \Delta x_{t-i} + \sum_{i=i}^v (\alpha_i^+ \Delta y_{t-i}^+ + \alpha_i^- \Delta y_{t-i}^-) + \epsilon_t \quad (3.4)$$

The unrestricted asymmetric error correction model is presented in the following form:

$$\begin{aligned} \Delta GDPpc_t &= \mu + \tau_1 GDPpc_{t-1} + \\ &\tau_2 \text{Human capital}_{t-1} + \tau_3 R\&D_{t-1} + \tau_4 DI_{t-1} + \tau_5 \text{Open}_{t-1} + \\ &\tau_6 INF_{t-1} + \tau_7 GC_{t-1} + (\alpha_8 FDI_{t-1}^+ + \alpha_9 FDI_{t-1}^-) + \\ &\sum_{i=1}^v \beta_{10} \Delta GDPpc_{t-1} + \sum_{i=0}^m \beta_{11} \Delta \text{Human capital}_{t-1} + \\ &\sum_{i=0}^m \beta_{12} \Delta R\&D_{t-1} + \sum_{i=0}^m \beta_{13} \Delta DI_{t-1} + \sum_{i=0}^m \beta_{14} \Delta \text{Open}_{t-1} + \\ &\sum_{i=0}^m \beta_{15} \Delta INF_{t-1} + \sum_{i=0}^m \beta_{16} \Delta GC_{t-1} + \sum_{i=0}^m \alpha_{17} \Delta FDI_{t-1}^+ + \\ &\sum_{i=0}^m \alpha_{18} \Delta FDI_{t-1}^- + \epsilon_t \end{aligned} \quad (3.5)$$

where  $\Delta GDPpc_t$  is the natural logarithm of real GDP per capita,  $\Delta FDI_{t-1}^+$  and  $\Delta FDI_{t-1}^-$  are the logarithms and are positive and negative changes in the decomposition of a partial sum of FDI,  $\Delta \text{Human capital}_{t-1}$  is human capital or school enrolment, secondary (% gross),  $\Delta R\&D_{t-1}$  is the research and development (R&D) expenditure (% of GDP),  $\Delta DI_{t-1}$  is the domestic investment (DI) (% of GDP),  $\Delta INF_{t-1}$  is inflation,  $\Delta GC_{t-1}$  is government consumption (% of GDP) and  $\Delta \text{Open}_{t-1}$  is trade openness (% of GDP),  $v$  is the lag order of the dependent variables and  $m$  is the lag order of the independent variables, while  $\epsilon_t$  is the error term in period  $t$ . The first part of Eq. (5) represents the long-run relationship, and the second part is the associated short-run relationship (Kurtović et al. 2021a).

The assessment of the nonlinear ARDL model is a two-stage process. The first stage implies the testing of long-term cointegration. The cointegration tests are called bounds tests and combine two separate statistics: the  $t$  test or Banerjee-Dolado-Mestre test ( $t_{BDM}$ ) and the  $F$  test (Fisher test) or Pesaran-Shin-Smith (PSS) (Kurtović et al. 2021a; Kurtović et al. 2021b). The second



stage implies testing the short- and long-run asymmetry using the Wald test (Kurtović et al. 2021b). The third stage implies the application of dynamic multipliers used to estimate the transition between the initial equilibrium, short-run imbalance following the change and the new long-run equilibrium. The cumulative dynamic multiplier impacts  $y_t^+$  and  $y_t^-$  on the dependent variable  $x_t$  can be expressed as follows (Kurtović et al. 2020; Kurtović et al. 2021b):

$$d_t^+ = \sum_{i=0}^m \frac{\partial y_{t+i}}{\partial x_{t-1}^-}, d_t^- = \sum_{i=0}^m \frac{\partial y_{t+i}}{\partial x_{t-1}^-}, t = 0,1,2 \dots \quad (3.6)$$

where  $d_t^+$  is a cumulative dynamic multiplier,  $t \rightarrow \infty$ , then  $d_t^+ \rightarrow \alpha^+$  and  $d_t^- \rightarrow \alpha^-$ .  $\alpha^+ = -\tau^+/\alpha$  and  $\alpha^- = -\tau^-/\alpha$  are asymmetric long-run coefficients (Shin et al. 2014; Kurtović et al. 2021).

### 3.2. Data sources

Real GDP per capita is the dependent variable, and it measures the entire production of goods and services in a country per capita annually. GDP per capita is based on constant 2010 US dollars. The data on real GDP per capita were obtained from the World Development Indicators. The inward FDI stock measures the cumulative value of the equity invested and the parent company's net loans (parent loans) provided to its subsidiaries or the subsidiaries resident in the host country. The inward FDI stock is denominated in US dollars at current prices per capita. The inward FDI stock information was obtained from the UNCTAD database. Human capital or school enrolment, secondary (% gross), represents the coefficient of gross enrolment, regardless of age, of the population in the age group that corresponds to the official level of education. Data on school enrolment, secondary (% gross), were obtained from the World Development Indicators. Research and development (R&D) expenditure (% of GDP) is measured as % of GDP allocated by a country to research and development. The data on R&D expenditure (% of GDP) were obtained from the World Development Indicators. Domestic investment (DI) or gross capital formation (GCF) (% of GDP) measures the outlays of the additions to the fixed assets of the economy plus net changes in the level of inventories. Domestic investment is based on constant 2010 US dollars. The domestic investment data were obtained from the World Development Indicators.

Government consumption measures the total expenditure of the central government as % of GDP. We received government consumption data from the World Development Indicators. Trade openness (% of GDP) represents the share of exports and imports in GDP. The trade openness data (% of GDP) were obtained from the World Development Indicators. Inflation is measured by the Consumer Price Index, and it reflects the changes in the prices of products and services on an annual basis. The data on inflation rates were obtained from the World Development Indicators and the national statistics agencies of the SEE countries.

#### 4. Empirical results and discussion

Table 1 presents the results following the bounds tests for asymmetry and symmetry. Bounds tests calculate the critical threshold values deemed to be statistically significant. There is a lower and upper critical threshold. The lower threshold implies that the variables are  $I(0)$ , while the upper threshold implies that the variables are  $I(1)$ . In one or both tests, the statistics were above the significant upper critical value, which means that cointegration exists between the variables.

**Table 1. Bounds statistics**

Countries	Asymmetry		Symmetry	
	F test or PSS	t test or $t_{BDM}$	F test or PSS	t test or $t_{BDM}$
BUL	4.50***	-2.01**	3.72***	-1.04**
CRO	4.90***	-2.06**	4.55***	-11.57***
N.MAC	2.50***	-2.45**	2.95***	-2.40**
MNE	24.20***	-5.42***	3.44***	-4.17***
ROM	16.86***	-10.46***	15.75***	-2.79***
SRB	5.11***	-5.73***	10.44***	-7.83***
SVN	12.7***	-6.04***	13.59***	-3.15***

Notes: Unrestricted constant and no trend were used for both statistics.

\*\*\*, \*\*, and \* show significance levels at 1%, 5% and 10%, respectively.

Source: Author's compilation

The next step in this section refers to the results of the disaggregate asymmetry and the symmetry of the inward FDI stock in relation to the economic growth in seven SEE economies. Based on the nonlinear ARDL model, the presence of asymmetry is determined by the sign and significance

of the decomposed partial sum of both the positive and negative changes in the inward FDI stock. A positive change represents an increase, and a negative change represents a decrease in inward FDI stocks. Therefore, we examined whether an increase and decrease in inward FDI stocks has an asymmetric impact on economic growth.

Table 2 presents the results of the long-term asymmetry and symmetry of the ARDL model. The coefficients of the estimation of the decomposed partial sum of positive and negative changes in inward FDI stock are of different signs, sizes and significance. In the long run, we found that the positive and negative changes in inward FDI stock are asymmetrically significant at the 1% level and had a positive impact on the economic growth of Romania and Slovenia. We also found that the positive change in inward FDI stock is asymmetrically significant at the 1% level for Montenegro and 10% for Bulgaria, with a positive impact on economic growth. An increase of 1% as a positive change in the inward FDI stock led to an increase in economic growth by 0.35% for Montenegro, 0.23% for Romania and 0.13% for Slovenia. On the other hand, a decrease of 1% in the negative in the inward FDI stock has led to an increase in economic growth of 0.17% for Romania and 0.11% for Slovenia. Therefore, we conclude that the positive changes in inward FDI stock had a stronger impact than the negative changes in inward FDI stock on the economic growth of Montenegro, Romania and Slovenia. This means that these countries have made significant reforms in terms of strengthening the competitiveness of the economy, which has had a positive impact on the inward FDI stock, exports and economic growth.

In Table 2, we also found that inward FDI stock is symmetrically significant and had a positive impact on the economic growth of Croatia, Romania and Serbia. An increase of 1% in inward FDI stock led to an increase in Croatia's economic growth of 0.06%, in addition to 0.12% for Romania and 0.10% for Serbia. Upon comparing the coefficient estimates of the asymmetric and symmetric results, we noticed that the asymmetry results were better than the symmetry results.

During the transition period, the economies of the SEE deemed FDI to be an important lever of economic growth and development, as well as an indicator of the stability of their economies. These countries therefore practised an active policy of attraction and achieved a significant increase in FDI inflow after 2000 when they launched EU integration processes. Slovenia has the largest GDP per capita and is considered to be the most developed SEE economy. Slovenia is a leader in structural reforms and has recorded an

increase in FDI following its accession to the EU in 2004. Most FDI inflow in Slovenia comes from EU countries. FDI is most represented in the industrial and service sectors. After accession to the EU in 2007, Romania achieved the largest volume of FDI inflow in comparison to other SEE countries. In addition, Romania has made the most significant structural reforms, which have led to larger economic growth. Most of the FDI inflow in Romania is from EU countries and is directed into the production and service sectors. Finally, Montenegro is a leader in preaccession negotiations with the EU in comparison to the other SEE candidate countries. Montenegro implemented some significant economic reforms that helped it secure its leadership position in terms of FDI per capita. The FDI inflow in Montenegro mostly comes from the EU and is mostly focused on the tourism and service sectors.

The results of this study indicate that there is an asymmetric impact of FDI on the economic growth of Montenegro, Romania and Slovenia and that a positive change in the inwards FDI stock has a stronger impact on economic growth. In particular, we would like to note that a change in the positive FDI stock in Montenegro has the largest impact on growth. Even during the global financial crisis of 2007-2009, Montenegro recorded a growth in FDI inflow, whereas Slovenia and Romania recorded a decrease. Montenegro, Romania and Slovenia have implemented economic reforms, improved the competitiveness of their economies, and increased GDP per capita, production and exports. In addition, the results of this study implicitly show that economic growth depends on the country of origin and the host country of FDI. European companies are the lead investors in SEE countries. Finally, the results of this study implicitly provide evidence that countries with more developed economies record a stronger impact of FDI on economic growth in comparison with less developed SEE countries. The results of this study are in line with the results of Alfaro et al. (2004), Blomstrom et al. (1994), Borenstein et al. (1998), Campos and Kinoshita (2002), De Mello (1999), Hansen and Rand (2006), Hlavacek and Bal-Domanska (2016), Iamsiraro and Doucouliagos (2015), Kornecki and Raghavan (2011), Liu (2016), Mahmoodia and Mahmoodi (2016), Miteski and Stefanova Janevska (2017), Prochniak (2011), Sapienza (2010), Solomon (2011), and Vojtovič et al. (2019).

**Table 2. Dynamic long-run asymmetric and symmetric estimation results**

Variable	Long-run of asymmetric						
	BUL	CRO	N. MAC	MNE	ROM	SRB	SVN
Country							
$IFDI_t^+$	0.359 [2.932] (0.060)*	-1.039 [-0.069] (0.948)	0.176 [1.894] (0.106)	0.355 [5.533] (0.005)***	0.238 [33.19] (0.000)***	0.452 [5.387] (0.116)	0.196 [49.565] (0.000)***
$IFDI_t^-$	-0.282 [-0.519] (0.639)	-9.209 [-0.076] (0.943)	-0.394 [-0.771] (0.469)	0.067 [1.219] (0.289)	-0.173 [-16.161] (0.003)***	-0.253 [-3.733] (0.166)	-0.110 [-43.39] (0.000)***
$IDI_t$	-0.031 [-1.228] (0.306)	0.139 [0.080] (0.941)	-0.012 [-0.452] (0.666)	-0.013 [-0.080] (0.940)	0.315 [4.162] (0.003)***	-0.032 [-3.525] (0.176)	0.010 [4.482] (0.046)**
Human capital <sub>t</sub>	-0.017 [-1.033] (0.377)	-0.359 [-0.075] (0.944)	-0.036 [-0.788] (0.460)	0.024 [3.901] (0.017)**	0.034 [10.761] (0.008)***	-0.029 [-3.985] (0.156)	0.004 [19.387] (0.002)***
$R\&D_t$	0.548 [1.078] (0.359)	-13.328 [-0.074] (0.945)	0.040 [0.233] (0.823)	0.098 [1.655] (0.173)	2.442 [11.86] (0.007)***	-0.812 [-3.837] (0.162)	0.124 [40.208] (0.002)***
$GC_t$	0.022 [0.690] (0.539)	-0.851 [-0.075] (0.944)	0.006 [0.600] (0.570)	-0.015 [-0.191] (0.857)	-0.057 [-8.131] (0.014)**	0.149 [3.661] (0.169)	-0.019 [-8.720] (0.012)**
$INF_t$	0.041 [1.371] (0.263)	0.718 [0.076] (0.943)	-0.018 [-1.185] (0.280)	-0.003 [3.682] (0.021)**	-0.014 [12.785] (0.006)***	0.011 [3.861] (0.161)	-0.009 [12.415] (0.006)***
$Open_t$	-0.016 [-0.225] (0.836)	0.099 [0.076] (0.943)	0.004 [1.413] (0.207)	0.006 [4.944] (0.007)***	0.032 [11.695] (0.007)***	0.002 [2.546] (0.238)	0.001 [12.415] (0.012)**
$ECT(-1)$	-0.41***	-0.68***	-0.37***	-0.85***	-0.67***	-0.53***	-0.79***
Adjusted R2	0.69	0.78	0.84	0.89	0.79	0.75	0.67
Wald Test	65.644***	737.30***	58.908***	36.719***	85.183***	983.61***	206.82***
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable	Stable	Stable	Stable	Stable
LM $x_{EC}^2$	0.2981	0.4785	0.3871	0.5100	0.1428	0.4869	0.1830
Norm. $x_{EC}^2$	0.7288	0.9542	0.2286	0.1427	0.1917	0.7770	0.8994
Heter. $x_W^2$	0.2763	0.2773	0.5411	0.9644	0.8391	0.4939	0.0739
RESET	0.6918	0.1456	0.3153	0.9914	0.7646	0.4523	0.1387

**Table 2. Dynamic long-run asymmetric and symmetric estimation result (continued)**

Variable	Long-run of symmetric						
	BUL	CRO	N. MAC	MNE	ROM	SRB	SVN
Country							
$IFDI_t$	1.733 [0.050] (0.961)	0.067 [3.941] (0.016)**	0.210 [1.722] (0.135)	0.079 [1.538] (0.167)	0.125 [3.627] (0.015)**	0.104 [18.292] (0.000)***	0.038 [0.647] (0.538)
$IDI_t$	-0.877 [-0.044] (0.966)	0.005 [8.212] (0.001)***	-0.010 [-0.379] (0.717)	0.004 [0.975] (0.362)	-0.083 [-3.000] (0.030)**	0.006 [4.560] (0.003)***	0.018 [2.666] (0.032)**
$Human\ capital_t$	-0.975 [-0.043] (0.966)*	0.012 [5.261] (0.006)***	-0.044 [-0.809] (0.449)	-0.019 [-2.386] (0.048)	0.026 [1.882] (0.118)	0.004 [1.311] (0.237)	0.012 [2.677] (0.031)**
$R\&D_t$	12.208 [0.045] (0.965)	0.284 [7.321] (0.001)***	0.257 [0.967] (0.370)	-0.097 [-1.075] (0.317)	1.084 [2.309] (0.069)*	-0.009 [-0.215] (0.836)	-0.033 [-0.472] (0.650)
$GC_t$	0.904 [0.944] (0.967)	0.011 [4.000] (0.016)**	0.003 [0.293] (0.779)	-0.009 [-1.216] (0.263)	0.089 [3.233] (0.023)**	-0.013 [-2.039] (0.087)*	-0.015 [-0.609] (0.561)
$Inf_t$	0.685 [0.044] (0.966)	-0.001 [-0.829] (0.453)	-0.019 [-1.163] (0.288)	-0.003 [-2.938] (0.021)**	-0.007 [-1.356] (0.232)	0.003 [-1.687] (0.142)	-0.027 [-2.028] (0.082)*
$Open_t$	0.211 [0.043] (0.966)	0.001 [3.498] (0.024)**	0.004 [1.337] (0.229)	-0.001 [-1.216] (0.464)	-0.026 [-1.985] (0.103)	0.010 [-0.861] (0.421)	0.003 [0.167] (0.871)
$ECT(-1)$	-0.19***	-0.92***	-0.34***	-0.77***	-0.35***	-0.86***	-0.27***
$Adj. R^2$	0.69	0.74	0.83	0.77	0.79	0.69	0.59
$Wald\ Test$	87.677***	163.33***	60.833***	88.873***	144.69***	33.505***	71.440***
$CUSUM$	stable	stable	stable	stable	stable	stable	stable
$CUSUMQ$	stable	stable	stable	stable	stable	stable	stable
$LM\ x_{SC}^2$	0.4676	0.5871	0.1982	0.0830	0.2568	0.2762	0.3761
$Norm. x_{SC}^2$	0.8622	0.2579	0.6918	0.5808	0.8364	0.8594	0.6888
$Heter. x_N^2$	0.6019	0.7029	0.3029	0.4211	0.7902	0.5104	0.8816
RESET	0.8546	0.6874	0.0607	0.8848	0.9009	0.6035	0.7328

Notes: Numbers outside the brackets are coefficients, while the numbers within the square brackets are t-statistics and those within round brackets are p values. \*\*\*, \*\*, and \* show significance levels at 1%, 5% and 10%, respectively.

Source: Author's compilation

The next step in this section refers to the results of the impact of human capital and research and development (R&D) on the absorption capacity. The study results showed that human capital is statistically significant and has a positive impact on the economic growth of Montenegro, Romania and Slovenia. An increase of 1% in human capital leads to an increase in economic growth by 0.24% for Montenegro, 0.34% for Romania and 0.04% for

Slovenia. Over the past two decades, these countries have seen growth in their skilled workforce with specialized skills and knowledge needed by the domestic economy. In that regard, policy-makers in these countries must stress the development of policies and measures that will promote the development of human capital through the development of modern education, the development of skills and knowledge, and informal and formal training. The education system needs to be additionally reformed to ensure links between the economy and education. The results showed that Montenegro, Romania and Slovenia, based on a positive impact of human capital on economic growth, have potential absorption capacity or the possibility of achieving growth based on FDI inflow. The results of this study are also in line with the results obtained by Blomstrom et al. (1994), Balasubramanyam et al. (1996), Borensztein et al. (1998), De Mello (1999), Hansen and Rand (2006), Hermes and Lensink (2003), Kornecki and Raghavan (2011), Li and Liu (2005), Liu (2016), Miteski and Janevska Stefanova (2017), Solomon (2011), and Vojtovič et al. (2019).

The results of this study show that there is a positive impact of R&D on the economic growth of Romania and Slovenia. An increase of 1% in R&D leads to an increase in economic growth by 2.44% for Romania and 0.12% for Slovenia. The results of this study are in line with endogenous growth theory, which considers that investing in R&D is a major growth factor because it prevents a reduction in the rate of return on capital. Slovenia and Romania are classified as countries with a high income, and an increased investment in R&D leads to economic growth. The results of this study are also in line with the results obtained by Liu (2016), Li and Liu (2005), Miteski and Janevska (2017), Szarowska (2018), Ulku (2004), and Yazgan and Yalçinkaya (2018).

In Table 2, we also present the results of the assessment of the control variables. Prior to the global financial crisis in 2007, the domestic investment (*DI*) in seven SEE countries had been growing. After the crisis, we saw it drop significantly. The drop in domestic investment was significant in the postcrisis years in almost all SEE countries with the exception of Romania and Slovenia. The study results therefore show that domestic investment (*DI*) was statistically significant and had a positive impact on the economic growth of Romania and Slovenia. Government consumption (*GC*) is negatively significant for Romania and Slovenia. In addition, the 2007 global financial crisis caused a recession, while high public debt caused macroeconomic instability in SEE countries. All SEE countries have taken austerity measures and a reduction in public debt, which has a negative impact on government

consumption (*GC*) cuts and, in turn, on economic growth. Observed in the long run, the inflation rate is negatively significant, and it has a positive impact on the economic growth of Montenegro, Romania and Slovenia. These countries have generally low inflation rates (*INF*) as a result of well-founded monetary and exchange rate policies that have a positive impact on economic growth. Trade openness (*Open*) is significant and has a positive impact on the economic growth of Montenegro, Romania and Slovenia. Increasing the degree of trade openness or the exports of these countries confirms the fact that these countries have made significant progress in strengthening the efficiency of their market structures, in turn strengthening market competition (the presence of foreign and domestic companies).

In the third and last phase of the nonlinear ARDL model, we used the cumulative dynamic multiplier to estimate the impact of the positive and negative changes in FDI stock on the economic growth of the host country (Figure 1). Economic growth in the first two to three years responds more strongly to the positive change in FDI stock of N. Macedonia, Montenegro, Romania and Serbia. After the third year, a new balance in economic growth for all four countries was established. Unstable performance was noted in Serbia during the first two years, but after the third year, we saw strong economic growth in response to a positive change in FDI stock. After the fourth year, a stable balance in economic growth was finally achieved in Serbia. Other countries noted stable performance.

Based on the estimation results using the cumulative dynamic multiplier, Montenegro, N. Macedonia, Romania and Serbia must continue implementation of economic reforms and further employment of macroeconomic policies that will promote an increase in FDI inflow and economic growth.

## 5. Conclusion

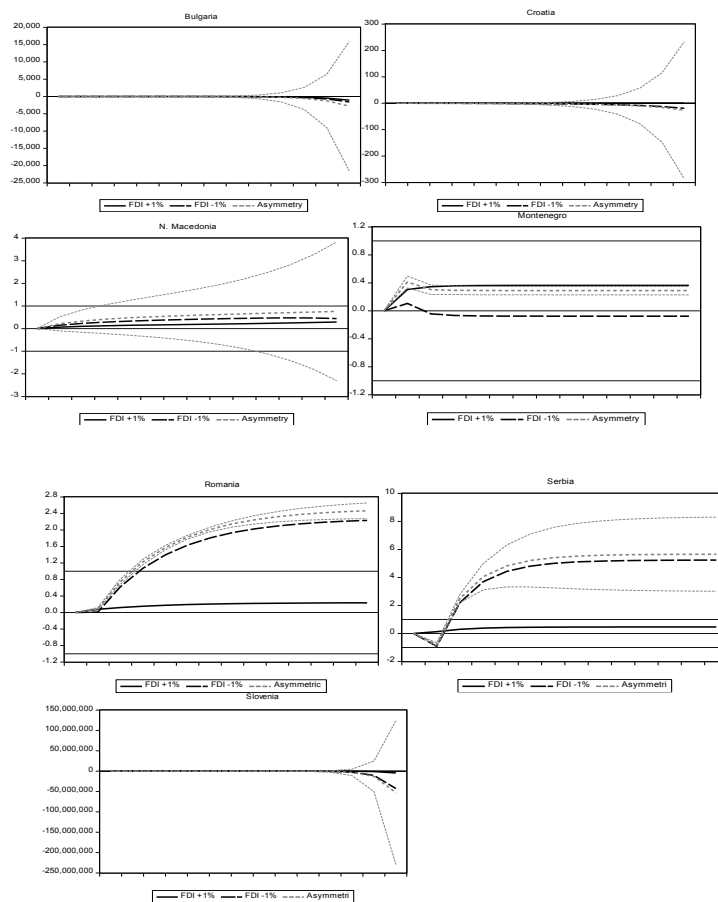
This study provides a validation of the theoretical background and empirical results of previous studies related to assessing the impact of inward FDI stock at the disaggregated level on the economic growth of seven SEE transition countries using the nonlinear ARDL model and annual data over the period 1997-2019.

The main results of our study are as follows: (1) In the long run, we found that the positive and negative changes in inward FDI stock are asymmetrically significant at the 1% level and have a positive impact on the economic growth



of Romania and Slovenia. We also found that the positive change in inward FDI stock

**Figure 1. Cumulative dynamic multiplier for the nonlinear ARDL model**



*Notes:* The positive shock in REER stock is represented with a bold black line while the negative shock in REER stock is presented with a dotted black line. The central red dotted line denotes the asymmetry and represents a difference between the positive and negative shocks in REER. The two red dotted lines indicate the upper and lower boundaries of statistical significance at the 5% level (Kurtović et al. 2021a; Kurtović et al. 2021b).

*Source:* Author's compilation

is asymmetrically significant at the 1% level for Montenegro and 10% for Bulgaria, with a positive impact on economic growth. An increase of 1% as a positive change in the inward FDI stock has led to an increase in economic growth by 0.35% for Montenegro, 0.23% for Romania and 0.13% for Slovenia. On the other hand, a decrease of 1% in the negative in the inward FDI stock has led to an increase in economic growth of 0.17% for Romania and 0.11% for Slovenia.

Therefore, the positive changes in inward FDI stock have a stronger impact than the negative changes in inward FDI stock on the economic growth of Montenegro, Romania and Slovenia. This means that these countries have made significant reforms in terms of strengthening the competitiveness of the economy, which has had a positive impact on the inward FDI stock, exports and economic growth. Slovenia has the largest GDP per capita and is considered to be the most developed SEE economy. It is also a leader in structural reforms and has recorded an increase in FDI following its accession to the EU in 2004. FDI is most represented in the industrial and service sectors. Most FDI inflow in Slovenia comes from EU countries. After accession to the EU in 2007, Romania achieved the largest volume of FDI inflow in comparison to other SEE countries. Most of the FDI inflow in Romania is from EU countries and is directed into the production and service sectors. Montenegro implemented some significant economic reforms that helped it secure its leadership position in terms of FDI per capita. The FDI inflow in Montenegro mostly comes from the EU and is mostly focused on the tourism and service sectors; (2) there is evidence that there is an absorption capacity due to the significant impact of human capital on the economic growth of Montenegro, Romania and Slovenia, and likewise for research and development (R&D) on the economic growth of Romania and Slovenia. The study results showed that human capital is statistically significant and has a positive impact on the economic growth of Montenegro, Romania and Slovenia. An increase of 1% in human capital leads to an increase in economic growth of 0.24% for Montenegro, 0.34% for Romania and 0.04% for Slovenia. According to endogenous theory, educated human capital contributes to growth because it leads to increased productivity and facilitates knowledge spillovers. The results of this study show that there is a positive impact of R&D on the economic growth of Romania and Slovenia. An increase of 1% in R&D leads to an increase in economic growth of 2.44% for Romania and 0.12% for Slovenia. According to endogenous theory, investing in R&D is a major growth factor because it prevents a reduction in the rate of return on

capital. It also increases the return on knowledge through the accumulation of knowledge. Slovenia and Romania are classified as countries with a high income, and an increased investment in R&D leads to economic growth.

The results of this study are important for policymakers to understand that the results obtained by the linear model can lead to an incorrect view of the impact of FDI on the economic growth of SEE countries. In addition, they need to be aware of the fact that there is an absorption capacity in these countries for the inflow of new FDI. Therefore, policymakers must strive in the future to work on strengthening absorption capacity by investing more in education, skills development and retraining the workforce and R&D. Finally, policymakers need to take reforms and measures that will facilitate FDI inflows and thus increase the economic growth of SEE countries.

However, we faced two crucial limitations in this study. The first is related to the lack of data for the technology gap variable for the time series from 1997 to 2019. The second limitation refers to the lack of data for estimating the asymmetric impact of FDI on economic growth per industrial sector.

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