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*Marjan Petreski**

THE FISCAL SPACE AND THE FISCAL STIMULUS DURING CRISIS IN THE WESTERN BALKANS

ABSTRACT: *The fiscal space of the Western Balkan 6 (WB6) economies has been significantly tested by recent crises, including the COVID-19 pandemic and the Energy and Food Price Crisis. This paper investigates the role of pre-crisis fiscal space in shaping fiscal stimulus measures during crises, by endogenizing an expanded set of fiscal space measures. Results reveal that WB6 nations, possessing some fiscal space before previous crises, encountered limitations in formulating and implementing fiscal stimulus measures amid subsequent crises. With fiscal space largely utilized during and post-pandemic, the ability to implement fiscal stimulus during the recent Energy and Food Price Crisis has been considerably restricted. These findings underscore the importance of building fiscal buffers during non-crisis times to maintain resilience for unforeseen challenges. The paper highlights the need for forward-looking fiscal policies, emphasizing the potential adverse effects of overly generous fiscal packages on fiscal sustainability, which could hamper future crisis response capabilities.*

KEY WORDS: *Fiscal space, Fiscal stimulus, Crisis management*

JEL CLASSIFICATION: E62, H12

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1. INTRODUCTION

The COVID-19 pandemic and the recent energy and food price crisis have tested the resilience of the Western Balkan 6 (WB6) economies. As the countries were bouncing back from the impacts of the healthcare crisis, Russia's invasion of Ukraine amplified the fiscal vulnerabilities of the WB6. The sudden energy and food price surges left little room for well-thought-out policies and instead prompted quick actions, many of which were costly. In response to these challenges, ample fiscal support was allocated for food and energy security and for compensating and safeguarding households and companies from the large price shock. Amid resource insecurity and the approaching heating season, in September 2022, Albania, Serbia, and North Macedonia took a collaborative step by agreeing to share food and energy surpluses.

The unprecedented jump in commodity prices caused historic levels of inflation unseen in the Western Balkan region since the 1990s and early 2000s. It was primarily international food prices that impacted inflation rates in the WB6, and they have probably exerted a lasting impact in the region. Minasyan et al. (2023) estimate that domestic factors also impacted the inflation dynamics of the Western Balkan countries. Following peak inflation rates at the end of 2022, signs of a fall were visible in 2023. Monetary policy also aided the decrease in inflation and the curbing of inflation expectations through continued synchronised monetary tightening, and recently, central banks have put a pause on the increase in policy interest rates. The World Bank (2024) estimates that the economic growth of the WB6 in 2023 will reach 2.5 per cent, increasing slowly to 3 per cent and 3.5 per cent in 2024 and 2025, respectively, hence enabling the long-assumed "soft landing."

These multilayer-crisis events have contributed towards increased public deficits and public debts of the WB6, significantly contributing toward narrowing of the fiscal space. This has brought attention to the need to (re)build fiscal buffers and comply with (any) fiscal rules. In 2022 and 2023, the WB6 implemented anti-crisis packages for the support of households and companies, frequently coupled with pressures to increase public wages and pensions. Most measures included various forms of price regulation (caps, freezes) both for energy and food products. WB6 governments did not resist public expectations for wage and pension increases, sometimes beyond prescribed adjustments, which could also

have medium-term implications for price dynamics. According to the International Monetary Fund Regional Economic Outlook (October 2023) (IMF, 2023), the public debt-to-GDP ratios of the emerging European market economies are projected to increase over the medium term, due to slower than expected growth and rising borrowing costs. It is expected that the fiscal consolidation for these economies will reach 0.25 and 0.72 per cent of GDP in 2023 and 2024, respectively.

Challenges will still continue to arise in the upcoming periods, given the ongoing geo-economic events. The energy crisis has highlighted the vulnerabilities of the energy sector of WB6 countries and the impact it can have on fiscal sustainability. Thus, greater attention has been paid to medium-term fiscal planning, with more WB6 countries now incorporating larger energy investments in their long-term development strategies.

Within the scope of this study, several crisis events are taken into account, such as the global financial crisis 2008–2010, the European sovereign crisis 2011–2013, as well as the latest crises – the COVID-19 pandemic in 2020–2021 and the energy and food price crisis 2022–2023. The objective of the analysis is to understand if fiscal space in the WB6 before a crisis struck played an important role for the fiscal stimuli that governments used as weapons to combat the contraction of the economy caused by that crisis. The novelty of this study is at least twofold: 1) we treat fiscal space in a wider framework devised through four indicators: public debt to GDP, public debt to tax revenues, interest expense to GDP, and the foreign currency sovereign debt ratings; and 2) we extensively examine the endogeneity between the fiscal space and the fiscal stimulus by employing observables related to the various crises, as well as by employing two IV-based estimators. The study is structured as follows. Section 2 presents a brief overview of the literature. Section 3 presents the data and underlying methodology. Section 4 presents the results and offers a discussion. Section 5 concludes.

2. OVERVIEW OF THE LITERATURE

The economic crisis that started during the COVID-19 pandemic, followed by the Ukraine-Russia conflict and the rising prices of food and energy, put an emphasis on fiscal policy as a tool for stirring collapsed demand. It accentuated the importance of governments' potential to use their fiscal policy counter-

cyclically to provide fiscal stimulus and support the contracted economy. Frankel et al. (2013) estimate that the proportion of developing countries that undertook countercyclical fiscal policy rose from 10 per cent in the 1990s to two-thirds after the global financial crisis 2008–2010, as many increased government spending. Countries adopted sizable fiscal stimuli to support economic activity and vulnerable household budgets to prevent serious and long-lasting damage to economic security. According to Lerner (1943, p.39), if economic insecurity exists,

The central idea is that government fiscal policy, its spending and taxing, its borrowing and repayment of loans, its issue of new money and its withdrawal of money, shall all be undertaken with an eye only to the results of these actions on the economy and not to any established traditional doctrine about what is sound or unsound.

Fiscal policy is conceived on the basis of fiscal space and fiscal capacities. Extensive fiscal space provides the government with financial resources and enables them to energise economic activity. Also, it guarantees the credibility of budget sustainability and ensures that financial stimulus supports economic growth. While the definition of fiscal space is blurry, it points to the availability of budget resources for a specific purpose (World Bank, 2008). A formal definition of fiscal space has been introduced by Heller (2005, p.32), defining fiscal space as 'a room in the government's budget that allows it to provide resources for a desired purpose without jeopardizing the sustainability of its fiscal position or the stability of the economy'. The Development Committee (2006, p.3) defines fiscal space as 'the gap between the current level of expenditure and the maximum level of expenditures a government can undertake without impairing its solvency'. Kose et al. (2022) point to the 'ability of the government to service its debt', explaining that countries with low capacity to repay their debt cannot indefinitely finance their operations in a sound manner. The United Nations Development Programme (UNDP) does not justify prioritising fiscal targets ahead of development objectives while defining the concept of fiscal space. They put emphasis on the mobilisation of resources to secure enabling governance, institutional, and economic environments for effective policy actions (Roy et al., 2012). In 2016, the IMF proposed a uniform definition of fiscal space to allow a systematic assessment of fiscal policies across countries. This concept

assesses whether a country has room for discretionary fiscal policy, i.e. whether a country can raise spending or lower taxes without endangering market access and debt sustainability (IMF, 2016).

After the outbreak of the recent crises mentioned above, many economists analysed the relationship between fiscal space and the size of the fiscal stimulus provided. Economies that entered the global financial crisis with ample fiscal space implemented more aggressive fiscal stimuli (Romer & Romer, 2018). China, Korea, and Australia, countries that had sound fiscal space, undertook relatively generous stimuli and greatly reduced the cost of the crisis. Iceland, which entered the crisis with low debt, provided stimuli and increased the debt-to-GDP ratio by 100 percentage points. Hence, low-debt countries faced only modest downturns, while those with a high debt-to-GDP ratio suffered long-lasting economic losses (Jordà et al., 2016). Romer and Romer (2019) explain that the limited response of high-debt countries is driven by two aspects: sovereign market access and the choices of domestic and international policymakers. Scared of borrowers not being able to repay their loans, investors refuse to lend to high-debt countries or push sovereign yields to prohibitive levels. Furthermore, due to current rules or bailout conditionality, international players such as the EU and IMF are not able to support high-debt countries in crisis times, leaving them to respond with very limited funds.

Many countries entered the pandemic crisis with a deteriorated fiscal stance due to the successive shocks of the global financial crisis and the 2014 plunge in commodity prices. The fiscal space of developing countries was generally more limited, especially in the low-income ones that already faced a high risk of debt distress. Hence, they had limited space to implement stimulus measures, resulting in wide disparities in the fiscal response compared to developed countries, whose fiscal packages were 700 times more valuable than those of the least developed countries (OECD, 2022).

Apeti et al. (2021) evaluate the effect of pre-pandemic fiscal space on the size of the fiscal stimulus package in 125 developed and developing countries, using three indicators for fiscal space: debt-to-GDP ratio, debt-to-taxes ratio, and sovereign debt rating to capture countries' access to finance. Their results reveal a lack of association between fiscal space captured through the debt-to-GDP ratio

and fiscal stimuli, even after controlling for potential omitted-variable bias. The other two indicators of fiscal space are statistically significant, suggesting that the degree to which public debt is backed up with tax revenues is a significant predictor of the size of fiscal stimuli; a higher debt-to-taxes ratio is associated with lower fiscal stimuli. The credit rating is positively related to fiscal stimuli; a one-standard-deviation increase in the rating increases fiscal stimuli by three percentage points. Benmelech and Tzur-Ilan (2020) find similar results, estimating a positive or close-to-zero relationship between the pre-pandemic debt-to-GDP ratio and fiscal stimuli in a set of 85 countries. According to them, the most important driver of fiscal policy is its pre-crisis sovereign credit rating. A country's credit rating affects its ability to follow an expansionary fiscal policy and provide ample fiscal stimuli during a crisis.

Bianchi et al. (2023) confirm that countercyclical fiscal policies are not common for countries with low credit ratings. Grion and Correa (2021) support the finding through their estimations on the fiscal stimuli undertaken during the pandemic. Their estimations show that the size of undertaken measures varied with the available fiscal space among countries, ranging from 10–12 per cent of GDP in high-income countries to 0.2–1.8 per cent in low-income countries that have limited tax capacity and sizable debt overhang.

In summary, the literature posits that prior fiscal space is significant for providing substantial fiscal stimulus to the economy during crisis times. An ample fiscal stimulus can greatly reduce the costs of a macroeconomic crisis, while lack of fiscal space can greatly constrain the stimulus and result in large income and job losses. Therefore, having fiscal room to manoeuver is very valuable for crisis times.

3. METHODOLOGY AND DATA

To address the research question of this paper, we utilise data for the six economies of the Western Balkans spanning the period 2003–2022. The advantage of employing such a lengthy time span is twofold: it allows for more robust statistical estimates and enables the examination of the repercussions of multiple crises, including the global financial crisis 2008–2010, the European sovereign crisis 2011–2013, as well as the more recent crises such as the COVID-19 pandemic in 2020– 2021 and the energy and food price crisis 2022–2023,

which are the focal points of our investigation. However, a drawback of this extended time frame is that it may encompass other fiscal pressures experienced by these countries, including those of a political nature. At present, we overlook this aspect, as major political and/or military events have subsided since the onset of the observation period.

At the methodological level, there are two key issues to address. The first concerns the definition of fiscal stimulus, which constitutes the phenomenon we aim to elucidate and serves as the dependent variable. Strictly speaking in terms of crisis spending, a fiscal stimulus could be construed as the packages of anti-crisis measures deployed by governments during various crises. While this approach may be feasible for the pandemic, for instance, through the utilisation of the IMF's database of fiscal policy responses, as demonstrated by Apeti et al. (2021), it may pose challenges in capturing fiscal stimuli across different crises. This is primarily because there is no unified database systematically collecting data on such fiscal packages. Instead, we opt for an alternative approach.

We define the fiscal stimulus as government spending that exceeds the spending in a usual or normal year, as reflected in the budget balance. During a crisis year, the budget deficit typically deepens to an extent that mirrors the severity of the crisis's impact on the economy. To estimate the long-term trajectory of the budget deficit, we employ Hodrick-Prescott filtering, under the assumption that a certain budget balance is appropriate for the structure and current stage of development of the economy. Subsequently, the disparity between the actual value and the long-term value of the budget deficit (as a percentage of GDP) is regarded as the deployed fiscal stimulus, i.e., the government spending that can be robustly attributed to the crisis. For instance, for the COVID-19 year of 2020, **Table 1** demonstrates that our calculation yields estimates similar to the actual realisation of the anti-crisis measures. Furthermore, the calculation accurately identifies that the two highest-ranked years over the period 2003–2022, based on the amount of the fiscal stimulus, are clearly the pandemic year of 2020 and either the hardest-hit year of the global financial crisis (2008–2010) or of the European sovereign crisis (2011–2013).

Table 1 – Fiscal stimulus during 2020: actual versus estimated

	Value of fiscal stimulus during COVID-19 / Fiscal year 2020 (% of GDP)		Lowest point year (2003–2022)	
	IMF*	Own estimates**	First lowest	Second lowest
Albania	1.2	2.7	2020	2009
Bosnia and Herzegovina	5.1	4.7	2020	2009
Kosovo	5.6	4.9	2020	2004
Montenegro	8.0	5.2	2020	2009
North Macedonia	2.9	3.4	2020	2012
Serbia	5.6	5.2	2020	2012

Sources: **IMF Database of Country Fiscal Measures in Response to the COVID-19 Pandemic; and IMF staff estimates. Only additional spending or foregone revenues considered. Estimates as of end-2020. ** Own calculation for the rest of the table.*

The second crucial methodological concern pertains to measuring the abstract concept of fiscal space. We employ three measures for fiscal space as follows. Ghosh et al. (2013) explore the negative correlation between public debt (as a percentage of GDP) and fiscal space, indicating that higher public debt leads to lower fiscal space. Building on Bohn's (2008) emphasis on the significance of primary surpluses for debt sustainability, Apeti et al. (2021) and Kose et al. (2022) propose using public debt as a ratio of taxes to understand how public debt is accommodated by fiscal revenues. Additionally, Minea and Villieu (2009, 2012) stress the importance of the debt burden, considering the cost of debt in the budget constraint accounting, including crowding-out effects. Blanchard's (2019) observation underscores its ability to account for potential risk premiums, suggesting a growing risk to debt sustainability and consequently reducing fiscal space. Therefore, the third and fourth measures of fiscal space we employ are interest expenses as a percentage of GDP and foreign currency long-term sovereign debt ratings from Kose et al. (2022) to gauge countries' ability to access finance on international markets. We introduce a one-year lag for fiscal space, reflecting the notion that sufficient fiscal space today facilitates navigating a crisis tomorrow more effectively.

We rely on a simple empirical model to estimate the effect of fiscal space on fiscal stimulus, as follows:

$$Fiscal\_stimulus_{i,t} = \beta_1 Fiscal\_space_{i,t-1} + \beta_2 X_{i,t}^{j} + \alpha_i + \varepsilon_{i,t} \quad (1)$$

where $Fiscal\_stimulus_{i,t}$ is the budget deficit (defined as positive values) in excess of the normal-year budget balance, as a percentage of GDP, for country *i* at time *t*; and $Fiscal\_space_{i,t-1}$ is respectively defined through public debt as a percentage of GDP and as a percentage of tax revenue, interest expenses as a percentage of GDP, and the sovereign debt ratings (index ranging from 1 to 21) for country *i* at time *t-1*. $X_{i,t}^{j}$ is a vector of *j* control variables, α_i is the country fixed effects, while $\varepsilon_{i,t}$ is the error term, which is assumed to be well-behaved.

The selection of control variables is guided by factors that typically influence spending levels during a crisis, drawing insights from Aizenman and Jinjarak (2010). We include GDP per capita (in logarithmic form) to reflect the economic development level; population density (in logarithmic form) to account for the strain of crises on healthcare, infrastructure, and employment; inflation to capture the urgency of government support amid eroding living standards; and an index of democracy to account for potential political budget cycles and transparency in crisis management, as in Apeti et al. (2021). The democracy index is derived from the average of Freedom House's political rights and civil liberties indices.

Additionally, we incorporate three variables that may be closely correlated with the three largest crises observed during the period: exports (in logarithmic form) as the primary channel during the global financial and European sovereign crises of 2008–2013, the case fatality rate to reflect the severity of the COVID-19 pandemic in 2020, and global prices of wheat and oil to reflect the impact of the energy and food price crisis of 2022–23.

Our key parameter of interest is β_1, which should be statistically significant and positive, revealing a favourable effect of the higher prior fiscal space on the subsequent fiscal stimulus.

Our data are collected from various sources: IMF's World Economic Outlook (IMF WEO), IMF's Government Finance Statistics (IMF GFS), World Bank's World Development Indicators (WB WDI), database of fiscal space of Kose et al. (2022), Freedom House's dataset on political rights and civil liberties (https://freedomhouse.org/), the Institute of Electrical and Electronics Engineers (IEEE) (https://www.ieee.org/), and World Bank Commodity Price Data – The Pink Sheet (https://www.worldbank.org/en/research/commodity-markets). Variables' descriptions and descriptive statistics are provided in the Appendix.

The primary challenge in estimating equation (1) lies in the simultaneity between fiscal space and fiscal stimulus. A higher desired fiscal stimulus necessitates greater fiscal space, and vice versa. However, we address this endogeneity concern through several strategies. First, the fiscal stimulus, being an excess of public spending compared to a 'normal' amount, is unlikely to influence the buildup of fiscal space as it is an unexpected event, especially for the small and open economies considered here, which are largely exogenous. Second, following the approach of Apeti et al. (2021), we lag the fiscal space by a year to account for the role of accumulated fiscal space in the past in shaping present actions.

Third, we employ a range of explanatory variables to mitigate potential omitted-variable bias, including factors directly related to crises' fiscal stimuli, such as the slowdown in export dynamics during the global financial crisis, the infection fatality rate during the pandemic, and the surge in commodity prices of wheat and oil during the energy and food price crisis.

Despite these efforts, we acknowledge that a simple fixed effects (FE) estimator may not fully capture the causal effect of fiscal space on fiscal stimulus. Anticipation of increased future fiscal spending can influence the buildup of fiscal space today, presenting a remaining source of endogeneity in equation (1). Therefore, in addition to FE estimates, we employ a standard instrumental variables two-stage least squares (IV-2SLS) estimator and the Arellano–Bover (1995) system generalized method of moments (GMM) estimator. The latter addresses endogeneity concerns by using lagged values of the endogenous variables as instruments, with their validity assessed through various tests.

By instrumenting the endogenous regressors with their lagged values, the Arellano–Bover estimator helps mitigate simultaneity bias in dynamic panel

models, particularly in the presence of unobserved individual heterogeneity. This makes it a valuable tool for analysing the dynamics of economic and social phenomena across different units over time.

4. RESULTS AND DISCUSSION

Our baseline results are presented in **Table 2**. The organisation of the results is such that columns (1)–(4) represent the FE estimates, columns (5)–(8) correspond to the IV-2SLS estimates, and columns (9)–(12) pertain to the system GMM estimates. Each set of columns examines the effects using different measures of fiscal space: public debt-to-GDP, public debt-to-tax revenues, interest expenses-to-GDP, and foreign currency sovereign debt ratings.

The findings indicate that a higher public debt as a percentage of GDP, reflecting a smaller fiscal space, leads to a reduction in the potential fiscal stimulus. Specifically, a one-percentage-point (p.p.) increase in public debt as a share of GDP is associated with a decrease in the fiscal stimulus ranging from 0.02 to 0.06 p.p. of GDP. The coefficients tend to be higher in IV-based estimates. Similarly, a higher public debt as a percentage of tax revenues results in a reduced fiscal stimulus potential, with coefficients ranging from 0.004 to 0.015 p.p. of GDP. Although these coefficients may appear small, they signify that a country with a 10 p.p. lower public debt-to-GDP ratio before the pandemic could deploy a higher fiscal stimulus package by up to 0.6 p.p. of GDP in the upper bound. This may reflect the perception that pre-COVID-19 public debt in the WB6 was moderate, averaging 48 per cent of GDP, thus providing sufficient fiscal space to cushion crisis effects.

Interest expenses as a percentage of GDP consistently show insignificance despite being negatively signed, while sovereign ratings only reveal significance in system GMM estimates, suggesting that countries with better ratings were able to provide more fiscal stimulus during crisis years.

Among the control variables, economic development level shows no significance, whereas inflation shows some importance. Higher inflation is associated with a smaller fiscal stimulus, likely due to the nominal effect of higher inflation on fiscal revenues, reducing the need to expand the budget deficit for counteracting measures. Similarly, higher exports correlate with a smaller fiscal stimulus,

indicating that periods of increased export coincide with good economic conditions requiring smaller or no fiscal stimulus.

The infection fatality rate is positively associated with a higher fiscal stimulus, reflecting increased measures to finance the health sector during the COVID-19 pandemic. Likewise, a higher international wheat price, particularly in 2022, correlates with a higher fiscal stimulus, as governments opted to shield the real value of the consumption basket by offering anti-crisis packages amid soaring prices.

Overall, the results suggest that WB6 countries, which had some fiscal space before the global financial crisis of 2008 and particularly before the COVID-19 pandemic, were reasonably constrained by this space in designing and deploying fiscal stimulus amid subsequent crises. Consequently, since much of the fiscal space was utilised during and after the pandemic, the findings indicate that during the ongoing energy and food price crisis, fiscal stimulus has been significantly constrained by exhausted fiscal space. Alternatively, if countries opted for more generous packages during the current crisis, it substantially impaired fiscal sustainability more than during previous crises. This aligns with previous evidence on the importance of fiscal space for governments' policies during crises. (see e.g. Aizenman & Jinjarak, 2010; Apeti et al., 2021; Jordà et al., 2016; Romer & Romer, 2019).

Table 2 – Results for the effect of fiscal space on fiscal stimulus in the WB6

	Dependent variable: Fiscal stimulus (% of GDP)											
	Fixed Effects				IV-2SLS				Arellano–Bover System-GMM			
VARIABLES	Public debt as % of GDP	Public debt as % of tax revenues	Interest expense as % of GDP	Foreign currency sovereign debt ratings♠	Public debt as % of GDP	Public debt as % of tax revenues	Interest expense as % of GDP	Foreign currency sovereign debt ratings♠	Public debt as % of GDP	Public debt as % of tax revenues	Interest expense as % of GDP	Foreign currency sovereign debt ratings♠
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fiscal stimulus (lagged)									0.458***	0.455***	0.395***	0.468***
									(0.052)	(0.055)	(0.025)	(0.040)
Public debt as % of GDP (lagged)	-0.0201**				-0.0587*				-0.0293***			
	(0.007)				(0.035)				(0.010)			
Public debt as % of tax revenues (lagged)		-0.00514**				-0.0148**				-0.00404*		
		(0.002)				(0.007)				(0.003)		
Interest expense as % of GDP (lagged)			-0.210				-0.650				-1.741	
			(0.388)				(0.535)				(1.292)	
Foreign currency sovereign debt ratings (lagged)				0.489				0.935				0.755**
				(0.365)				(0.601)				(0.360)
GDP per capita (log)	-0.667	-0.473	-1.39	-0.143	1.602	2.205	-0.475	2.272	-1.462	-1.869	-2.579	-4.527***
	(1.328)	(1.441)	(1.537)	(5.339)	(2.470)	(2.570)	(2.557)	(6.319)	(1.293)	(1.212)	(3.196)	(1.369)
Inflation (%)	-0.165***	-0.164***	-0.157***	-0.135**	-0.209***	-0.206***	-0.189***	-0.0885	0.0787	0.086	0.0824	0.0563
	(0.029)	(0.029)	(0.029)	(0.036)	(0.068)	(0.070)	(0.067)	(0.089)	(0.107)	(0.108)	(0.106)	(0.098)
Population density (log)	7.105	7.209	6.846	6.239	9.842	10.37	8.337	11.9	-1.140*	-0.892	-1.725	-1.026
	(6.567)	(6.514)	(6.594)	(10.710)	(9.838)	(9.963)	(9.597)	(13.560)	(0.642)	(0.604)	(1.650)	(0.957)
Democracy index	-0.457	-0.483	-0.405	-1.055	-0.48	-0.551	-0.337	-1.457	-0.114	-0.0517	-0.394	-0.390**
	(0.405)	(0.419)	(0.334)	(0.961)	(0.502)	(0.503)	(0.538)	(1.032)	(0.084)	(0.075)	(0.292)	(0.171)
Exports (log)	-0.0792**	-0.0764**	-0.0586*	-0.0762	-0.132**	-0.122*	-0.0771	-0.096	-0.196***	-0.184***	-0.176***	-0.209***
	(0.026)	(0.021)	(0.025)	(0.053)	(0.065)	(0.066)	(0.065)	(0.072)	(0.030)	(0.029)	(0.064)	(0.037)
Infection fatality rate	1.568**	1.558**	1.605**	1.438*	1.456**	1.436**	1.569***	1.612***	2.253***	2.295***	2.162***	2.012***
	(0.596)	(0.597)	(0.542)	(0.662)	(0.567)	(0.558)	(0.583)	(0.619)	(0.694)	(0.696)	(0.732)	(0.679)

International wheat price (log)	4.094**	4.108***	3.907**	4.092*	4.603*	4.615*	3.965*	2.128	0.841	0.775	0.928	2.511*
	(1.027)	(0.991)	(1.121)	(1.863)	(2.635)	(2.586)	(2.407)	(3.205)	(1.117)	(1.084)	(1.560)	(1.361)
International Brent oil price (log)	-0.6	-0.649	-0.422	-0.999	-0.89	-0.986	-0.303	-0.459	-0.266	-0.14	-0.738	-1.353
	(0.769)	(0.798)	(0.640)	(0.734)	(1.993)	(1.969)	(1.760)	(2.289)	(1.501)	(1.505)	(1.997)	(1.696)
Constant	-40.89	-42.6	-34.64	-41.98					19.43	20.64	34.83	34.22***
	(34.520)	(35.060)	(34.490)	(77.890)					(14.090)	(14.540)	(31.530)	(10.650)
Observations	103	103	103	83	99	99	99	76	103	103	103	83
R-squared	0.285	0.287	0.281	0.26	0.262	0.261	0.276	0.26				
Number of countries	6	6	6	5	6	6	6	5	6	6	6	5
Underidentification test (Kleibergen–Paap rk LM statistic) (p-val)					0.0000	0.0000	0.0000	0.0001				
Weak identification test (Kleibergen–Paap rk Wald F statistic)					76.92	94.87	228.6	166.9				
Hansen J statistic (overidentification test of all instruments) (p-val)					0.103	0.0589	0.961	0.665				
Arellano–Bond test for AR(1) in first differences (p-val)									0.147	0.148	0.143	0.164
Arellano–Bond test for AR(2) in first differences (p-val)									0.191	0.197	0.112	0.21
Sargan test of overid. restrictions (p-val)									0.212	0.241	0.531	0.0363

Source: *Author's calculations. *, **, and *** signify a statistical significance at the 10%, 5%, and 1% levels, respectively. Robust standard errors provided in parentheses.* ♣ *The variable is not available for Kosovo.*

5. CONCLUSION AND POLICY LESSONS

In response to various crises – most recently, the global financial crisis, the European sovereign crisis, the COVID-19 pandemic crisis, and the energy and food price crisis – governments globally, including those in the WB6, implemented fiscal stimuli. This paper investigates the role of pre-crisis fiscal space in shaping the fiscal stimulus provided during crises, drawing on a significant body of literature emphasising the benefits of fiscal space for fiscal policy in times of crisis.

The findings suggest that WB6 nations, having some fiscal space before the global financial crisis of 2008 and notably prior to the COVID-19 pandemic crisis of 2020, faced limitations – albeit reasonably manageable ones – stemming from this fiscal capacity in formulating and implementing fiscal stimulus measures amid subsequent crises. With substantial utilisation of fiscal space during and after the pandemic, the results indicate that the ongoing energy and food price crisis has considerably restricted the ability to implement fiscal stimulus due to depleted fiscal space. Alternatively, should countries opt for more generous financial packages amid the current crisis, it will likely substantially compromise fiscal sustainability to a greater extent than observed during previous crises.

The policy lesson derived from this conclusion is that fiscal buffers should be built during non-crisis times as they crucially determine the government's manoeuvering space when a crisis occurs. This is particularly relevant when countries operate with lower levels of fiscal space due to earlier government actions or crises that depleted this fiscal capacity. This was evident for all WB6 countries in the COVID-19 pandemic crisis of 2020, during which public debt increased, on average, by 10 percentage points of GDP. This left these countries with limited options for the subsequent shock from the energy and food price crisis stemming from Russia's invasion of Ukraine in February 2022. As a result, fiscal stimuli during and after the ongoing energy and food price crisis have been constrained or have posed a threat to the sustainability of public finances.

Policymakers are encouraged to adopt forward-looking fiscal policies that balance the use of fiscal space during economic downturns with the imperative of maintaining resilience for unforeseen challenges. Establishing fiscal rules pertaining to public debt and budget deficit can significantly help in replenishing

fiscal space promptly. A positive aspect is that most WB6 countries have introduced fiscal mechanisms, such as medium-term fiscal planning and fiscal councils in some countries. Additionally, the results caution against overly generous fiscal packages during crises, highlighting the potential adverse effects on fiscal sustainability, which could hamper future crisis response capabilities. Fiscal rules can assist in this regard by ensuring that anti-crisis packages are strictly targeted to avoid deadweight losses arising from assisting households and companies that were less impacted during the crisis or could have withstood the pressure themselves.

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APPENDIX – VARIABLES' DESCRIPTIONS AND BASIC STATISTICS

Table A 1 – Variables' descriptions and sources

VARIABLES	DESCRIPTION	Source
Fiscal stimulus	Estimated variable as a difference between actual budget balance and the long-run budget balance implied from an HP trend	Own calculations based on data from IMF WEO
Public debt as % of GDP	General government gross debt, % of GDP	IMF WEO
Public debt as % of tax revenues	General government gross debt, % of average tax revenues	IMF GFS
Interest expense as % of GDP	Interest expenses, % of GDP	IMF WEO (Implied from the primary balance data)
Foreign currency sovereign debt ratings	Foreign currency long-term sovereign debt ratings, index from 1–21	Database of fiscal space (Kose et al., 2022)
GDP per capita	GDP per capita (constant 2015 US$), logged	WB WDI
Inflation (%)	Inflation, consumer prices (annual %)	WB WDI
Population density	Population density (people per sq. km of land area), logged	WB WDI, National data for Kosovo
Democracy index	Average of the political rights and civil liberties	Freedom House
Exports (log)	Exports of goods and services (constant 2015 US$), logged	WB WDI
Infection fatality rate	Case fatality rate, attack rate data of COVID-19	IEEE, https://ieee-dataport.org/open-access/case-fatality-rate-attack-rate-data-covid-19
International wheat price	Wheat (U.S.), ($/mt), logged	World Bank Commodity Price Data – The Pink Sheet, https://www.worldbank.org/en/research/commodity-markets
International Brent oil price	Crude oil, Brent, $/bbl, logged	World Bank Commodity Price Data – The Pink Sheet, https://www.worldbank.org/en/research/commodity-markets

Table A 2 – Variables' descriptive statistics

VARIABLES	Observations	Mean	St.dev.	Min	Max
Fiscal stimulus	120	(0.10)	2.32	(9.95)	5.49
Public debt as % of GDP	117	43.87	20.14	5.57	107.35
Public debt as % of tax revenues	117	211.01	102.91	28.16	436.14
Interest expense as % of GDP	120	1.33	1.00	(0.46)	4.40
Foreign currency sovereign debt ratings	91	8.67	1.45	6.00	11.00
GDP per capita	115	8.42	0.27	7.78	8.97
Inflation (%)	114	3.19	3.86	(2.41)	16.12
Population density	114	4.46	0.38	3.82	5.12
Democracy index	111	3.85	1.59	2.00	7.00
Exports (log)	112	21.90	1.88	4.40	24.25
Infection fatality rate	120	0.11	0.53	0.00	3.87
International wheat price (log)	120	5.37	0.27	4.91	5.95
International Brent oil price (log)	120	4.20	0.38	3.36	4.72

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FOREIGN DIRECT INVESTMENT, DOMESTIC INVESTMENT, AND THE ROLE OF INSTITUTIONS IN CENTRAL, EASTERN, AND SOUTH-EASTERN EUROPE

ABSTRACT: *The paper examines the relationship between foreign direct investment (FDI) and domestic investment in Central, Eastern, and South-Eastern European (CESEE) countries from 1995 to 2021. The primary hypothesis posits that FDI exerts a positive influence on domestic investment, with variations observed across diverse institutional contexts. The research utilises fixed effects and a one-step difference generalised method of moments (GMM) to determine whether FDI leads to an increase or decrease in domestic investment in CESEE countries. The findings indicate that FDI has a favourable and statistically significant influence on domestic investment. However, the coefficients for FDI are less than one, indicating that while FDI stimulates overall investment, it does not create a crowding-in effect where the rise in total investment surpasses the FDI inflows. When the data is split on the basis of institutional quality, it is evident that FDI continues to positively impact domestic investment in high and low-institutional-quality settings. The coefficients for FDI in both subgroups are less than one, implying that institutional quality does not substantially change the correlation between FDI and domestic investment. These results indicate the positive and significant impact of FDI on domestic investment, without crowding-in effects for the entire sample of CESEE economies and both subgroups that differ in institutional quality.*

KEY WORDS: *Domestic investment, foreign direct investment, economic growth, fixed effects, GMM*

JEL CLASSIFICATION: E22, F21, F41

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1. INTRODUCTION

The growth of Central, Eastern, and South-Eastern European (CESEE) countries relies heavily on external financing, with foreign direct investment (FDI) playing a crucial role in their development. FDI refers to the net inflow of investments aimed at acquiring a significant and lasting management interest (10 per cent or more of the voting stock) in an enterprise operating in an economy other than that of the investor (World Bank, 1996). The inflow of FDI has been crucial for the privatisation process and economic development in CESEE countries (Popescu, 2014). Many countries transitioning from this region have offered special incentives and subsidies to attract foreign capital.

The inflow of FDI has been particularly significant for CESEE countries over the past three decades. Between 1993 and 2020, the average FDI inflows to CESEE amounted to a remarkable 4.4% of the region's gross domestic product (GDP), significantly exceeding the global average of 2.5% (Jovanović & Hanzl-Weiss, 2022). This notable trend has led to an increase in academic research focused on FDI and its impact on the economies of CESEE.

FDI affects host countries, i.e., countries that receive FDI inflows, in different ways. First, FDI and domestic investment together constitute the total investment in the host country. Under Solow's neoclassical growth model, FDI increases the capital stock as an exogenous factor and promotes the short-term economic growth of the host country through capital formation financing (Solow, 1956). Accordingly, the impact of FDI on growth is identical to that of domestic investment. In contrast, in endogenous growth models (Grossman & Helpman, 1991; Lucas, 1988; Romer, 1990), FDI is generally assumed to be more productive than domestic investment. These models imply that FDI can promote long-term economic growth by diffusion of technology in the host country (Borensztein et al., 1998), acquisition and diffusion of management skills and employee training, alternative management practices and better organisational arrangements (de Mello, 1999; Kljucnikov & Belas, 2016; Kottaridi & Stengos, 2010; Krajnakova et al., 2015; Li & Liu, 2005; Srovnalikova & Karbach, 2016; Yao & Wei, 2007), as well as the expansion of international production networks, and access to markets (Alfaro et al., 2004; Crespo & Fontoura, 2007).

In addition, FDI is used as a means of expanding an industry in a host country (Eller et al., 2006), reducing a country's dependence on one or more sectors, directing investment toward less attractive economic activities, and diversifying the economic base (Lee & Chang, 2009). It stimulates the creation of new companies as well as the expansion of existing ones, job creation, and tax collection. Such a transfer of technological and managerial know-how provides opportunities for local companies to remain viable in conditions of increasing competition. For example, Balasubramanyam et al. (1999) claim that FDI has a positive effect only if a host country employs a strategy of export stimulation. Moreover, a country must have a sufficient level of human capital and well-developed financial markets (Wang & Wong, 2009).

However, FDI can also have negative effects, such as increased income inequality (Feenstra & Hanson, 1997) and overreliance on foreign capital (Alfaro & Charlton, 2007). It may also slow economic growth, especially in concentrated industries with high entry barriers (Glass & Saggi, 2002). Additionally, FDI can hinder human capital development, leading to "brain drain" as local expertise is leveraged by international firms (Kottaridi & Stengos, 2010; Reiter & Steensma, 2010). The impact of FDI on domestic competition varies, with some studies showing a crowding-out effect on local businesses after multinational corporations enter the market (Mišun & Tomšk, 2002).

A number of studies have examined the impact of FDI on the economies of CESEE countries. Studies by Campos and Kinoshita (2003) and Neuhaus (2006) have shown that FDI is associated with positive effects on economic growth. Kherfi and Soliman (2005) studied the impact of FDI on economic growth in Central and Eastern Europe (CEE) and the Middle East and North Africa (MENA) and found that FDI inflows stimulate economic growth only in EU accession countries of the CEE region. However, the effect of FDI on growth in MENA and non-EU accession countries is either non-existent or negative. EU membership candidacy seems to be a key driver for more effective reforms that contribute to the positive effect of FDI inflows on growth. Vojtovič et al. (2019) examined the impact of FDI on economic growth in 11 CEE countries from 1997 to 2014 and found both contemporaneous and lagged relationships, suggesting that FDI has a positive impact on economic growth, with this effect being further strengthened by financial market development. Similarly, Jovanović and Hanzl-

Weiss (2022) provided further empirical support by demonstrating the predominantly favourable impact of FDI inflows on economic growth in CESEE, with notably substantial effects attributed to German and Austrian FDI. On the other hand, Bačić et al. (2004) argued that FDI has had no effects on GDP, as most of the FDI has been brownfield and therefore has not contributed to new capital formation.

Furthermore, several studies have investigated the impact of FDI on productivity and employment. Damijan et al. (2003), Javorcik (2004), and Lipsey (2006) found that FDI has led to positive technological spillovers and has had a beneficial impact on productivity. On the other hand, Jovanović and Hanzl-Weiss (2022) found that FDI had no impact on labour productivity because higher GDP was followed by an increase in employment and therefore output per worker remained unchanged. Bijsterbosch and Kolasa (2010) and Damijan et al. (2013) argued that the effects on productivity vary and depend on the destination of FDI flows, with industries of higher technology intensity experiencing greater benefits.

When it comes to employment, Hunya and Geishecker (2005) found mixed effects – FDI reduced employment in domestically owned manufacturing companies but increased employment in foreign-owned enterprises. Onaran and Stockhammer (2008) reported generally insignificant employment effects with some evidence of negative impacts. Jude and Silaghi (2016) noted that foreign direct investment (FDI) leads to a phenomenon of creative destruction. This is where the introduction of labour-saving technologies initially has a negative effect on employment. However, the progressive integration of foreign affiliates into the local economy eventually brings positive long-term effects. Jovanović and Hanzl-Weiss (2022) argue that FDI in CEE reduces unemployment rates, but this effect occurs only after two years and is linked to reinvested profits.

Regarding the impact of FDI on wages in CESEE countries, Jovanović and Hanzl-Weiss (2022) found that FDI boosts wages in CESEE, while Onaran and Stockhammer (2008) and Stockhammer and Onaran (2009) show that FDI increases wages in the short term, while the full wage spillover effects of FDI require time for labour market adjustments.

The effect of FDI on income inequality has been a subject of significant research. Mahutga and Bandelj (2008) as well as Zulfiu Alili and Adnett (2018) have presented findings suggesting that FDI contributes to increased income inequality in CESEE countries. However, Mihaylova (2015) has put forth a compelling argument, contending that this effect is prominent only at lower levels of human capital and economic development. As education becomes more widespread and GDP per capita increases, the adverse distributional effect of FDI diminishes.

Ganić (2019) found that FDI had no effect on poverty in the Central European region, but it reduced poverty in the Western Balkans. Stehrer et al. (2020) discussed the income generated by EU FDI in the CEE EU member states. They found that the cumulated FDI income earned in the region is roughly equal to the cumulated outward investment to the region. This means that the income EU investors make grossly covers their new investment outlays. Additionally, around three-quarters of the earned income has not stayed in the host economies but has been sent back abroad. The rate at which income is sent back from the CEE EU member states is lower than the rate from the EU-28.

According to Jovanović and Hanzl-Weiss (2022), total FDI inflows in CEE have no impact on income inequality and poverty, but FDI from the EU15 and FDI from Germany and Austria reduce both income inequality and poverty.

The existing literature regarding the relationship between FDI and domestic investment presents mixed findings; FDI has the potential to either encourage, complement, or replace domestic investment. While many studies have focused on developing nations (Al-Sadig, 2012; Gökçeli et al., 2022; Gondim et al., 2018; Mamatkulov, 2020; Wang, 2010), there is a lack of research exploring the relationship between FDI and domestic investment in CESEE countries. Our study aims to make a significant contribution to the existing body of literature by examining the impact of foreign FDI and domestic investment in the CESEE countries. To analyse this relationship, our study utilises fixed effects and the generalised method of moments (GMM) to address potential endogeneity concerns and capture the dynamic nature of investment decisions. By focusing specifically on the CESEE countries, our research offers valuable insights into how FDI influences domestic investment within this unique regional context,

characterised by varying levels of institutional quality and economic development. This research will be an important resource for scholars, policymakers, and practitioners seeking to understand the complexities of the CESEE region and its implications for broader economic and social trends.

Based on our analysis, foreign direct investment has a positive impact on domestic investment in CESEE countries. Our findings indicate that while FDI contributes significantly to gross fixed capital formation (GFCF), the coefficients fall below one, suggesting that FDI does not result in a crowding-in effect where total investment surpasses FDI inflows. This relationship holds true across different institutional quality settings, indicating that FDI's influence on domestic investment is not significantly affected by institutional context.

The paper is structured as follows: the second section presents some empirical background on the direct and indirect impacts of foreign direct investment on domestic investment; the third section presents specific trends in the movement of FDI and domestic investments in the CESEE countries as well as individually in each of the countries; the fourth section elaborates on the data and methodology employed for analysis; the fifth section presents a discussion of the findings; and the final section offers a concise summary of the results along with pertinent recommendations for policymakers in these nations.

2. LITERATURE REVIEW

Research on the nexus between FDI and domestic investment and economic growth in host countries can be divided into two categories: studies that examine the relationship between FDI and economic growth, and studies that examine the crowding-in and crowding-out effects between FDI and domestic investment.

The link between FDI and economic growth is explained by two main theories: (i) the modernisation theory, which is based on neoclassical growth models, such as Solow's model (Solow, 1956) and endogenous growth theories, and (ii) the dependency theory. It is important to note that the modernisation theory focuses on the benefits of FDI, and the dependency theory on the negative effects of FDI. According to Solow's growth model (Solow, 1956), capital accumulation primarily influences economic growth in the short term, and technology sourced through FDI identified as a key driver of long-term economic growth. Moreover,

the endogenous growth theories suggested by Romer (1990), Aghion and Howitt (1992), and Grossman and Helpman (1991) highlight the critical importance of FDI in stimulating economic growth through mechanisms such as technology diffusion (imitation), learning-by-doing, and encouraging local firms to engage in research and development. Consistent with Romer's endogenous growth model, Agosin and Machado (2005) present a clear and concise theoretical framework that posits foreign affiliates in developing nations introduce new products for both domestic and international markets, thereby positively influencing capital formation through upstream and downstream spillovers. However, they assert that for a comprehensive crowding-in effect to be anticipated, the sectoral distribution of foreign direct investment (FDI) inflows must differ from the current productive capacity of the host countries.

The industrial organisation theory, developed by Hymer (1960, 1970, 1976, 1990) and Kindelberger (1969), and the eclectic paradigm (Dunning, 1977) explain that companies operating in foreign countries have to compete with domestic firms that have certain advantages. To overcome these disadvantages, foreign companies need to have "firm-specific advantages" in Hymer's terms (Hymer, 1960, 1970 and 1990) or "monopolistic advantage" in Kindleberger's terms (Kindelberger, 1969), in the form of superior technology, patented products, brand names, management skills, economies of scale, and access to cheaper sources of finance. Dunning's eclectic FDI theory (Dunning, 1977), also referred to as the OLI framework, synthesises ownership, location, and internalisation advantages to clarify the rationale behind firms' FDI decisions. This implies that FDI can act as a significant driver of economic growth in developing nations by introducing advanced technologies that are absent in the local market and by enhancing the use of underutilised labour and dormant resources.

In contrast, dependency theory assumes that host economies are adversely affected by FDI, primarily due to repatriation of profits (Mihalache-O'Keef & Li, 2011; Dos Santos, 1970), acquisition of ownership of raw materials and goods (Prebisch, 1962), worsening income inequality (Chase-Dunn, 1975; Emmanuel, 1969), rising unemployment (Hein, 1992), and crowding-out effects (Rakhmatullayeva et al., 2020).

The new trade theory serves as an alternative framework to classical trade theories for analysing actual trade patterns. This model initially incorporated aspects such as economies of scale, market imperfections, and product differentiation. Markusen (1984) and Helpman (1984) significantly expanded the model by integrating FDI and multinational enterprises (MNEs). Foreign investors assess their location choices on the basis of a balance between the benefits of centralised production for achieving economies of scale and the cost savings associated with producing goods in various countries nearer to local markets. This concept led to distinguishing between two types of FDI: horizontal FDI and vertical FDI, as well as the development of two models to explain the determinants of FDI. The horizontal FDI model posits, as developed by Markusen (1984), that the primary motivation for investors is to penetrate markets with high growth potential in order to sell their products. The volume of FDI inflows is influenced by the size and growth opportunities within host countries. These forms of FDI act as substitutes for exports; thus, transportation and commercial costs serve as motivating factors for horizontal FDI (Campos & Kinoshita, 2003). In contrast, the vertical FDI model, as articulated by Helpman (1984), attributes the incentives for FDI to variations in factor prices. The essence of this model lies in the differing endowments of production factors across countries (Markusen & Maskus, 2002). Consequently, foreign investors are likely to favour regions that offer lower production costs.

The knowledge-capital (KC) model of the MNEs represents an integration of the theories of horizontal and vertical FDI into a model of the new trade theory. The term knowledge-capital model is derived from the assumption that MNEs have an ownership advantage compared with other firms due to some knowledge asset, such as patents, blueprints, procedures, brand names, trademarks, or reputation. The KC model regards FDI as a flow of knowledge in the form of managerial and engineering services, financial services, reputation, and trademarks across borders. This model incorporates three key factors: commercial costs, the absolute and relative disparities in production factor endowments between countries, and the barriers to investment. Knowledge is treated as a valuable asset that can be readily transferred to production units located in different geographical areas, necessitating a highly skilled workforce and exhibiting significant mobility (Markusen & Maskus, 2002). The model advocates for the

complete liberalisation of trade and investment as a means to enhance the wealth of the host nation.

The KC model has also been tested empirically. While Carr et al. (2001) strongly supported the KC model, Markusen and Maskus (2001) rejected it for the subsample of US affiliate sales. Later, using the same data set as in Carr et al. (2001), Markusen and Maskus (2002) proposed another empirical model that distinguishes between the vertical model, the horizontal model, and the intellectual capital model and found support for both the KC model and the horizontal model, but no support for the vertical model. In contrast, Braconier et al. (2003) added Swedish data to the Markusen and Maskus (2002) dataset and found more support for vertical investment and the KC model. Anghel (2006) applied the KC model to a sample of multinational companies from EU countries engaging in FDI in seven transition countries and demonstrated that there is a combination of horizontal and vertical types of FDI, with horizontal FDI predominating. Sohn (2016) applied the KC model on country-pair data for China and countries in the Association of Southeast Asian Nations (ASEAN) with nations in the Organisation for Economic Co-operation and Development (OECD) during the period 1985–2010 and demonstrated that China's rise in FDI induced a strong synergic impact on FDI flows to ASEAN countries from OECD nations. Using a large international dataset, Kox (2022) found strong, robust, and consistent support for the KC model and demonstrated the important role of public knowledge production for foreign direct investment.

Since the early 2000s, an increasing amount of empirical research has sought to clarify the potential crowding-in or crowding-out effects in recipient nations in order to evaluate the overall net impact of FDI on domestic investment. Initial findings for developing countries are inconclusive, as the net impact of FDI can vary based on host country characteristics, including governance quality, local policies, financial development (Alfaro et al., 2004), technological gaps, and the absorptive capacity of local businesses (Barrios et al., 2005).

Agosin and Machado (2005) studied 36 developing nations from 1971 to 2000 and were unable to establish a definitive conclusion regarding the impact of FDI on domestic investment. Aitken and Harrison (1999), Wang (2010), Morrissey and Udomkerdmongkol (2012), Göçer et al., (2014), Yao and Salim (2020), Ali et

al. (2021), and Magbondé et al. (2024) concluded that FDI exerts a crowding-out effect on domestic investment in developing countries.

Conversely, a more recent study by Farla et al. (2016), which employed the same dataset as that of Morrissey and Udomkerdmongkol (2012), arrived at a contrasting conclusion. By enhancing the domestic investment proxy used by Morrissey and Udomkerdmongkol (2012) and refining their estimation techniques, Farla et al. (2016) found evidence for a crowding-in effect. Similarly, Lalwani (2002), Al-Sadig (2012), and Abu and Karim (2016) provided empirical evidence in support of the crowding-in hypothesis.

Conversely, Polat (2017) and Gökçeli et al. (2022) concluded that FDI does not have a significant influence on domestic investment. Agosin and Mayer (2000) and Pilbeam and Oboleviciute (2012) reported mixed effects of FDI on domestic investment across different regions. On the other hand, Kim and Seo (2003) along with Tang et al., (2008) argued that FDI and domestic investment work together to promote economic growth, without undermining or reducing the importance of domestic investment.

Research on the relationship between FDI and domestic investment in CESEE countries has also produced inconsistent findings.

Mišun and Tomšk (2002) conducted a study on the impact of FDI on domestic investment in Poland, Hungary, and the Czech Republic, covering the years 1990 to 2000 for Poland and Hungary, and 1993 to 2000 for the Czech Republic. Their findings indicated that FDI led to an increase in domestic investment in the Czech Republic and Hungary, while in Poland, it resulted in a decrease in domestic investment due to crowding-out effects. Mileva (2008) expanded the analysis to a broader sample of 22 transition countries, including both EU members and non-members, to examine the influence of FDI on domestic investment. The results suggested that FDI flows could produce modest investment spillovers within host economies across the entire sample, particularly in countries that either have completed or are close to completing their transition processes. In contrast, in ten nations of the Commonwealth of Independent States and Albania, FDI flows were found to crowd out domestic investment. Similarly, Szkorupová, (2015) investigated the crowding-in and crowding-out effects of FDI on domestic investment in CEE from 1993 to 2012 through panel regression analysis. The

research revealed that FDI frequently crowds out domestic investment due to various factors. During the transformation phase, FDI was primarily motivated by privatisation, which allowed foreign investors to take control of critical sectors such as telecommunications and manufacturing, thereby hindering the competitiveness of domestic firms, particularly as government policies often favoured foreign entities. Titarenko (2006) reached a similar conclusion regarding Lithuania. Additionally, Kosová (2010) provided empirical evidence indicating that crowding out has a short-term impact on the Czech Republic, while Zajc Kejžar (2016) corroborated this finding for Slovenia.

In a similar vein, Jude (2019) examined the same relationship using data from ten CEE nations spanning the years 1995 to 2015. FDI is considered to exhibit a "creative destruction phenomenon," characterised by an initial short-term crowding-out effect, which is subsequently followed by a long-term crowding-in impact. The manner of entry significantly influences the effect of FDI on domestic investment. The findings indicated that greenfield FDI, which involves the establishment of entirely new firms represented by foreign affiliates and the acquisition of fixed assets (in addition to capital stock), demonstrates a pronounced crowding-out effect. Conversely, mergers and acquisitions, which entail a transfer of ownership of existing assets (without an increase in capital stock), do not facilitate capital accumulation. Given that greenfield FDI typically aims to establish trade connections with domestic enterprises, it fosters a crowding-in effect over the long term.

Jovanović and Hanzl-Weiss (2022) found no impact of FDI on domestic investment in CESEE countries. FDI has not crowded out domestic investment, but it has not crowded in domestic investment either, perhaps reflecting the weak linkages between foreign and local firms.

Several studies have highlighted the role of institutions, corruption, and governance in attracting FDI in developing countries**.** Bénassy-Quéré et al. (2007) and Miao et al. (2021) found that institutions and specific governance indicators played a critical role in attracting FDI. In contrast, Magbondé et al. (2024) did not find any significant effect of institutions on investment. Furthermore, financial development and its interaction with FDI inflows do not exhibit a significant impact on investment. Minović et al. (2021) noted that controlling corruption,

maintaining political stability, and upholding the rule of law are crucial in driving FDI inflows to the Western Balkans. Nonetheless, there is a lack of definitive evidence suggesting that good governance fosters domestic investment, as the influence of FDI on domestic investment is contingent upon the prevailing institutional environment.

The preceding literature review highlights a scarcity of research focused on the impact of FDI on domestic investment in CESEE countries. Furthermore, the results from the available studies are ambiguous, demonstrating crowding-out (Kosová, 2010; Szkorupová, 2015; Titarenko, 2006; Zajc Kejžar, 2016), mixed (Jude, 2019; Mileva 2008; Mišun & Tomšk, 2002) or no effects of FDI on domestic investment (Jovanović & Hanzl-Weiss, 2022). This study aims to significantly contribute to the existing literature by examining the correlation between FDI and domestic investment, particularly within the CESEE context and different institutional frameworks. As there is a shortage of studies focusing on this region, our study provides valuable insights into how FDI influences domestic investment, including whether it results in a crowding-in or crowding-out effect, across various levels of institutional quality. By delving into these dynamics, the study offers a nuanced understanding that is often overlooked in broader analyses, particularly within the context of emerging economies in Central, Eastern, and South-Eastern Europe.

3. FOREIGN DIRECT INVESTMENT AND DOMESTIC INVESTMENT IN THE COUNTRIES OF CENTRAL, EASTERN, AND SOUTH-EASTERN EUROPE

This section provides a comparative analysis of domestic investment presented by GFCF and FDI as a percentage of GDP across several CESEE countries from 1995 to 2021. This analysis aims to identify domestic and foreign investment trends and understand the factors influencing these economic indicators.

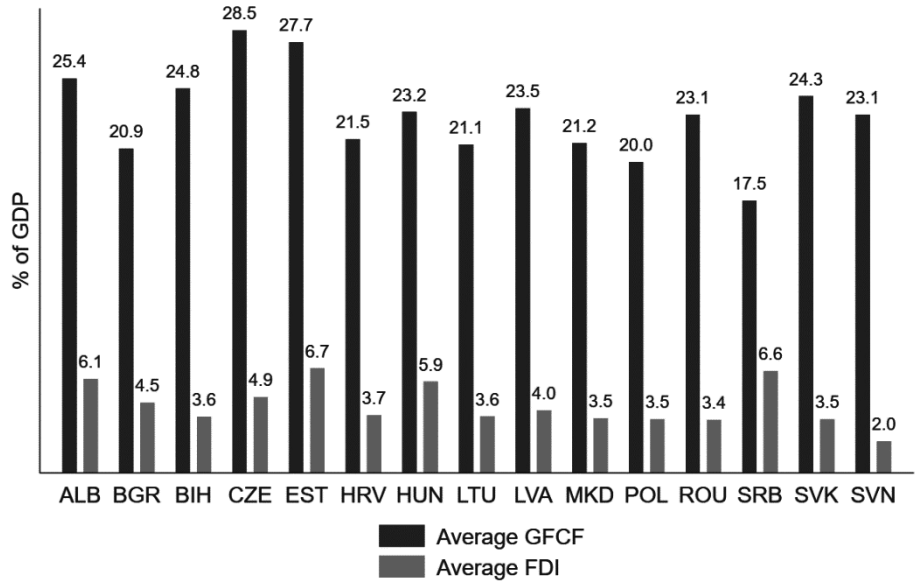
The Czech Republic, Estonia, and Albania were among the top-performing CESEE countries in average domestic investment percentages from 1995 to 2021. The Czech Republic led with a substantial GFCF percentage of 28.5%, closely followed by Estonia at 27.7%, and Albania at 25.4%. These statistics highlight significant investment in their domestic economies, particularly infrastructure and industrial development initiatives. In contrast, Bulgaria, Poland, and Serbia had comparatively lower average GFCF percentages of 20.9%, 20.0%, and 17.5%,

respectively, from 1995 to 2021. This may reflect more cautious investment strategies or potential economic constraints limiting these countries' capacity for large-scale capital formation. Despite these lower percentages, both groups of nations have implemented structural reforms and attracted foreign investment to bolster their economies (Figure 1).

Estonia, Serbia, and Hungary have notably maintained relatively high average foreign direct investment (FDI) percentages of 6.7%, 6.6%, and 5.9% from 1995 to 2021, respectively. These figures indicate favourable conditions for foreign investments attributed to strategic geographic positioning, liberal economic policies, and a dynamic market environment. In contrast, Slovenia has recorded a lower average FDI percentage of 2.0% from 1995 to 2021. This may indicate market saturation, potential economic risks, or restrictive foreign investment regulations. Nevertheless, Slovenia has taken proactive steps to introduce new laws and offer incentives to attract foreign investment and create a more hospitable environment for foreign businesses and investors (Figure 1).

The analysis indicates that the CESEE countries have had differing levels of success in attracting foreign direct investment and stimulating domestic capital formation. While some nations have excelled in these areas, others may encounter challenges that necessitate strategic interventions. Encouraging domestic investments ensures enduring economic growth and stability, particularly amid increasingly uncertain global economic conditions. Through increased domestic investment, the CESEE countries can broaden their sources of economic growth and lessen their dependency on foreign direct investment, thereby establishing a more resilient and stable economic footing for the future.

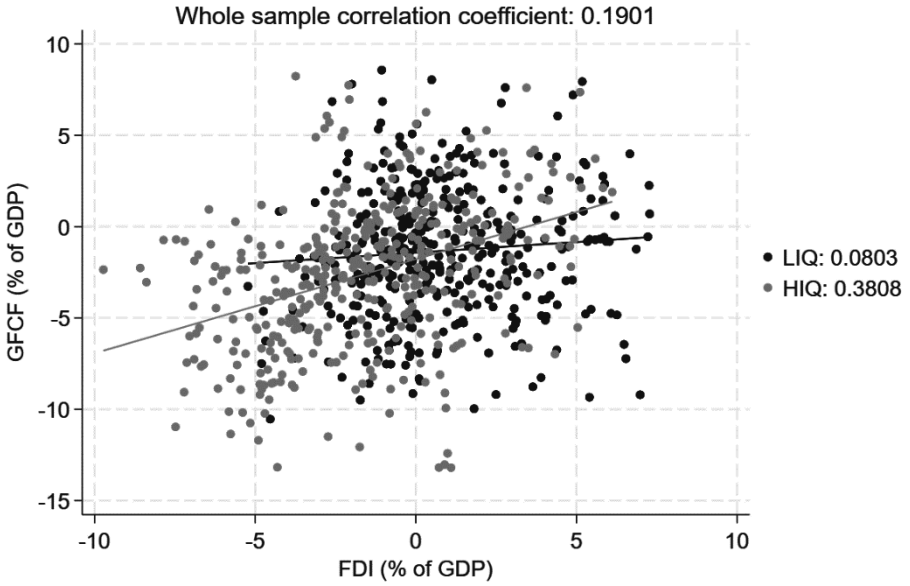
Figure 1. Average FDI and GFCF as a percentage of GDP in CESEE countries in the period 1995–2021



Source: Authors' calculations based on data from the World Bank, World Development Indicators database, https://databank.worldbank.org/source/world-development-indicators#..

The scatter chart depicted in Figure 2 illustrates the correlation between FDI and GFCF as a percentage of GDP in CESEE countries from 1995 to 2021. This correlation has been adjusted for the effects of other variables, such as real GDP per capita growth, real interest rates, and gross domestic savings, all of which may influence this relationship. The chart presents compelling evidence of a robust positive correlation between these two variables, with the overall sample correlation coefficient standing at 0.19. This suggests that countries with higher FDI also tend to have higher levels of domestic investment, and vice versa. The statistical significance of this correlation underscores the idea that foreign investment can indeed have a positive impact on a country's domestic economy.

Figure 2. Scatter chart on the relationship between FDI and GFCF as a percentage of GDP in CESEE countries in the period 1995–2021

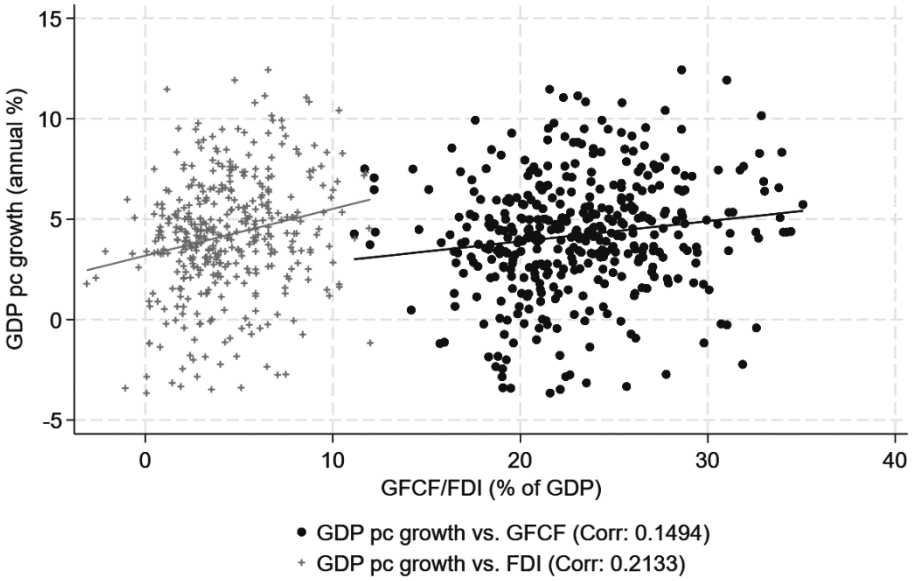


Note: LIQ – Countries with lower institutional quality; HIQ – Countries with higher institutional quality. Source: Authors' calculations based on data from the World Bank, World Development Indicators database, https://databank.worldbank.org/source/world-development-indicators# and Fraser Institute, Economic Freedom database, https://www.fraserinstitute.org/economic-freedom/dataset?geozone=world&year=2021&page=dataset&min-year=2&max-year=0&filter=0.

It is clear from the data that CESEE countries with higher institutional quality, as determined by the economic freedom index of the Fraser Institute (2021), exhibit a stronger correlation coefficient (0.38) compared to those with lower institutional quality (0.08). This indicates that countries with better institutional quality generally experience a more positive link between domestic and foreign direct investments. It is worth noting, however, that correlation alone does not establish causation, and additional research is required to fully comprehend the underlying causal mechanisms. Nevertheless, these findings offer valuable insight into the potential advantages of enhancing institutional quality to advance sustainable economic growth in CESEE countries.

In Figure 3, we can see a scatter chart of the correlation between FDI as a percentage of GDP and GDP per capita growth and the correlation between GFCF as a percentage of GDP and GDP per capita growth. The scatter chart shows that both FDI and domestic investment have positive correlation coefficients with GDP per capita growth of 0.21 and 0.15, respectively. Furthermore, the graph reveals that the correlation between FDI and GDP per capita growth is stronger than that of domestic investment and GDP per capita growth. The findings from this analysis suggest that attracting foreign investment can benefit a country's economic development. Countries that can effectively attract FDI may experience increased GDP per capita growth compared to countries that do not attract foreign investment.

Figure 3. Scatter chart on the relationship between FDI as a percentage of GDP and GDP per capita growth and GFCF as a percentage of GDP and GDP per capita growth in CESEE countries in the period 1995–2021



Source: Authors' calculations based on data from the World Bank the World Bank, World Development Indicators database, https://databank.worldbank.org/source/world-development-indicators#.

The evidence shows a strong positive correlation between foreign direct investment and domestic investment, suggesting that higher levels of FDI are often accompanied by greater domestic investment. This indicates that foreign investment could encourage or occur alongside increased domestic economic activity. Additionally, the data indicates that countries with better institutional quality exhibit a stronger correlation between these investments, highlighting the significance of good governance and robust institutions in enhancing the positive effects of FDI. While FDI has a slightly stronger correlation with GDP per capita growth than domestic investment, it may have a slightly greater impact on economic development. These findings emphasise the importance of prioritising institutional quality and creating a favourable investment climate in CESEE nations. By doing so, policymakers can maximise the benefits of FDI, which could lead to more substantial and sustainable economic growth. Therefore, policymakers should strengthen institutional frameworks and economic policies that efficiently attract and utilise foreign investment to ensure it brings concrete economic improvements.

4. THEORETICAL FRAMEWORK, EMPIRICAL METHODOLOGY, AND DATA

4.1. Theoretical Framework and Empirical Methodology

In this section, we present the theoretical framework, empirical methodology, and data used to analyse the impact of foreign direct investment on domestic investment in selected countries in CESEE. This study specifically focuses on GFCF, i.e., gross fixed capital formation, as a measure of investment, representing the net additions to fixed assets within an economy. The significance of GFCF as a determinant of long-term economic growth is well-established in neoclassical economic theory, which emphasises the centrality of capital accumulation to growth (Solow, 1956). The model is an augmented investment function, reflecting a partial adjustment process between the existing and desired capital stock under liquidity and time adjustment constraints. The investment rate is expected to demonstrate high persistence, modelled as an autoregressive process (Carkovic & Levine, 2005). The partial adjustment process justifies the inclusion of lagged GFCF as an independent variable in the model.

Our model considers lagged GDP growth, real interest rates, and gross domestic savings as the primary factors influencing investment (Carkovic & Levine, 2005;

Jude, 2019; Wang, 2010). Incorporating lagged GDP growth considers the accelerator effect, which posits that higher economic growth stimulates investment by fostering optimism about future demand and profitability. This idea is rooted in Keynesian economic theory, which highlights the role of firms' expectations in shaping investment choices (Keynes, 1936). By factoring in lagged GDP growth, the model captures how previous economic performance shapes current investment decisions as businesses adjust their strategies based on past growth.

Real interest rates are utilised as a control variable to signify the expense of borrowing. Following classical economic theory, higher real interest rates elevate the cost of capital, thus deterring investment, while lower interest rates diminish borrowing costs and render investment more appealing (Modigliani & Miller, 1958). This addition underscores the impact of financing costs on investment, a pivotal consideration in capital expansion decisions. Gross domestic savings is a crucial control variable that reflects the availability of financial resources for investment. Higher savings rates lead to more capital for investment, promoting capital accumulation and supporting economic growth. Both classical and neoclassical growth theories highlight the importance of savings in financing investment, suggesting that increased domestic savings result in higher levels of investment and, consequently, greater economic growth (Domar, 1946; Harrod, 1939). By including gross domestic savings in the analysis, we can consider the impact of the domestic financial environment on investment decisions.

According to the theoretical explanations, the equation for estimating the effects of foreign direct investment on domestic investment takes the following form:

$$GFCF_{i,t} = \alpha_i + \beta_1 GFCF_{i,t-1} + \beta_2 FDI_{i,t} + \beta_3 GDPG_{i,t-1} + \beta_4 RIR_{i,t} + \beta_5 GDS_{i,t} + \varepsilon_{i,t}\,, \quad (1)$$

where $GFCF_{i,t}$ is gross fixed capital formation as a percentage of GDP, $GFCF_{i,t-1}$ is lagged gross fixed capital formation as a percentage of GDP, $FDI_{i,t}$ is foreign direct investment as a percentage of GDP, $GDPG_{i,t-1}$ is lagged GDP per capita growth as an annual %, $RIR_{i,t}$ is real interest rate, $GDS_{i,t}$ is gross domestic savings as a percentage of GDP for country i and period t, α_i is the country-fixed effect, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are coefficients for the variables, and $\varepsilon_{i,t}$ is the error term.

The analysis utilises a fixed-effects model to account for unobservable differences across countries. Each country may exhibit distinct characteristics, such as variations in institutional quality, infrastructure, cultural influences, or long-standing economic policies, which could impact domestic investment. These features remain constant over time but differ across countries and can significantly influence the dependent variable. By employing a fixed-effects model, we effectively control these country-specific factors encapsulated by the country-specific intercept α_i. While this intercept varies by country, it remains constant over time for each country. The fixed-effects approach alleviates any bias if these unobserved characteristics are correlated with the independent variables. Essentially, the fixed-effects model isolates the impact of the independent variables on the dependent variable by adjusting for all time-invariant discrepancies between countries.

However, although the fixed-effects model effectively controls for unobserved heterogeneity, it does not fully account for the dynamic nature of the investment process. Investment decisions are inherently dynamic, meaning past investment levels influence current investment. This creates a situation where the lagged dependent variable is included as a regressor, introducing potential endogeneity issues. Endogeneity arises because the lagged dependent variable is likely correlated with the error term, particularly in panel data with short periods and numerous cross-sectional units. To address this, dynamic panel data models, such as the GMM, are employed. The GMM approach, particularly the difference GMM or system GMM, is specifically designed to handle the endogeneity of the lagged dependent variable and other potentially endogenous regressors. GMM uses instrumental variables, often constructed from the lagged values of the dependent variable and other exogenous variables, to offer consistent and unbiased estimates.

We utilised the difference GMM to capture the dynamic nature of the equation. This method, originally developed by Arellano and Bond (1991), involves transforming the data by first differencing to eliminate country-specific effects that could bias the results. The differenced equation takes the following form:

$$\Delta GFCF_{i,t} = \beta_1 \Delta GFCF_{i,t-1} + \beta_2 \Delta FDI_{i,t} + \beta_3 \Delta GDPG_{i,t-1} + \beta_4 \Delta RIR_{i,t} + \beta_5 \Delta GDS_{i,t} + \Delta \varepsilon_{i,t}\ , \quad (2)$$

where Δ refers to the first difference of the variables capturing the change from period $t-1$ to t, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are coefficients for the first-differenced variables, and $\Delta\varepsilon_{i,t}$ is the first-differenced error term.

However, our model is constructed based on 15 cross-sections and 27 periods (1995–2021), which may not be ideal for generalised GMM. Still, some authors, such as Jude (2019), have successfully employed GMM in similar contexts, particularly to capture the dynamic relationships inherent in the investment process. To address the issue of having more instruments than cross-sections, we restricted the instruments for the lagged dependent variable to lags 2 and 3, and utilised the collapse option to reduce the number of instruments. To decide between the difference GMM (Arellano & Bond, 1991) and system GMM (Arellano & Bover, 1995; Blundell & Bond, 1998), we referred to Bond (2002) and considered that the coefficient of the lagged dependent variable estimated by the fixed-effect model should be viewed as a lower bound estimate. If the coefficient of the lagged dependent variable estimated by the difference GMM is similar to the fixed-effects estimation, then the system GMM is preferred.

Given that GFCF represents net investment in fixed assets that encompasses both domestic and foreign investment, a positive coefficient on FDI does not necessarily imply that FDI leads to crowding-in effects. It indicates that an increase in FDI results in a higher total investment, as captured by GFCF. For the crowding-in effect to occur, the coefficient before FDI must be greater than one, signifying that a one-unit increase in FDI leads to a total investment increase of more than one unit (Jude, 2019).

According to Jude (2019), in the long run, the investment rate converges to its steady-state equilibrium level, meaning that $GFCF_{i,t-1} = GFCF_{i,t}$. Thus, the marginal effect of FDI on GFCF assimilated to the long-run elasticity of investment to FDI is given by the following equation:

$$\beta_L = \frac{\beta_S(FDI)}{1-\beta_1}, \tag{3}$$

where β_L refers to the long-run elasticity of investment to FDI, β_S is the estimated coefficient of FDI from the regression, and β_1 is the estimated coefficient of the lagged dependent variable. The significance of this long-run elasticity is tested

using a non-linear Wald test. The hypotheses we are testing are $\beta_L = 1$ and $\beta_L > 1$, in order to test whether there is crowding-in effect in the long run or not.

4.2. Data and Variables

The data needed for the empirical analysis of CESEE countries were obtained from the World Development Indicators database of the World Bank (2023), the annual macro-economic database (AMECO) of the European Commission (2024), the International Financial Statistics of the International Monetary Fund (2024), Federal Reserve Bank of St. Louis (2024), the Fraser Institute (2021), and national sources. The data set examined annual data for each country in the sample for the following variables:

- Domestic investment (GFCF as a percentage of GDP);
- Foreign direct investment (FDI inflows as a percentage of GDP);
- GDP per capita growth (annual %);
- Real interest rate (short-term interest rate minus the GDP deflator);
- Gross domestic savings (as a percentage of GDP).

According to data availability, we selected the following 15 countries from CESEE: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, North Macedonia, Poland, Romania, Serbia, Slovak Republic, and Slovenia. The paper deals with annual data from 1995 to 2021. Table 1 presents descriptive statistics of the variables and their sources.

Table 1. Descriptive statistics of the variables and their sources

Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Source
Domestic investment (GFCF)	405	23.06	4.35	11.14	35.08	World Bank (2023), Gross fixed capital formation (% of GDP), 1995–2021
Foreign direct investment (FDI)	405	4.37	2.68	-3.13	12.00	World Bank (2023), Foreign direct investment, net inflows (% of GDP), 1995–2021
GDP per capita growth (GDPG)	405	4.20	2.93	-3.65	12.44	World Bank (2023), GDP per capita growth (annual %), 1995–2021
Real interest rate (RIR)	405	0.98	3.64	-8.62	11.43	European Commission (2024), International Monetary Fund (2024), Federal Reserve Bank of St. Louis (2024), National sources, Short-term interest rate minus GDP deflator, 1995–2021
Gross domestic savings (GDS)	405	18.17	9.31	-6.89	34.82	World Bank (2023), Gross domestic savings (% of GDP)

Source: Authors' calculations.

The selected sample consists of countries at various stages of economic development, including those from former socialist systems, countries in transition, and those that have successfully emerged from transition. After estimating the entire sample, we divided it into two subsections based on

institutional quality, using the average Fraser Institute economic freedom index as a proxy for this measure. We then conducted a fixed-effects estimation for these two subsamples, considering the small cross-sections relative to the period. Although some countries are not independent throughout the analysis timeframe (e.g., Serbia), data is shown separately. Some data, especially real interest rates, are obtained from national sources. The outliers in the data were removed.

Table 2 presents the correlation coefficients between the variables from the panel data from 1995 to 2021 in the examined countries. The correlation analysis reveals noteworthy positive and significant relationships between GFCF and FDI, confirming the hypothesis that FDI is interconnected and positively linked to domestic investment levels. The moderate yet significant correlations indicate that FDI is crucial in encouraging domestic investment among the sample countries. However, further analysis through econometric modelling is necessary to establish causal relationships and comprehend the underlying dynamics between domestic investment and FDI.

Table 2. Correlation matrix of the variables

Variable	GFCF	FDI	GDPG	RIR	GDS
GFCF	1				
FDI	0.2173***	1			
GDPG	0.1494***	0.2133***	1		
RIR	-0.0245	-0.0555	-0.1696***	1	
GDS	0.2774***	-0.0091	-0.0682	-0.4079***	1

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' calculations.

Before proceeding with the equations' estimation, it is essential to assess the time series properties of the variables to ensure the validity of the estimation techniques. Specifically, it is crucial to first check for cross-sectional dependence and perform unit root tests. After conducting the Breusch-Pagan LM test to consider cross-sectional dependence, we used the Pesaran CADF and CIPS tests for panel data unit root testing, with a maximum of one lag. The test results are shown in Table 3.

Table 3. Unit root test results

Variable	Test	Test Stat.	CV 10%	CV 5%	CV 1%	Z(t-bar)	p-value
GFCF	Pesaran CADF	-2.083	-2.14	-2.25	-2.45	-1.250	0.106
GFCF	Pesaran CADF + trend	-3.096***	-2.66	-2.76	-2.96	-3.233	0.001
GFCF	CIPS	-2.182*	-2.14	-2.25	-2.45		
GFCF	CIPS + trend	-2.996***	-2.66	-2.76	-2.96		
FDI	Pesaran CADF	-3.217***	-2.14	-2.25	-2.45	-5.776	0.000
FDI	Pesaran CADF + trend	-3.317***	-2.66	-2.76	-2.96	-4.152	0.000
FDI	CIPS	-3.931***	-2.14	-2.25	-2.45		
FDI	CIPS + trend	-3.958***	-2.66	-2.76	-2.96		
GDPG	Pesaran CADF	-2.841***	-2.14	-2.25	-2.45	-4.275	0.000
GDPG	Pesaran CADF + trend	-3.086***	-2.66	-2.76	-2.96	-3.192	0.001
GDPG	CIPS	-3.980***	-2.14	-2.25	-2.45		
GDPG	CIPS + trend	-4.233***	-2.66	-2.76	-2.96		
RIR	Pesaran CADF	-2.433***	-2.14	-2.25	-2.45	-2.647	0.004
RIR	Pesaran CADF + trend	-3.200***	-2.66	-2.76	-2.96	-3.663	0.000
RIR	CIPS	-3.577***	-2.14	-2.25	-2.45		
RIR	CIPS + trend	-4.179***	-2.66	-2.76	-2.96		
GDS	Pesaran CADF	-2.510***	-2.14	-2.25	-2.45	-2.953	0.002
GDS	Pesaran CADF + trend	-2.450	-2.66	-2.76	-2.96	-0.542	0.294
GDS	CIPS	-2.847***	-2.14	-2.25	-2.45		
GDS	CIPS + trend	-2.958**	-2.66	-2.76	-2.96		

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Authors' calculations.

Based on the test results, it is evident that all variables, with the exception of GFCF and gross domestic savings, exhibit stationarity at levels with and without trend at a 1% significance level. The data shows that GFCF is non-stationary without trend and stationary at the level with a trend at a 1% significance level according to the Pesaran CADF test. Additionally, according to the CIPS test, it is stationary at the level without trend at a 10% significance level and with a trend at a 1% significance level. On the other hand, gross domestic savings is stationary at the level without trend at a 1% significance level and non-stationary at the level with trend according to the Pesaran CADF test. According to the CIPS test, it is

stationary at the level without trend at a 1% significance level and at the 5% significance level without trend.

The majority of the tests indicate that the variables are stationary at their levels with a significance level of 1%. The results are essential for conducting further econometric analysis, as they confirm the suitability of these variables in models that rely on stationarity.

5. RESULTS AND DISCUSSION

This section shows the regression results for the estimated equations discussed in the previous section. Table 4 displays the fixed-effects and one-step difference GMM results for the whole sample.

The findings in Table 4 reveal a notably positive and statistically significant influence of lagged GFCF in both models. This suggests a robust continuity in domestic investment, emphasising the pivotal role of past investment levels in shaping current investment decisions. The magnitude of these coefficients aligns with existing literature underscoring the significance of consistent investment behaviour, whereby previous capital formation activities markedly impact future investment choices (Choe, 2003).

Based on the findings, the coefficients on FDI are positively and significantly associated with domestic investment in both the fixed-effects and difference GMM models. This suggests that FDI has a positive impact on domestic investment. However, as Jude (2019) discussed, a coefficient greater than one would be necessary to indicate a crowding-in effect, where FDI stimulates more than just its direct contribution to investment. Coefficients below 1 imply that while FDI does increase overall investment levels, it does not lead to a crowding-in effect, meaning that the increase in total investment is less than proportional to the increase in FDI inflows. This result is consistent with earlier findings that FDI's impact on domestic investment can be significant but not necessarily multiplicative (Borensztein et al., 1998).

Wald test results, presented in Table 4, show a *p*-value of 0.0000 for the hypothesis that the long-run elasticity of investment to FDI is equal to 1. This extremely low *p*-value leads us to reject the null hypothesis that the long-run elasticity of

investment to FDI is equal to 1 with high confidence. The Wald test's rejection of the null hypothesis suggests that the long-run elasticity of investment with respect to FDI is significantly different from one. Given that the estimated coefficients for FDI in both models are below one, this elasticity is less than one. This implies that while FDI contributes positively to total investment (Borensztein et al., 1998), it does not induce a crowding-in effect where domestic investment increases by more than the amount of FDI inflows.

Alfaro et al. (2004) found that FDI can complement domestic investment by bringing in capital, technology, and managerial expertise, thereby enhancing overall investment levels. However, the magnitude of this effect does not always exceed unity, as required for a crowding-in phenomenon. Similarly, Javorcik (2004) highlights that while FDI can stimulate domestic investment through various channels, the extent of this stimulation is contingent on factors such as the absorptive capacity of the host economy and the sectors in which FDI is concentrated.

The findings indicate that lagged GDP growth remains positive and statistically significant in both models. This outcome aligns with the accelerator theory of investment, which posits that higher economic growth triggers increased investment in the following periods. The positive association between GDP growth and investment implies that robust economic performance prompts businesses to enhance their productive capabilities (Alfaro et al., 2004).

Other control variables, such as real interest rate, show a positive but not statistically significant effect in both models. This lack of significance suggests that the cost of capital, as measured by real interest rates, may not be a primary determinant of domestic investment in this sample. This finding could imply that factors such as credit availability or external financial conditions are more critical in influencing investment decisions (Modigliani & Miller, 1958).

In the fixed-effects model, the coefficient on gross domestic savings is positive and marginally significant but insignificant in the difference GMM model. This suggests that while domestic savings may contribute to investment, their effect is limited when dynamic effects and potential endogeneity are considered (Feldstein & Horioka, 1980; Loayza et al., 2000).

Table 4. Regression results for the whole sample

Variables	Fixed effects	Difference GMM
	GFCF	GFCF
L.GFCF	0.5767097***	0.7046575***
	(0.0727679)	(0.0754005)
FDI	0.1425214***	0.1129981***
	(0.0497949)	(0.0391783)
L.GDPG	0.2509586***	0.2187857***
	(0.0447041)	(0.0455607)
RIR	0.0372813	0.0061947
	(0.0477974)	(0.06264)
GDS	0.0564711*	0.0278917
	(0.0334537)	(0.0382545)
Constant	8.254681***	
	(1.639425)	
Observations	390	375
Adj. R-squared	0.7007	
F statistic	72.48	
p > F	0.0000	
Ramsey RESET test	1.52	
p > Ramsey RESET	0.2090	
Breusch-Pagan LM test	161.867	
p > Breusch-Pagan LM test	0.0003	
AR(1) test		-2.62
p > AR(1)		0.009
AR(2) test		0.76
p > AR(2)		0.449
Sargan test		0.02
p > Sargan		0.882
Hansen test		0.03
p > Hansen		0.853
Wald test: β_L(FDI) = 1 (p-value)	0.0000	0.0000

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations.

The diagnostic tests conducted on the regression models provide important insights into the robustness and validity of the results. The Ramsey RESET test, with a *p*-value of 0.2090, suggests that the fixed-effects model does not suffer from misspecification, indicating that the functional form of the model is appropriate for the data. This implies that the model correctly specifies and captures the underlying relationships between the variables without omitting important factors or including unnecessary ones.

The AR(1) and AR(2) tests in the difference GMM model are crucial for assessing the validity of the instruments used in the model. The AR(1) test shows significant first-order autocorrelation in the residuals with a *p*-value of 0.009, which is expected due to the nature of the differenced model. However, the AR(2) test, with a *p*-value of 0.449, indicates no significant second-order autocorrelation. The absence of second-order autocorrelation is important because it confirms that the instruments are valid and that the differenced model does not suffer from problems related to autocorrelation in the residuals, thereby ensuring the consistency of the GMM estimates. The Sargan and Hansen tests further support the validity of the instruments in the difference GMM model. The Sargan test, with a *p*-value of 0.882, and the Hansen test, with a *p*-value of 0.853, both indicate that the instruments are not over-identified. This means that the instruments are appropriately correlated with the endogenous regressors but uncorrelated with the error term. This ensures that the instruments used in the model are valid and that the model's estimates are not biased due to over-identification issues.

The following analysis involves splitting the dataset into two subsamples based on institutional quality, measured by the average economic freedom index of the Fraser Institute between 1995 and 2021. The objective is to examine each subgroup's domestic and foreign direct investment relationship. This is driven by the hypothesis that institutional environments significantly influence the effectiveness and impact of FDI. By categorising the dataset into countries with higher and lower institutional quality, we aim to explore whether the relationship between FDI and domestic investment displays variation under different institutional conditions. Analysing these subsamples allows us to uncover the nuanced effects of institutional quality on investment dynamics. This approach provides valuable insights into whether FDI's impact on domestic investment is

consistent across diverse institutional environments or if it varies based on the strength of the institutional framework.

Additionally, this segmentation addresses potential heterogeneity within the sample, ensuring that the analysis captures the diverse economic realities across countries with varying levels of institutional development. By isolating the influence of institutional quality, we gain a deeper understanding of the mechanisms through which FDI affects domestic investment and identify the factors that either facilitate or impede this relationship. Ultimately, this approach enables us to draw targeted conclusions and formulate relevant policy recommendations, as the findings revealed specific conditions under which FDI is most likely to contribute positively to domestic investment.

In both subgroups, the lagged GFCF variable is positively and significantly associated with the current level of domestic investment. This suggests that previous investment levels significantly impact current investment in both contexts, with a slightly stronger effect observed in settings with weaker institutions. The higher coefficient within the group countries with lower institutional quality implies the likelihood of firms in these environments relying more heavily on past investments, possibly due to greater uncertainty or less supportive institutional frameworks, leading them to pursue more cautious investment strategies.

In analysing the impact of FDI, it is apparent that both subsamples demonstrate positive and significant coefficients. These findings suggest that FDI positively influences domestic investment in both scenarios. Nonetheless, the coefficients remain below one in both subsamples, indicating that FDI does not lead to a crowding-in effect where it stimulates more than its direct contribution to domestic investment. The close resemblance between the coefficients across subsamples implies that institutional quality does not significantly modify the fundamental relationship between FDI and domestic investment. However, it may impact the wider economic environment in which this relationship operates (Borensztein et al., 1998; Jude, 2019).

The results of the Wald test indicate significant *p*-values for the hypothesis testing the long-run elasticity of investment with respect to FDI being equal to 1 in both subsamples. The *p*-values were 0.0015 in the lower institutional quality subsample

and 0.0000 in the higher institutional quality subsample. Therefore, we can reject the null hypothesis that the long-run elasticity of investment to FDI is equal to 1 with high confidence in both contexts. This rejection suggests that FDI does not lead to a crowding-in effect in either subsample, as the long-run elasticity is likely less than one. These findings support the conclusion that while FDI positively impacts domestic investment, its effect does not exceed its direct contribution, and therefore does not induce additional domestic investment beyond what is accounted for by the FDI itself (Jude, 2019).

Table 5. Fixed-effects results for the different subsamples

Variables	Lower institutional quality	Higher institutional quality
	GFCF	GFCF
L.GFCF	0.6157222***	0.5159134***
	(0.1119229)	(0.085501)
FDI	0.1597811**	0.1520221**
	(0.0685585)	(0.0698879)
L.GDPG	0.2374272***	0.2757489***
	(0.0572507)	(0.0659486)
RIR	0.0857821*	-0.0338258
	(0.0507473)	(0.0872063)
GDS	0.0665036	0.017409
	(0.0458637)	(0.052208)
Constant	7.907748***	10.10299***
	(3.043331)	(2.022832)
Observations	208	182
Adj. R-squared	0.6637	0.6391
F statistic	39.06	47.51
p > F	0.0000	0.0000
Ramsey RESET test	0.56	0.59
p > Ramsey RESET	0.6414	0.6200
Breusch-Pagan LM test	44.007	25.916
p> Breusch-Pagan LM test	0.0277	0.2097
Wald test: β_L(FDI) = 1 (p-value)	0.0015	0.0000

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations.

The variable representing lagged GDP growth demonstrates a positive and significant impact on domestic investment in both subsamples. This outcome aligns with the accelerator theory of investment, which posits that past economic growth leads to increased current investment as firms expand their capacity to meet future demand. The marginally higher coefficient in the high institutional quality subsample suggests that firms may be better positioned in these environments to take advantage of past economic growth, possibly due to more efficient markets, better governance, and easier access to finance. This discovery underscores the role of institutional quality in strengthening the responsiveness of investment to economic conditions.

Real interest rates (RIR) have varying impacts across different subsamples. The coefficient is positive and marginally significant in the lower institutional quality subsample, suggesting that higher interest rates might be associated with increased investment. This could indicate higher returns on investment or more stable economic conditions where firms are willing to invest despite higher borrowing costs. Conversely, the coefficient for real interest rates in the higher institutional quality subsample is negative and insignificant, implying that the cost of capital may be less of a concern in these contexts, possibly due to better access to financing and more stable economic environments. The difference in significance and direction between the two subsamples highlights how institutional quality can influence the sensitivity of investment decisions to financing conditions.

The data show that gross domestic savings have a positive, yet not statistically significant, impact on domestic investment in both subsets. This suggests that while savings contribute to investment, their influence is relatively modest and does not vary significantly depending on institutional contexts. The lack of statistical significance may indicate that other factors, such as external financing or investment incentives, are more crucial in driving domestic investment decisions in both subsets.

In the subsample with lower institutional quality, the Ramsey RESET test indicates a *p*-value of 0.6414, suggesting no evidence of model misspecification. This implies that the model's functional form is suitable for the data and adequately captures key variable relationships. Similarly, in the subsample with

higher institutional quality, the Ramsey RESET test shows no evidence of model misspecification, with a *p*-value of 0.6200. This confirms that the model is correctly specified and accurately represents the relationships between the variables within the chosen functional form.

6. CONCLUSION

This study investigates the relationship between domestic investment and foreign direct investment in 15 Central, Eastern, and South-Eastern European countries between 1995 and 2021. The research findings indicate that FDI has a positive impact on domestic investment, suggesting that an increase in FDI is linked to a corresponding rise in total investment. However, the estimated coefficients on FDI, in both the fixed-effects and GMM models, consistently remain below one. This implies that although FDI contributes to higher overall investment levels, it does not lead to a crowding-in effect where the increase in total investment surpasses the amount of FDI inflows. The Wald test supports this finding by rejecting the null hypothesis that the long-run elasticity of investment to FDI is equal to one. This indicates that the elasticity is likely to be less than one, emphasising the idea that FDI, while beneficial, does not significantly stimulate domestic investment beyond its direct impact.

In terms of the impact of institutional quality, the findings indicate that FDI has a positive effect on domestic investment in both high- and low-institutional-quality settings. However, the coefficients remain below one in both scenarios, suggesting that institutional quality does not significantly alter the core relationship between FDI and domestic investment. The minor variations in coefficients between the scenarios suggest that although institutional quality may influence the broader economic environment, it does not substantially change the direct impact of FDI on domestic investment.

The analysis included several control variables such as lagged GDP growth, real interest rates, and gross domestic savings. These variables shed light on the factors influencing domestic investment. Lagged GDP growth consistently revealed a positive and statistically significant relationship with domestic investment, indicating the accelerator effect, where past economic performance influences future investment. The real interest rate, however, showed a more intricate relationship, displaying positive and marginal significance in lower institutional

quality contexts, while being insignificant in higher institutional quality contexts. This suggests that the cost of capital plays a varying role depending on the financial and institutional environment. Lastly, gross domestic savings, while positively associated with investment, did not exhibit statistical significance in either model.

The results suggest that while the quality of institutions does not significantly affect the relationship between FDI and domestic investment in the analysed sample, FDI consistently positively impacts domestic investment. However, the coefficients indicate that FDI does not lead to a crowding-in effect, where domestic investment increases by more than the amount of FDI inflows. This means that while FDI contributes to higher total investment, its impact is more of an addition than a multiplication.

Policymakers must acknowledge that while FDI can boost domestic investment, it may not always result in substantial additional domestic investment beyond its direct impact. To promote a crowding-in effect, it is crucial to enact policies that attract FDI and establish an environment where local companies can capitalise on foreign investments to expand their operations. This may involve enhancing access to financing, encouraging innovation, and facilitating connections between foreign and domestic firms.

Our study has some key limitations, primarily related to the scarcity of data from the selected Central, Eastern, and South-Eastern European countries. The limited availability of comprehensive data in these regions restricts the depth and robustness of our analysis. Furthermore, our data is collected on an annual basis instead of quarterly, which limits the number of observations and may require us to reassess whether the results might be affected by structural breaks. Additionally, our empirical analysis does not consider the financing methods for foreign investment, nor does it differentiate between various financing sources or strategies employed by foreign investors. This could potentially influence the nature and impact of foreign direct investment on domestic investment. Addressing these limitations in future research could offer a more comprehensive understanding of the relationships under investigation.

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EDUCATION AS A FEMALE ENTREPRENEURSHIP CATALYST

ABSTRACT: *The number of businesses in Serbia owned and managed by women is increasing, but female entrepreneurs are still in the minority. This study aims to explore characteristics, motivations, advantages, and disadvantages of female entrepreneurship in Serbia in relation to differences in the education level of female entrepreneurs. The main idea is that education level influences the motivation to become an entrepreneur and the choice of the business sector and that female entrepreneurs of different education levels perceive the advantages and disadvantages of entrepreneurship differently. The research was conducted during the first quarter of 2023. The research sample included 104 female entrepreneurs from different sectors and regions of the country. It was demonstrated that education level has an impact on female entrepreneurship. The choice of business sector was influenced by the education level of female entrepreneurs. The way female entrepreneurs perceived the advantages and disadvantages of entrepreneurship was, in some cases, associated with the level of education, while the decision and motivation to become an entrepreneur were not. The results of this study can be used for researchers and policymakers in the field of entrepreneurship to increase the number of female entrepreneurs in Serbia.*

KEY WORDS: *female entrepreneurship motivation, female entrepreneurship advantages, female entrepreneurship disadvantages, female education level, Serbia*

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1. INTRODUCTION

Entrepreneurship is considered one of the most important development factors of a country (Rahim, 2022). The participation of women in entrepreneurship is increasing in economies worldwide (Tovmasyan, 2022; Khajuria, 2021). Different studies have pointed out the contribution of female entrepreneurship to economic and social development (Mashapure et al., 2022; Niyonsaba et al., 2022), since more women are getting involved in business growth, creating more jobs (Kannappan, 2022; Cardella et al., 2020), and taking on prominent roles in educational and business realms (Allahar, 2015). Being conditioned by social and economic factors (Raman, et al., 2022), the motives and characteristics of female entrepreneurship differ from region to region (Türko, 2021; Kannappan, 2022). The motivations for women to engage in entrepreneurial activities can be divided into "opportunity-driven" factors, related to the desire for independence and status recognition, and "necessity-driven" factors, which consider unemployment, dissatisfaction with the current job, or financial needs (Rahabhi et al., 2021). Despite regional differences, female entrepreneurship is highly concentrated in micro, small and medium enterprises, and women usually utilise opportunities in the service sector and sales. Although some of the challenges can be applied to entrepreneurship generally (Paoloni & Serafini, 2018), it has been shown that women involved in entrepreneurial activities face greater difficulties than men, especially in developing countries (Deng et al., 2020; Isah & Leko Simic, 2022). Globally, it is estimated that women own and manage approximately one third of businesses in developed countries (Fosic et al., 2017; Gawel & Glodowska, 2021). This gender gap in entrepreneurship is considered the result of gender inequality and discrimination against women, related to social, economic, legal, political, and technological factors (Knezevic et al., 2022). In this paper, the term female entrepreneur refers to an entrepreneur who is a woman and owns more than 50% of an enterprise, and includes self-employed women and women who employ others (Popovic-Pantic, 2014).

2. FEMALE ENTREPRENEURSHIP AND EDUCATION

Education is considered an important factor in providing female entrepreneurs with more skills and competences necessary to succeed as entrepreneurs (Fuller-Love, 2009), and the impact of formal education on female entrepreneurship has been emphasised (Kannappan, 2022). Education in relevant business fields

enables women to engage in networks and access resources and support. Academic education has been shown to have an impact on entrepreneurship in terms of resource exploitation and business creation (Martinez Cerda & Sanchez Macias, 2022). Previous studies have demonstrated that women with a high level of education are more likely to engage in entrepreneurship (Rahabhi et al., 2021) and less likely to fail than low-educated entrepreneurs (Khyareh, 2018). However, although the lack of formal education is believed to be one of the factors explaining the gender gap in entrepreneurship, in the EU women are more likely than men to have a high level of education, while the gender gap in entrepreneurship still remains prominent since women still constitute only one third of entrepreneurs (Gawel, 2021). In developing and underdeveloped countries, women have fewer educational opportunities than men (Chawla & Amist, 2021), and it is considered one of the reasons for fewer female entrepreneurs. Although formal education is believed to help women to better recognise entrepreneurial opportunities and to have better access to entrepreneurial resources, some studies have shown that both the highest and the lowest categories of the education level are related to a high entrepreneurship rate. On one hand, women with higher levels of education have better job market prospects, which increases their motivation for entrepreneurial activities. On the other hand, the higher level of education provides the necessary skills to find a better-paid job on the market without taking the risk of entrepreneurship. It has been shown as well that education is not the most important factor in becoming an entrepreneur, since many entrepreneurs do not have a formal education (Gawel, 2021). Women in entrepreneurship have a wide range of educational backgrounds (D'Silva & Bhat, 2022), but women generally have less entrepreneurial knowledge and education (Deng et al., 2020), which, together with the lack of training, have proven to be the major problem faced by women who own micro and small businesses, and they are in the majority (Khajuria, 2021). There is the assumption that female entrepreneurship is explained by different levels of education (primary, secondary, and tertiary), which impacts their decisions to enter entrepreneurship (Gawel, 2021).

Despite the attention given to gender equality in national employment strategies, persistent gender gaps within the Serbian labour market still exist. The employment rate of the working age population (15–64) was 65.6% percent for men and 52.0% for women in 2019 (Oliver-Burgess et al., 2020). The

unemployment rate of women was only 2% higher than of men (16.4% vs. 14.3%) in 2016 (Dokmanovic, 2016). According to the Labour Force Survey, the female labour market participation rate in Serbia in 2019 was 47.1%, whereas the male participation rate was 62.8% (Lebedinski & Vladisavljević, 2022). But when it comes to entrepreneurial activity, there are many more significant differences. According to the SORS[1], the share of female-owned businesses in the total number of small and medium enterprises in Serbia is 31.7% (Popovic-Pantic et al., 2020; Ferigra Stefanovic, 2021). Women are primarily engaged in micro enterprises, which are predominant in the Serbian MSME sector (Dokmanovic, 2016), and a much larger share of women are engaged in social sectors of the economy, which are generally low paid and include typically female-dominated professions (education, health care, social protection, and public administration) (Oliver-Burgess et al. 2020; Babovic, 2016), and the service sector – trade, administration, finance, and information technology (80.4%) (Dokmanovic, 2016). One study demonstrated that gender-based segregation in the labour market has an impact on overall competitiveness and limits educational choices. In four-year upper secondary schools, there is an overrepresentation of girls in sectors relating to personal care, health and social welfare, and the textile and leather industry. In tertiary education, women predominate in education (87%), medicine and social welfare (73%), art and humanistic sciences (71%), and law (61%) (Ferigra Stefanovic, 2021; Dokmanovic, 2016). The gender differences in the areas of study could be one of the reasons for lower rates of female participation in the employment and labour market. These trends result in a higher concentration of women in the social service (75%), trade (56%), and personal service sectors (53%). Additionally, men are more likely to pursue entrepreneurship or self-employment (Oliver-Burgess et al., 2020).

This study addresses the pressing issue of the gender gap in entrepreneurship, particularly evident in Serbia where only approximately one third of SMEs are owned by women. Moreover, these women predominantly operate in traditional sectors characterised by low income and limited growth prospects. Building upon the assumption that educational attainment plays a crucial role in motivating individuals to embark on entrepreneurial ventures, as demonstrated by previous studies indicating that women with higher levels of education are more inclined to become entrepreneurs, our study aims to investigate whether the educational

[1] Statistical Office of the Republic of Serbia

background and level of education of female entrepreneurs impact various facets of female entrepreneurship. This includes exploring their decisions and motivation to pursue entrepreneurship, their choice of business sector, and the strategies employed in managing their businesses. If a correlation is identified, it suggests that enhancing educational opportunities in entrepreneurial skills could potentially improve the state of female entrepreneurship in Serbia. By fostering education in this domain, more women might be encouraged to actively participate in entrepreneurship, thereby contributing to a more inclusive and thriving entrepreneurial landscape.

Based on the assumptions that the motivation of female entrepreneurs and their experience and perceptions on being an entrepreneur are related to their education level, the following hypotheses were made:

General hypothesis:

H1. Education level has an impact on the way female entrepreneurs do business.

Specific hypotheses:

HS1. The motives that drive female entrepreneurs to start a business and the decision to become entrepreneurs are associated with their education level.

HS2. The choice of the business sector of female entrepreneurs is influenced by their education level.

HS3. The perception of the advantages of entrepreneurship among female entrepreneurs is associated with their education level.

HS4. The perception of the disadvantages of entrepreneurship among female entrepreneurs is associated with their education level.

3. RESEARCH METHODOLOGY

Our study was conducted in Serbia during the first half of 2023. The instrument for this research was developed by the authors, with a specialised questionnaire being designed for this purpose. The questionnaire was distributed to

respondents via email and additional online platforms, and the data were collected using Google Forms. The questionnaire contained 50 closed-ended and open-ended questions divided into three sections. The first section contained general questions related to the socio-demographic data of the respondents, including education level, and the other two sections contained specific questions regarding the socio-economic dimension of female entrepreneurship. The second section included questions about the respondents' entrepreneurial experience and general information about the enterprise, such as number of employees, annual income, and activity. The open-ended questions referred to the advantages and disadvantages of entrepreneurship as reported by female entrepreneurs. The responses obtained were grouped into several basic categories, which are presented in the research results. For the purpose of the analysis, these groups were represented as nominal-type variables and descriptive statistics were applied to them. The third section included 21 questions regarding the innovation management of the enterprise as the general approach to the business of female entrepreneurs. Descriptive statistics were used for grouping and presenting the results. The Pearson chi-square test of independence was used to assess whether observations consisting of measures on two variables are independent of each other. The Pearson correlation coefficient was used as a measure of linear correlation between the two sets of data. A one-way analysis of variance (ANOVA) was performed to compare the effect of education level on the business sector of female entrepreneurs.

The sample was drawn from a database of female-owned and managed companies of largest national organisation of women entrepreneurs, the Association of Business Women in Serbia, considered relevant for the study. The questionnaires were distributed to 300 official email addresses of these companies, with the identities of participating entities kept confidential to ensure anonymity. The questionnaire link was also distributed through the social media profile of the Association of Business Women. Thus, a total of 104 responses were received, and each company was provided with an equal opportunity to respond. The study sample consists of female entrepreneurs belonging to different sectors, with most of them managing micro enterprises (78%). The majority of respondents come from urban areas (94%), mostly from Belgrade (49%), Western Serbia (17%), and Vojvodina (14%). Most of the respondents work in the field of manufacturing crafts (17%), industry (10.4%), education and science (10.4%),

and media and communications (8.5%). Less represented are the fields of construction (7.5%), service crafts, trades, and legal services and administrative affairs (6.6% each), IT (5.7%), and tourism, hospitality, and transport (5.7%). The least represented are agriculture (4.7%), health (4.7%), and culture and art (3.8%). The respondents are mainly highly educated women, with 65.4% of female entrepreneurs having an undergraduate or a postgraduate education, 18.3% a college or vocational studies education, and 16.3% a vocational high school or grammar school/comprehensive school education.

4. RESEARCH RESULTS

4.1. Education level and motivation for entrepreneurship

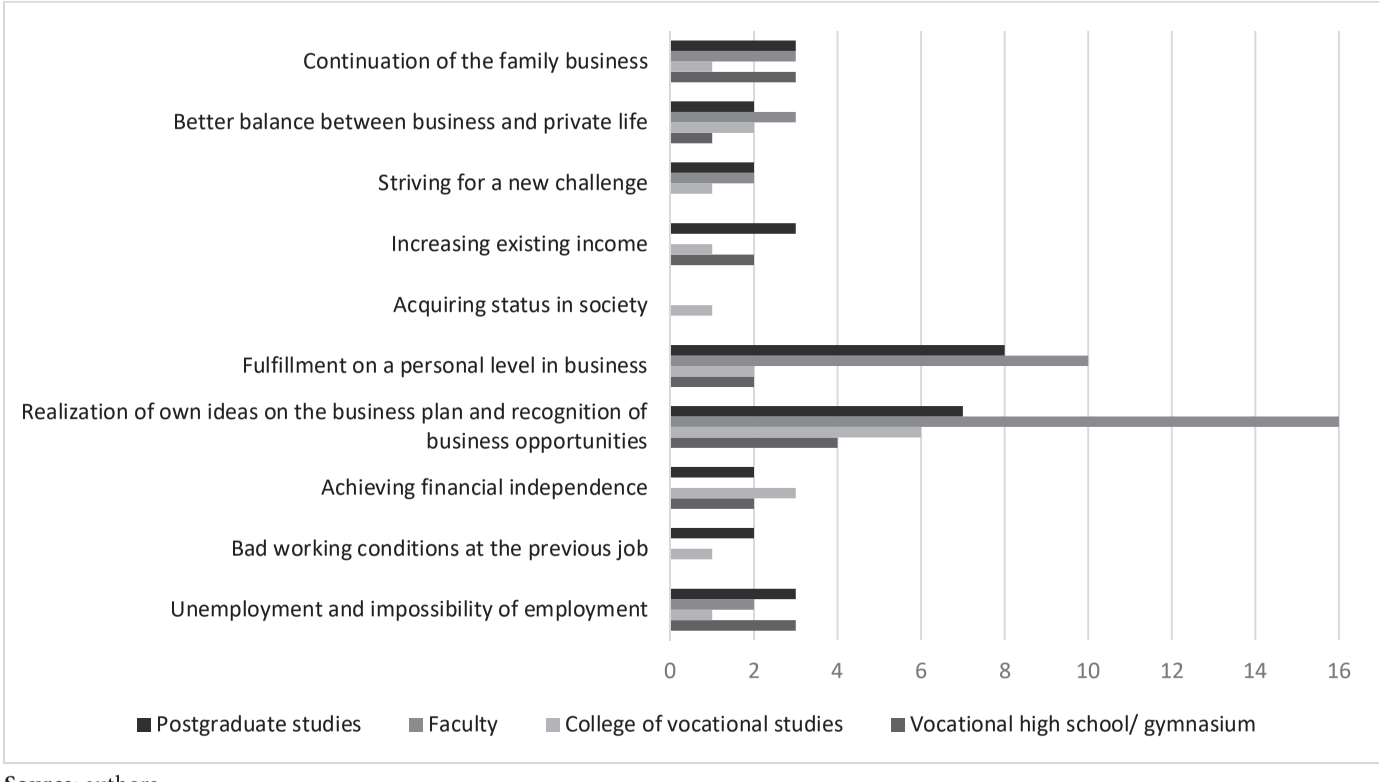
The decision to start a business was observed in relation to previous work experience in the field of business and the level of education, Table 1.

Table 1: Decision to start a business in relation to work experience and education level

Education level	Previous work experience in the field of business (Yes/No)		Total
	Yes	No	
Vocational high school/ grammar school/ comprehensive school	11	6	17
College or vocational studies	12	7	19
Undergraduate studies	17	19	36
Postgraduate studies	22	10	32
Total	62	42	104

Utilising the Pearson chi-square test, it was determined that there is no discernible association between the education level of female entrepreneurs and their decision to start a business in relation to their work experience ($X^2(3) = 3.698$, $p = 0.297$, $p>0.05$).

Figure 1: Motivation for starting a business in relation to education level



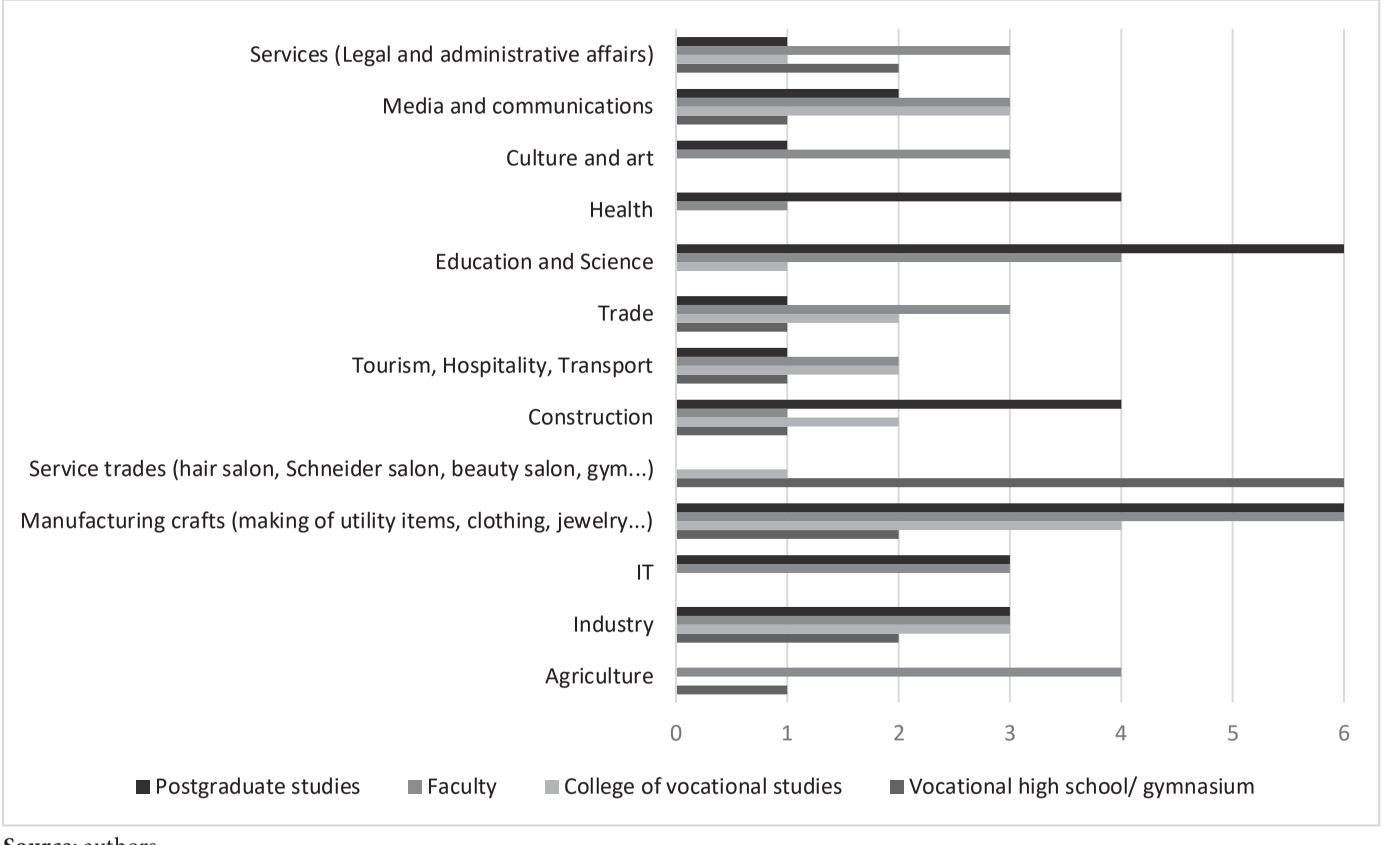
Source: authors

It was assumed that education level impacts women's motives for entrepreneurship, and this correlation was examined. It was demonstrated that the greatest motive for entrepreneurship was realisation of one's own idea while identifying business opportunities. The next motive was fulfilment at a personal level. In both cases, the largest number of female entrepreneurs with these motives have a university degree, whether undergraduate or postgraduate (see Figure 1). Acquiring status in society was the least prevalent motive among the female entrepreneurs of college or vocational studies education level. This can be connected partly with the national culture, which is predominantly collectivist. Female entrepreneurs of both the lowest and the highest education levels cited "Bad working conditions at previous workplace" as a motive for starting a business. The desire for new challenges is not seen as a motive by any female entrepreneur of the lowest education levels. The motives of acquiring status in society, poor working conditions at the previous workplace, increasing existing income, and achieving financial independence were not relevant for university-educated women. Utilising the Pearson chi-square test, it was determined that there was no discernible association between the education level of female entrepreneurs and their decision to start a business ($X^2(27) = 27.976$, $p = 0.412$, $p>0.05$). This refutes the first specific hypothesis, which posited that the decision and motive influencing women to start a business are connected to their education level. The obtained results indicate that a formal education level is not a decisive factor in a woman's decision to embark on a career in entrepreneurship.

4.2. Education level and choice of business sector

Examining the correlation between the two demonstrated that education level affects the choice of business sector (see Figure 2). Female entrepreneurs with the lowest level of education are not represented in businesses related to culture and art, health, education and science, and IT. Undergraduate-educated female entrepreneurs are represented in all the observed fields, except in service trades, as are female entrepreneurs with a postgraduate education, who are not represented in agriculture.

Figure 2: Business sector in relation to education level



Source: authors

One-way ANOVA was performed to compare the impact of education level on the choice of business sector. The results showed a statistically significant difference in the mean of the education levels between at least two groups [F(12, 91) = 3.421, p = 0.0001]. Tukey's HSD (honestly significant difference) test is a statistical method used to determine the minimum difference between two means that must exist for the difference to be considered statistically significant. The HSD is calculated on the basis of the analysis of variance results and the number of groups being compared. In practical terms, if the difference between the means of two groups is greater than the HSD value, then it is unlikely that this difference occurred due to random chance alone. Therefore, the two means are considered significantly different at a specified level of significance (usually set at 0.05 or 0.01), indicating a meaningful distinction between the groups. Tukey's HSD test for multiple comparisons showed that the mean value of the education levels was significantly different between the groups of the businesses service trades (with the lowest level of education, Sig.<0.0001) and all other sectors (see Table 2).

Table 2: Tukey's HSD test for different economic sectors depending on education level

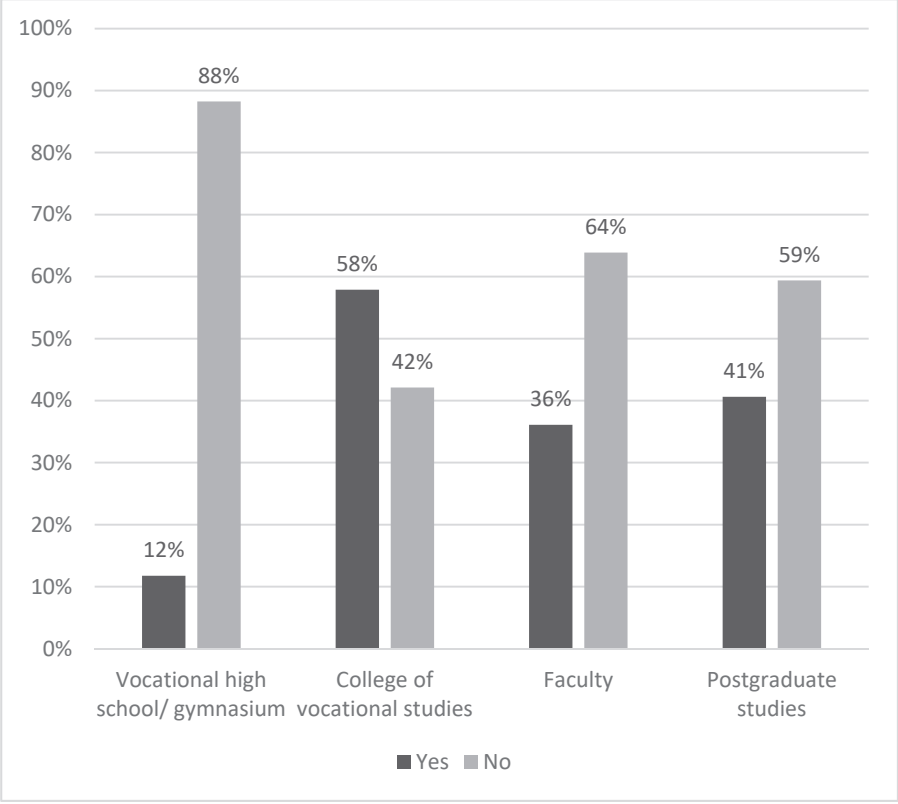
Service trades (hair salon, tailoring salon, beauty salon, gym, etc)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
Industry	-1.750*	0.247	0.000	-2.57	-0.93
IT	-2.356*	0.262	0.000	-3.23	-1.48
Manufacturing crafts (making of utility items. clothing. jewellery, etc)	-1.943*	0.232	0.000	-2.72	-1.17
Construction	-2.112*	0.255	0.000	-2.96	-1.26
Tourism, hospitality, transport	-1.562*	0.275	0.000	-2.48	-0.64
Trade	-1.600*	0.266	0.000	-2.49	-0.71
Education and science	-2.351*	0.240	0.000	-3.15	-1.55
Health	-2.633*	0.268	0.000	-3.53	-1.74
Culture and art	-2.094*	0.289	0.000	-3.06	-1.13
Media and communications	-1.709*	0.254	0.000	-2.55	-0.86
Services (legal and administrative affairs)	-1.550*	0.268	0.000	-2.44	-0.66

Female entrepreneurs with a medium level of education are mainly engaged in legal and administrative affairs services, agriculture, industry, and media, and female entrepreneurs with the highest education level are mostly engaged in health, IT industry, education and science. This validates the second specific hypothesis, suggesting that the business sector of female entrepreneurs is influenced by their education level.

4.3. The advantages of female entrepreneurship in relation to education level

The advantages of female entrepreneurship were identified in the questions which respondents answered in free form. The feeling of freedom to be one's own boss and manage one's own time is the predominant answer of respondents in all the education level categories (59.6%). Regardless of education level, considerably fewer respondents (35.58%) cited independence in decision-making as an essential advantage of entrepreneurship, as was the case with financial compensation commensurate with the commitment made (18.27%), which was cited to a similar extent by the respondents at all education levels. It was demonstrated as well that among the respondents of the same education level category, a significantly greater number of respondents did not consider financial compensation commensurate with the commitment made an advantage generally, especially at the higher levels of education. Even though achieving self-realisation can be very rewarding, both personally and professionally, our results showed that slightly more than one third of female entrepreneurs (37.5%) found this an important advantage of entrepreneurship (see Figure 3).

Figure 3: Self-realisation in relation to education level



Source: authors

In order to examine the relation between the advantages of freedom of being one's own boss and managing one's own time, independence in decision making, financial compensation commensurate with the commitment made, a sense of self-realisation, and education level, a Pearson chi-square test of independence was performed (see Table 3).

Table 3: The advantages of entrepreneurship in relation to education level

Advantages	Pearson chi-square test	p-value	Conclusion
The freedom to be your own boss and manage your own time	X^2 (3, N = 104) = 1.210	p = 0.751	"The freedom to be your own boss and manage your own time" is not associated with education level
Independence in decision making	X^2 (3, N = 104) = 3.136	p = 0.371	"Independence in decision making" is not associated with education level
Financial compensation commensurate with the commitment made	X^2 (3, N = 104) = 3.199	p = 0.262	"The attitude that financial compensation is commensurate with the commitment made" is not associated with education level
A sense of self realisation	X^2 (3, N = 104) = 8.339	p = 0.040	"A sense of self-realisation" is associated with education level

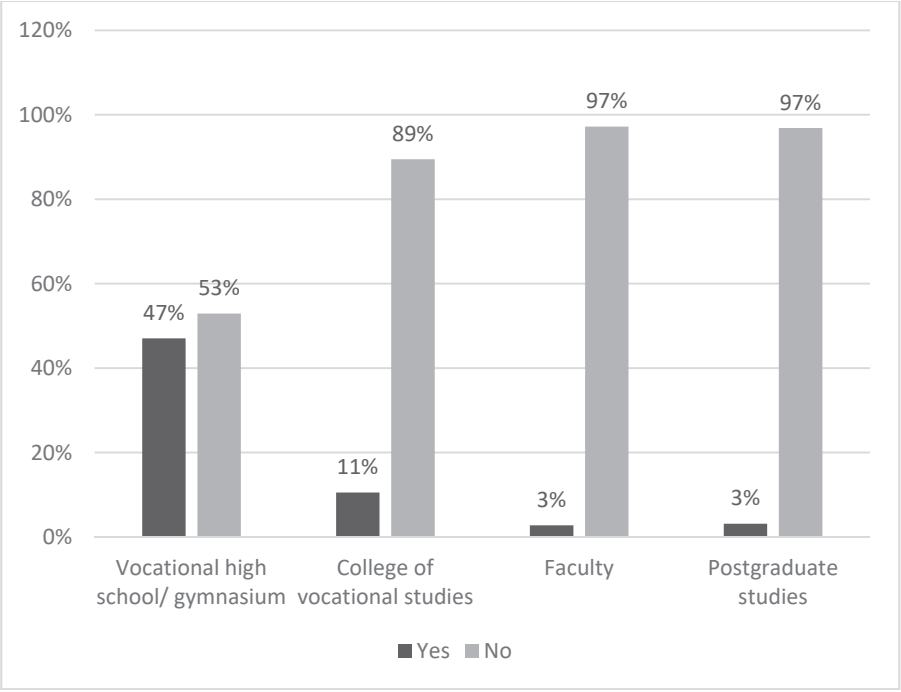
It can be concluded that the advantages of freedom to be one's own boss and manage one's own time, independence in decision making, and financial compensation commensurate with the commitment made are not associated with the education level of the female entrepreneur, while self-realisation is. This substantiates the third specific hypothesis, indicating that the perception of the advantages of entrepreneurship among female entrepreneurs is, to some extent, associated with their level of education.

4.4. The disadvantages of female entrepreneurship in relation to education level

The disadvantages of female entrepreneurship were identified from the questions which respondents answered in free form: difficulties in establishing a work–life balance, legal support of the state, corruption, high taxes and fees, inadequate conditions for pregnant women and mothers, uncertainty due to changing

market conditions and stress, too extensive administration and frequent changes in regulations, and lack of workers on the labour market (two cases). The results showed that slightly more than one third of the respondents (33.5%) believe that the main disadvantage of entrepreneurship is full-time work and a lack of time for a private life, while 26.92% of the respondents stated uncertainty and stress and 11.53% administration and frequent changes in regulations as the big disadvantages of entrepreneurship. Inadequate conditions for pregnant women and mothers were identified as a disadvantage by only 5 respondents (4.8%), and it might be stated that this is not considered an essential advantage of entrepreneurship. The largest number of female entrepreneurs who considered administration and frequent changes in regulations a disadvantage belongs to the category of vocational high school/grammar school/comprehensive school, which are, as shown before, involved mostly in manufacturing crafts and service trades (see Figure 4).

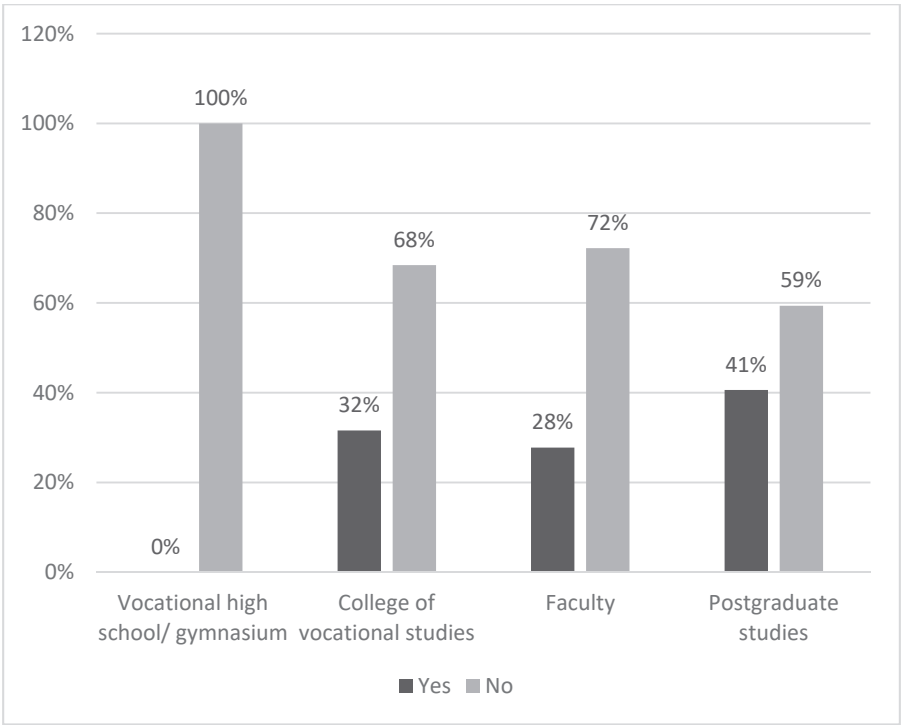
Figure 4: Administration and frequent changes in regulations in relation to education level



Source: authors

Financial and legal support of the state, corruption, and high taxes and fees are perceived as disadvantages by 11.54 % of respondents. Only respondents from the lowest education level category did not find this a disadvantage of entrepreneurship (see Figure 5).

Figure 5: Financial and legal support of the state, corruption, and high taxes and fees in relation to education level



Source: authors

Gender discrimination of some form was experienced by 40.38% of respondents, which makes this entrepreneurship disadvantage the most prevalent. Most of the female entrepreneurs who have experienced gender discrimination are university-educated women.

In order to examine the relationship between education level and the disadvantages identified, a Pearson chi-square test of independence was performed, the results of which can be found in Table 4.

Table 4: The disadvantages of entrepreneurship in relation to education level

Disadvantages	Pearson chi-square test	p-value	Conclusion
Difficulties in establishing a work–life balance	X^2 (3, N = 104) = 1.103	p = 0.776	"Difficulties in establishing a work–life balance" is not associated with education level
Inadequate conditions for pregnant women and mothers	X^2 (3, N = 104) = 0.521	p = 0.914	"Inadequate conditions for pregnant women and mothers" is not associated with education level
Uncertainty and stress	X^2 (3, N = 104) = 1.018	p = 0.797	"The attitude of female entrepreneurs about uncertainty and stress" is not associated with education level
Problems with administration and frequent changes in regulations	X^2 (3, N = 104) = 25.959	p = 0.0001	"Problems with administration and frequent changes in regulations" is associated with education level
Financial and legal support of the state, corruption, and high taxes and fees	X^2 (3, N = 104) = 9.285	p = 0.026	"Problems with financial and legal support of the state, corruption, and high taxes and fees" is associated with education level
Experienced gender discrimination	X^2 (3, N = 104) = 5.384	p= 0.146	"The experience of gender discrimination" is not associated with education level

Most of the identified disadvantages were stated by all female entrepreneurs, but an association with education level was obtained for administration and frequent changes in regulations and financial and legal support of the state, corruption, and high taxes and fees. This supports the fourth specific hypothesis, suggesting that the perception of the disadvantages of entrepreneurship among female entrepreneurs is, to some extent, associated with their level of education.

5. CONCLUSION

Our results show that the level of education of female entrepreneurs in Serbia has an impact on their entrepreneurial experience, although the decision to become an entrepreneur is not influenced by any previous experience in entrepreneurship nor by education level. Our findings are consistent with previous research, which has shown that the level of education can be a differentiating factor in the motive for entrepreneurship in so far as women with a high level of education are more likely to become "opportunity" entrepreneurs, while those with a lower level of education are more likely to become "necessity" entrepreneurs (Rahabhi et al., 2021).

We also find that the choice of business sector of female entrepreneurs is influenced by their education level. Female entrepreneurs with lower levels of education are mainly active in service and production crafts. Those with a medium level of education are predominantly engaged in legal and administrative affairs, agriculture, industry, and media and communications. University-educated female entrepreneurs are chiefly active in health, IT industry, education, and science.

Concerning the advantages of entrepreneurship, female entrepreneurs cited independence in decision making, adequate financial resources, self-realisation, and a feeling of freedom to be one's own boss and manage one's own time. These represented the predominant answers from respondents at all education levels. However, one of the main disadvantages for female entrepreneurs was stated to be difficulties in establishing an adequate work–life balance. This is consistent with the findings of previous studies which have shown that while some women choose entrepreneurship to balance work and family responsibilities (Rao, 2011) and establish a better work–life balance (Isah & Leko-Simic, 2022), after starting a business they may re-evaluate their prior expectation (Fosic et al., 2017). Female entrepreneurs face difficulties balancing work, family life, and social life (Deshpande, 2021; Tovmasyan, 2022), even finding role conflict between work and family life to be one of the most significant obstacles for creating or managing a new business (Rahabhi et al., 2021). The other disadvantages of entrepreneurship for female entrepreneurs include a lack of support from the state, corruption, high taxes and fees, inadequate conditions for pregnant women,

uncertainty due to changing market conditions and stress, too much administration and frequent changes in regulations, and gender discrimination.

The survey results further revealed that the key advantage of entrepreneurship associated with the education level of the female entrepreneur is a sense of self-realisation, an advantage felt predominantly by women with post-secondary education (see Figure 3). In contrast, freedom to be one's own boss and manage one's own time, independence in decision making, and adequate financial compensation are more likely to be experienced as advantages by female entrepreneurs independently of their education level.

The survey results also revealed that the key disadvantages associated with the education level of female entrepreneurs are related, firstly, to difficulties with the state administration and frequent changes in regulations (see Figure 4). These disadvantages are felt predominantly by female entrepreneurs with a lower (only secondary school) education level. Secondly, female entrepreneurs with a higher (post-secondary) level of education are more likely to experience disadvantages of entrepreneurship due to a lack of financial or legal support from the state, problems with corruption, and high taxes and fees (see Figure 5). All other disadvantages are experienced by female entrepreneurs independently of their education level.

This paper shows that female entrepreneurs with different education levels engaged in different sectors of business face different disadvantages in entrepreneurship and perceive different advantages in managing their businesses. Better educated female entrepreneurs are especially attracted by the sense of self-realisation in running a business, while less educated female entrepreneurs suffer disadvantages due to complex administration and changes in business regulations. More highly educated female entrepreneurs are more likely to experience disadvantages of entrepreneurship due to corruption and a lack of support from the state accompanied by high taxes and fees.

Since female entrepreneurship is an important source of economic competitiveness and growth in the Serbian economy, it would be important to support women in managing their own businesses. The results of this research indicate that policymakers should be aware of the differential impact of their policies on female entrepreneurs with different levels of education. Better

educated women can be supported by facilitating their self-realisation in setting up and running a small business, while less educated women need much greater support from the state than is currently available in dealing with complex administration and business regulations. At the same time, more highly educated female entrepreneurs need more support from the state in dealing with corruption and with high taxes and fees.

The limitations of the study relate to the unequal distribution of education levels in the research sample, as higher education accounted for about 65% of the respondents, as well as the insufficient representation of respondents from rural areas. Further research should provide a more profound investigation into the problems of female entrepreneurs identified in this study, in order to provide more detailed insight into the relationship between education and the decision and motives to engage in entrepreneurial activities and the choice of business sector, as well as to include female entrepreneurs from rural areas with different education levels to a greater extent.

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IMPACT OF CRUDE OIL PRICE VOLATILITY ON INDIAN STOCK MARKET RETURNS: A QUANTILE REGRESSION APPROACH

ABSTRACT: *This paper examines the heterogenous effect of oil price volatility on Indian sectoral stock returns for the period January 2011 to September 2022 using the quantile regression method, which helps us to analyse the impact in bearish, normal, and bullish periods. The results show that total and sectoral stock returns are negatively affected by oil price fluctuations and the negative effect is stronger during the bearish period. In the normal and bullish periods, oil price volatility does not affect stock returns greatly. The interest rate and exchange rate changes have a stronger effect on sectoral returns in the bearish period in the pharmaceutical, healthcare, banking and finance, IT, fast-moving consumer goods (FMCG), and consumer durables sectors. The study shows that the impact of oil price volatility on sectoral returns is less than the impact of interest rate and exchange rate changes. The study also shows that oil price volatility directly impacts market portfolio returns initially, which subsequently spills over to sectoral returns, which implies that sectoral returns are impacted by oil price volatility through an indirect channel.*

KEY WORDS: *oil price volatility, sectoral returns, quantile regression, bearish, bullish*

JEL CLASSIFICATION: C32, G10, E44

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1. INTRODUCTION

Crude oil is an important resource for all countries across the world. As countries develop, urbanise and modernise, the demand for this black gold rises. The irregularity of crude oil prices might affect business cash flow as crude oil is a major input used in production and can affect stock exchange growth (Belhassine & Karamti, 2021). Fluctuations in crude oil prices have a significant impact on stock market returns since they adversely affect discount factors and future cash flows of firms (Youssef & Mokni, 2019).

Theoretically, this relationship is justified by the fact that asset prices are evaluated using the current discounted value of future dividends and earnings. The links between stocks and oil prices can be attributed to changes in expected cash flows or discount rates. Expected cash flows can be affected by oil prices, as oil is a crucial input in most firms' production process and leads to changes in costs, affecting earnings and dividends and, hence, stock prices. On the other hand, discount rates comprise an expected inflation and a real interest rate component. Higher oil prices may lead to overestimation of the expected inflation and thus higher nominal interest rates; and since discount rates are negatively related to stock prices, increases in interest rates depress stock prices.

Like oil price changes, the crude oil market's unpredictability also affects economic and financial structures and influences stock returns (Nath et. al, 2014). However, most of the research has used crude oil and stock prices measured by historical price series. Now, instead, there is a fresh perspective to explore the relationships between the oil price volatility and the stock market by using the oil volatility index (OVX). The crucial reason for this is that the OVX derived from market options contains both historical and future volatility information, and is thus regarded as a direct and more accurate measure of uncertainty in the oil market (Xiao et.al, 2018). Oil price volatility quantifies the degree of uncertainty associated with fluctuations in oil prices within the market. High volatility is indicative of significant price fluctuations, which pose challenges for both oil-exporting and oil-importing nations. Increased uncertainty in oil prices escalates the costs involved in managing this critical resource, thereby adversely impacting economic stability and planning (Choi & Hong, 2020). Therefore, it is essential to investigate the oil market and stock returns from the perspective of ambiguity.

Uncertainty in the oil price might reduce investment, production, and aggregate outputs (Bloom, 2009).

There exist a large number of studies that highlight the relationship between oil prices and economic activities. Since the stock market is considered the barometer of an economy, most of the studies have focused on oil prices and the stock market as a whole. The use of aggregate stock returns may not be appropriate to analyse the underlying dynamics of the relationship between oil prices and stock returns across sectors due to cross-correlations (Arouri et al., 2012; Smyth & Narayan, 2018). Aggregate indices may mask the heterogeneity at the sector level. Therefore, using sectoral indices allows us to better understand the transmission channels of oil market shocks to the stock market (Ahmadi et al., 2016).

Oil price volatility may have a differential impact on sectoral stock returns depending on whether they are from oil-intensive or non-oil-intensive sectors.

i) Oil-intensive sectors: Sectors that are highly dependent on oil as a key input, such as energy and transportation companies, might be more directly impacted by oil price volatility. When oil prices rise, the costs of production and transportation increase, which can lead to lower profits and stock prices. On the other hand, when oil prices fall, these companies tend to benefit from lower input costs, which can boost profits and stock prices.
ii) Non-oil-intensive sectors: Sectors that are less dependent on oil as a key input, such as technology and healthcare firms, might be less directly impacted by oil price volatility. However, they can still be affected indirectly through higher transportation costs, increased inflation, and changes in consumer spending. Higher oil prices can lead to increased production and transportation costs, which can lead to reduced profitability and lower stock prices for non-oil-intensive companies.

This paper focuses on the heterogenous impacts of oil price uncertainty measured by the OVX on Indian sectoral stock returns under different market conditions by using the quantile regression method to observe the dependence under bearish, normal, and bullish market conditions. There is a paucity of studies that investigate the relationship between oil price uncertainty and the Indian stock market, especially from the perspective of oil price volatility. As India is a net oil

importing country, the study and the understanding of the effects of oil price volatility (i.e. a measure of ambiguity) on sectoral stock returns is indeed crucial. In this regard, this study contributes to the existing literature.

The main findings of the study are: Oil price volatility negatively affects Indian sectoral returns at all quantiles and is stronger at the lowest quantiles. In normal and bullish periods, the relationship is more or less stable in most of the sectors. Furthermore, interest rate and exchange rate changes also affect sectoral returns at all quantiles. However, the impact of interest and exchange rate changes on sectoral returns is greater than the impact of oil price volatility.

The remainder of the study is organised as follows. The following section provides a review of literature. Section 3 explains the data and methodology. Section 4 deals with a discussion of the results, and the final section provides our conclusion and discussion.

2. LITERATURE REVIEW

2.1. Studies based on the link between oil prices and stock markets

The foundational work of Hamilton (1983) established a critical link between oil prices and economic activity, suggesting that fluctuations in oil prices could precipitate economic recessions. This early research laid the groundwork for subsequent studies exploring the dynamic relationship between oil prices and stock markets. Later studies on the effects of oil prices on stock markets by Brown and Otsuki (1990), Ferson and Harvey (1995), Kaneko and Lee (1995), and Jones and Kaul (1996) reported negative effects. Malik and Ewing (2009), conducting an early study focusing on six US sectoral stock market indices, found that oil price volatility positively affects sectoral stock market volatility, although this effect was not observed in the financial and industrial sectors. Vo (2011) examined the relationship between the S&P 500 index and West Texas Intermediate (WTI) crude oil price volatilities from 1999 to 2008, discovering a mutual interdependence between the two. This was corroborated by Mensi et.al (2013) who found positive bidirectional effects between S&P500 and WTI volatilities, although the same did not hold for Brent crude oil. Numerous studies have been conducted on the potential links between crude oil prices and stock (Filis et al., 2011; Jammazi et al., 2017, Maghyereh et al., 2019). Degiannakis et al.

(2018) gives a comprehensive review of the research papers dealing with the relationship between the oil price and the stock market. The review indicates that the causal effects between oil and stock markets are heavily influenced by whether the research utilises aggregate stock market indices, sectoral indices, or firm-level data, as well as whether the stock markets are situated in net oil-importing or net oil-exporting countries. Furthermore, the conclusions vary based on whether studies examine symmetric or asymmetric changes in oil prices, or whether they focus on unexpected changes in oil prices. Ultimately, the review finds that most studies demonstrate that oil price volatility transmits to stock market volatility and that incorporating measures of stock market performance enhances the forecasts of oil prices and oil price volatility.

Most of the papers examine return spillovers or return volatilities, and the evidence implies that rising crude oil prices could impact the world economy. Sadorsky's (1999) results from a vector autoregression show that oil prices and oil price volatility both affect real stock returns. There is evidence that oil price changes explain a larger portion of the forecast error variance in real stock returns than changes in interest rates, and oil price volatility shocks have asymmetric effects on the economy. Basher and Sadorsky (2006), using a multi-factor model that allows for both unconditional and conditional risk factors, investigated the relationship between oil price risk and emerging stock market returns and found strong evidence that oil price risk impacts stock price returns in emerging markets. Nandha and Faff (2008) analyse 35 DataStream global industry indices to study the extent to which oil price shocks affect stock market returns. Their results show that oil price rises negatively impact equity returns for all sectors except mining and oil and gas industries. These results are consistent with economic theory. Kilian and Park (2009) document that oil price changes have different impacts on equity returns, depending on the source (demand vs. supply) of the structural shock. Kilian (2009) proposes a structural vector autoregression approach to disentangle oil price shocks into demand and supply shocks at monthly frequency. The extent of volatility transmission between the oil and stock markets in Europe and the US at the sector level is examined by Arouri et al. (2012). They found that those industries which make use of oil and oil-related products as their inputs or output are affected more by oil price volatilities. The general notion is that oil price changes matter to some industries but not all. Sreenu (2022) examines the asymmetric effects of ambiguity shockwaves by

applying the positive (+) and negative (-) fluctuations of the crude oil price volatility index and also measures whether the reform of 2012 stimulated the oil price volatility index and stock market relationship. The results indicate that the changes in the oil price volatility index mostly confirm the significant adverse effects on the aggregate and various economic sectoral stock returns and also show that the information content of the crude price oil volatility index improves the volatility forecasts for stock market returns. Joo and Park (2021) investigate the effects of oil price volatility on the stock market returns of ten major oil-importing countries. They make use of both quantile regression and quantile-on-quantile regression approaches and find that oil price uncertainty has an asymmetrical effect on stock returns and this asymmetric behaviour depends on the level of stock returns and also on oil market conditions.

2.2. Studies based on various methodologies

A wide range of literature uses different methodologies to understand the relationship between oil prices and stock market returns. Arouri and Rault (2012) analyse the long-run relationship between oil prices and stock markets in the Gulf Cooperation Council (GCC) using recent bootstrap panel cointegration techniques and seemingly unrelated regression (SUR) methods and find that oil price increases have a positive impact on stock prices, except in Saudi Arabia. Gogineni (2010) investigates the impact of oil price changes on the stock returns of industries by classifying them into oil- intensive and non-oil-intensive groups and concludes that sensitivity of industries' returns to oil price changes depends on oil on both the cost-side and demand-side dependence and that the relative effects of these factors vary across industries. Broadstock et al. (2014) attempt to decompose the impact of oil price shocks on stock returns into two channels of effects: direct and indirect. A rise in oil prices increases the operational costs of the firms belonging to some industries, which results in lower profit and low stock prices. This relates to the effect through the direct channel, whereas the indirect channel arises through the impact on systematic risk. Jammazi et al. (2017) investigate the presence of time-varying causal interdependencies between shocks in oil prices and stock returns for oil-importing countries (including Spain). They combine wavelet analysis and a new version of the dynamic causality test of Lu et al. (2014) and find a significant bidirectional oil and stock market causal relation over various periods for all nations. Zhang (2017) makes use of the methodology of measuring connectedness developed by Diebold and Yilmaz

(2014) to study the association between oil shocks and returns at six major stock markets around the world and come up with the finding that the contribution of oil shocks to the world financial system is limited and only significant shocks matter. Using the spillover index approach developed by Diebold and Yılmaz (2009, 2012, 2014, 2015) and the dynamic correlation coefficient model developed by Engle (2002), Antonakakis et al. (2018) investigate the volatility spillovers and co-movements among oil prices and stock prices of major oil and gas corporations in order to identify the transmission mechanisms of volatility shocks. Wei et al. (2019) study the connectedness between crude oil prices and the China stock market by applying a nonlinear threshold cointegration method within a multivariate framework. The results show that the long-term relationships between them shift significantly across different market regimes and have seen substantial improvement in recent years due to changes in China's refined oil pricing mechanism and exchange rate system.. Umar et al. (2021) examines both the static and dynamic linkages between risk, demand, and supply shocks in oil prices and the performance of equity indices in Spain, covering the period from January 2000 to July 2019.They used Ready's (2018) methodology for disentangling the oil price shocks and Diebold and Yılmaz's (2014) approach for analysing the connectedness between the disentangled oil shocks and the sector equity returns. They document differences over time and between sectors, mainly during the recent global financial crisis and the European sovereign debt crisis. Overall, financials, telecommunications, industrials and utilities are the most influential sectors. Chowdhury & Irfan (2022) examine the connectedness between the sectors in the Indian stock market for the period January 2011 through December 2020 making use of a TVP-VAR-based connectedness approach which shows that nearly 84% of the forecast error variance throughout the entire study period may be attributed to cross-sectional shocks within the network of Indian stock market sectors. Thus, shocks only explain 16% of the total variability, indicating strong overall sectoral reliance. The results suggest that cyclical stocks are the net transmitters of shocks and noncyclical stocks the net receivers.

There are a few studies on oil-importing countries which analyse the influence of oil price uncertainty on stock returns (Maghyereh et al., 2019; Silvapulle et al., 2017).

The aforementioned studies analyse the connection between the oil and stock markets using some linear models and/or conditional mean specifications, such as vector autoregression. Although the conditional mean specification offers some insightful information on the linear relationship, it might fall short in explaining several significant elements of oil and stock price trends. These models contain only the average relationship between oil and stock prices and do not capture the distributional heterogeneity. Such models or specifications do not consider such market conditions as the boom or bust of oil and stock markets. Unfortunately, the underlying relationship at lower and higher quantiles of data cannot be captured by these conditional mean-based time series models. When the distribution of the time series under study is skewed and leptokurtic, it is difficult to find some noteworthy correlations between different quantiles of the time series variables. In order to give a more thorough examination of the connection between oil price volatility and Indian sectoral stock returns, it is imperative to use an appropriate methodology that captures the entire dependence structure of oil and stock market returns. To accommodate this aspect, this study makes use of a quantile regression method which considers the entire conditional distribution of the dependent variable and offers an alternative approach to analyse the potential heterogeneity (and capture the asymmetric nature) in the data.

3. MATERIAL AND METHODS

The study makes use of Chicago Board Options Exchange (CBOE) crude oil price volatility index (OVX) data and Indian sectoral returns data from the automobile, consumer durables, realty, metal, pharmaceutical, IT, healthcare, fast-moving consumer goods (FMCG), and finance and banking sectors and total aggregate index Nifty 50 data from the National Stock Exchange of India database. Daily stock returns data and daily sectoral returns data are used in the study. The period considered is from January 2011 to September 2022. The daily call money interest rate and exchange rate (with respect to the dollar) data are taken from the Reserve Bank of India database.

3.1. Quantile regression approach

The quantile regression model is used to explore the dependence between oil price volatility and sectoral stock returns in India. Quantile regression is an

extension of standard regression, providing a complete picture of a conditional distribution. Only focusing on mean effects may lead to inaccurate estimation of relevant coefficients or omission of important relationships (Binder & Coad, 2011). The quantile regression estimator is less sensitive to the presence of outlier observations, skewness, and heterogeneity of the response variable (Koenker & Hallock, 2001). Quantile regression was first introduced by Koenker and Bassett (1978). This method assumes that the value of ϵ_i conditional on the regressors in the τ-th quantile is zero. Then, the conditional quantile model of y_i given x_i is specified as follows:

$$Q_{y_i}(\tau|x) = \alpha(\tau) + x_i'\beta(\tau), \tag{1}$$

where $0 < \tau < 1$, $Q_{y_i}(\tau|x)$ denotes the τ-th conditional quantile of y_i, $\beta(\tau)$ is the estimated parameter in the equation, and α presents the unobserved effect. x includes variables assumed to affect the dependent variable. The coefficients of the τ-th quantile of the the conditional distribution are estimated as:

$$\hat{\beta}(\tau) = arg \min_{\beta \in \mathbb{R}^p} \sum_{i=1}^{n} \rho_\tau\big(y_i - x`_i\beta(\tau) - \alpha(\tau)\big), \tag{2}$$

where $\rho_\tau(u) = u(\tau - I(u < 0))$ is the check function and $I(.)$ is an indicator function (in this case, $u = y_i - x`_i\beta(\tau) - \alpha(\tau)$).

The stock market usually has diverse market conditions. It oscillates between bearish, normal, and bullish periods. Therefore, policymakers and stockholders are interested in understanding in detail how the crude oil price unpredictability impacts stock market returns under diverse market circumstances in order to devise appropriate investment and risk management strategies. In such a scenario, the quantile regression technique proposed by Koenker and Bassett (1978) could be an appropriate estimation procedure to capture the impact of independent variables on the different conditional distributions of the dependent variable. Also, compared to the ordinary least square (OLS) regression, the quantile regression can produce more precise results since it is less susceptible to outlier observations, skewness of the distribution, and heterogeneity of the dependent variable (Koenker & Hallock, 2001).

A functional understanding of the correlation between oil prices and stock returns necessitates an accurate analysis of extreme tail event risk and its time-varying impact on the market. Consider the following regression model to analyse how the impact of oil price uncertainty varies across different quantiles of stock returns:

$$r_t = \alpha + \beta_1 OVX_t + \beta_2 IR_t + \beta_3 ER_t + \varepsilon_t \,, \tag{3}$$

where r_t is the sectoral stock return at time *t*, OVX_t is the oil price volatility at time t, $IR_t$is the call money interest rate at time t, and ER_t is the exchange rate at time t; ε_t denotes the usual error term. To increase the explanatory power of the model, the call money interest rate and exchange rate are added as control variables in addition to the oil price volatility. Oil price changes might affect stock prices by influencing expected earnings. However, it is essential to control for interest rate changes that could also affect stock prices which directly influence the discount rate on expected earnings. Spiro (1990) reported that the interest rate is primarily responsible for the short-term volatility of stock price indices. Similarly, the exchange rate also affects stock prices, which is evident from the flow-oriented model of Dornbusch and Fischer (1980), which posits that changes in the foreign exchange rate can affect trade balances and international competitiveness. The phenomenon can be explained as follows: a depreciation (or appreciation) of the local currency will make domestic firms more (or less) competitive by having cheaper (or expensive) exports in international trade which will ultimately lead to an appreciation (or depreciation) of the stock prices of domestic firms. In this regard, the causality will run from the exchange rate to stock prices. Therefore, it is necessary to control for the effect of the exchange rate on stock returns as well.

We can then write the conditional quantile function of r_t given the covariates as:

$$Q_{r_t}(\tau|x_t) = \alpha(\tau) + \beta_1(\tau) OVX_t + \beta_2(\tau) IR_t + \beta_3(\tau) ER_t \,, \tag{4}$$

where $Q_{r_t}(\tau|x_t)$denotes the τ^{th} conditional quantile of r_t, $0 < \tau < 1$, and $\alpha(\tau)$ and $\beta_i(\tau)$, i = 1,2,3, are the regression quantile coefficients.

We can estimate the regression quantile $\beta_i(\tau)$, i = 1,2,3, by solving the following minimisation problem:

$$\min_{(\alpha,\beta`)`\in\backslash\mathbb{R}^p} \sum_{i=1}^{n} \rho_\tau(r_t - \alpha(\tau) - \beta_1(\tau)OVX_t - \beta_2(\tau)IR_t - \beta_3(\tau)ER_t), \quad (5)$$

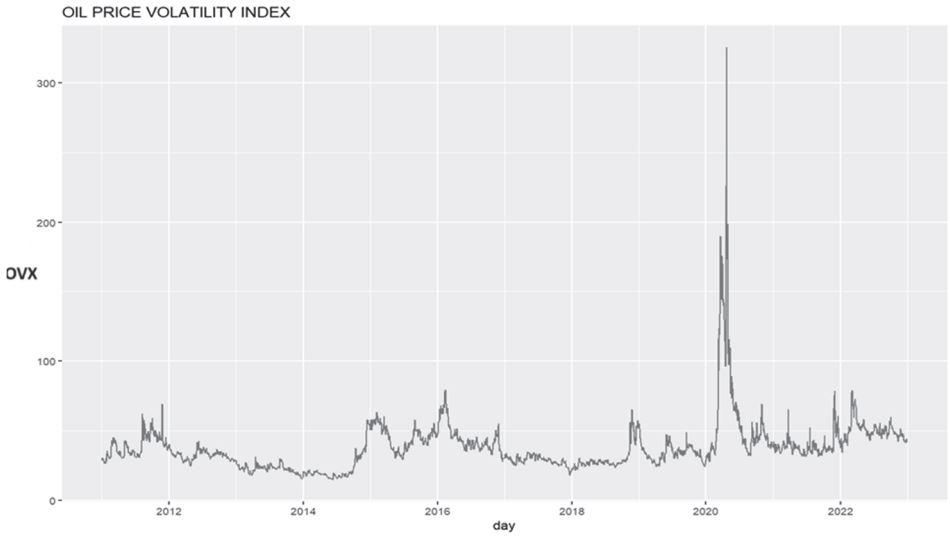
where $\rho_\tau(u) = u\big(\tau - I(u < 0)\big)$ is the check function and $I(\cdot)$ is an indicator function. In Eq.(5) $\beta_1(\tau)$ measures the marginal effects of oil price volatility at the τ quantile levels. In the quantile regression model, we represent stock market conditions by different quantile levels. In the empirical analysis, we choose nine quantiles, τ = (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9), where the low quantile (0.1), middle (0.4, 0.5, 0.6), and high quantiles (0.9) represent bearish, normal, and bullish market conditions, respectively. Therefore, the quantile regression analysis allows us to investigate the impact of oil price volatility under different stock market conditions. The *quantreg* package developed by Roger Koenker was used for the purpose of this analysis.

4. RESULTS AND DISCUSSION

The index returns, which represent the change in value of an index over time, can be computed using the first difference of the natural logarithmic series. $r_t = \ln(p_t - p_{t-1})$, where r_t is the return on the index at time *t*, and p_t and p_{t-1} are the price or index at time *t* and *t*-1, respectively. Log returns are also taken for the exchange rate and oil price volatility index but the interest rate is used at the levels.

As we can see from the diagram, there are substantial spikes in the OVX throughout the sample period. For example, the most substantial spike is during the 2020 COVID crisis. The oil price volatility is extreme during this crisis. In the 2015–16 period, the oil price volatility index also has a minor spike. The oil price volatility index changes indicate high uncertainty in the Indian crude oil market.

Figure 1. Oil price volatility index over the period.



In order to analyse how the changes in the oil price volatility index affect Indian sectoral stock returns under different market conditions, the quantile regression method is applied. Tables 1 and 2 show the OLS and quantile regression estimation outcomes. OLS regression coefficients are included in the table to make a comparison with the quantile regression coefficients. The OLS regression helps to understand the average effect of the independent variable on the dependent variable values. Based on the value of the OLS coefficients in Table 1, the study finds that the oil price volatility index deviations negatively affect the sectoral stock returns. This signifies that higher uncertainty in the crude oil market leads to lower stock market returns. One explanation for this outcome is that crude oil plays a significant role in the production of various goods and services. The increase in crude oil price uncertainty negatively affects investments in the real economy, which in turn leads to lower stock returns (Sreenu , 2022).

Table 2 shows the respective quantile regression coefficients from 0.01 to 0.99. The bearish period is represented by $\tau = 0.01, 0.05, 0.1$, the normal period by τ =0.4,0.5,0.6, and the bullish period by $\tau = 0.9$, 0.95, 0.99. These coefficients capture the heterogeneous dependence of crude oil price uncertainty on sectoral stock returns under diverse market conditions.

Table 1. OLS regression results.

SECTORS	Nifty 50	Automobile	Consumer	Finance	FMCG	Metal	Realty	Health	Pharma	IT	Bank
OVX	0.033***	-0.04***	0.023***	0.023***	-0.021***	-0.05***	0.037***	0.019***	-0.021***	-0.024***	0.041***
Interest rate	0.000	0.000	-0.000015	0.000	0.000	-0.0003.	0.00023	0.000	0.000	0.000	0.00003
Exchange rate	-0.758***	-0.860***	-0.7819***	-1.106***	-0.444***	-0.931***	-1.282***	-0.281***	-0.253***	-0.183***	-1.099***

Note: Significance levels: *** $p< 0.001$, ** $p< 0.01$, * $p< 0.05$, . $p< 0.1$

Table 2. Quantile regression results

QUANTILES													
SECTORS	**0.01**	**0.05**	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**0.95**	**0.99**
Nifty50													
Intercept	-0.031***	-0.014***	-0.009	-0.003	0.000	0.001	0.000	0.002	0.004	0.007	0.009	0.013	0.03***
OVX	-0.066*	-0.042***	-0.036***	-0.036***	-0.035***	-0.033***	-0.032***	-0.026***	-0.026***	-0.025***	-0.027***	-0.029***	-0.032
InterestRate	0.0008	-0.0002	-0.0003	-0.0004**	-0.0004***	-0.0004***	0.0001	0.0001	0.0001	0.000	0.0004*	0.001**	-0.001
ExchangeRate	-0.961*	-0.827***	-0.772***	-0.736***	-0.68***	-0.692***	-0.688***	-0.717***	-0.717***	-0.771***	-0.770***	-0.607***	-0.462
Automobile													
Intercept	-0.031***	-0.014***	-0.009	-0.003	0.000	0.001	0.000	0.002	0.004	0.007	0.009	0.012	0.029***
OVX	-0.066	-0.043***	-0.037***	-0.036***	-0.039***	-0.034***	-0.027***	-0.027***	-0.029***	-0.035***	-0.033***	-0.042***	-0.032
InterestRate	0.003**	0.0005	-0.000	-0.0004*	-0.0004*	-0.0004***	0.0001	0.0004**	0.0002	0.0001	0.0001	-0.005	-0.001
ExchangeRate	-1.087***	-0.902***	-0.862***	-0.705***	-0.688***	-0.685***	-0.702***	-0.782***	-0.833***	-0.857***	-0.802***	-0.615***	-0.645***
Consumer													
Intercept	-0.037***	-0.017***	-0.011***	-0.004***	0.0001	0.001	0.000	0.002*	0.004	0.008***	0.013***	0.016***	0.034**
OVX	0.003	-0.024***	-0.027***	-0.029***	-0.021***	-0.024***	-0.022***	-0.021***	-0.022***	-0.022***	-0.018***	-0.014	-0.016
InterestRate	0.001	-0.0001	-0.0003	-0.0005**	-0.0005***	-0.0004***	0.0002.	0.0002	0.0003*	0.0002	0.000	0.001.	-0.0001
ExchangeRate	-1.181*	-0.955***	-0.851***	-0.754***	-0.723***	-0.681***	-0.644***	-0.635 ***	-0.645***	-0.682***	-0.666***	-0.674***	-0.898
Finance													
Intercept	-0.039***	-0.021***	-0.002***	-0.005***	0.000	0.001*	0.000	0.000	0.004***	0.007***	0.012***	0.021***	0.042***
OVX	-0.028	-0.029***	-0.032***	-0.033***	-0.026***	-0.029***	-0.026***	-0.024***	-0.024***	-0.019***	-0.013***	-0.021***	-0.027
InterestRate	0.002	0.001	0.0003	-0.0002**	-0.0002***	-0.0004***	0.0002	0.0008**	0.0007*	0.0010*	0.0012*	0.0008	0.0007
ExchangeRate	-0.853***	-1.051***	-1.033***	-0.900***	-0.910***	-0.824***	-0.818***	-0.834***	-0.859***	-0.835***	-0.984***	-0.803***	-0.706***
FMCG													
Intercept	-0.022*	-0.0103***	-0.008***	-0.005***	-0.002*	0.000	-0.0008**	0.000	0.002**	0.004***	0.011***	0.014***	0.025***
OVX	-0.037	-0.023**	-0.024***	-0.019***	-0.019***	-0.019***	-0.018***	-0.017***	-0.017***	-0.018***	-0.017***	-0.023**	-0.030**

InterestRate	-0.0008	-0.0009**	-0.0005*	-0.0003	-0.0003*	-0.0003*	0.0003***	0.0004***	0.0004***	0.0006***	0.0003	0.0005	0.0003
ExchangeRate	-0.40	-0.436***	-0.503***	-0.438***	-0.42***	-0.374***	-0.39***	-0.357***	-0.3670***	-0.366***	-0.451***	-0.513***	-0.750*
Metal													
Intercept	-0.053***	0.028***	-0.019***	-0.008***	-0.001	0.003***	0.000	0.004**	0.009***	0.015***	0.024***	0.031***	0.05***
OVX	-0.098	-0.071***	-0.052***	-0.058***	-0.049***	-0.041***	-0.038***	-0.042***	-0.044***	-0.052***	-0.051***	-0.067***	-0.047
InterestRate	0.0013	0.0001	-0.0002	-0.0006**	-0.0009***	-0.0010***	-0.0001	0.0000	-0.0002	-0.0002	-0.0005	-0.0006	-0.001
ExchangeRate	-1.246***	-1.024***	-1.032***	-0.99***	-1.022***	-1.031***	-0.976***	-0.998***	-1.019***	-0.939***	-0.865***	-0.766***	-0.12
Realty													
Intercept	-0.044**	-0.021***	-0.010***	-0.006***	-0.002	0.002*	0.000	0.001	0.006***	0.011***	0.018***	0.023***	0.051***
OVX	-0.083	-0.043*	-0.039**	-0.038***	-0.037***	-0.033***	-0.037***	-0.030***	-0.031***	-0.027***	-0.036***	-0.025	0.007
InterestRate	-0.002	-0.002***	-0.002***	-0.0011***	-0.0009**	-0.0008***	0.0002	0.0005*	0.0005*	0.0007*	0.001	0.001**	0.00
ExchangeRate	-1.735***	-1.648***	-1.465***	-1.304***	-1.381***	-1.237***	-1.227***	-1.176***	-1.155***	-1.214***	-1.164***	-1.176***	-1.100**
Health													
Intercept	-0.037***	-0.02***	-0.017***	-0.01***	-0.004***	-0.001	0.000	0.000	0.004***	0.009***	0.015***	0.021***	0.041***
OVX	-0.032	-0.021**	-0.027***	-0.025***	-0.026***	-0.019***	-0.020***	-0.016***	-0.017**	-0.011*	-0.01***	-0.005	-0.003
InterestRate	0.001	0.0006*	0.0007***	0.0003	0.0001	-0.0001	0.0002*	0.0003**	0.0001	-0.0001	-0.0004*	-0.0004	-0.0019*
ExchangeRate	-0.857**	-0.324***	-0.280***	-0.278***	-0.273***	-0.230***	-0.221***	-0.261***	-0.229***	-0.237***	-0.179**	-0.118	0.086
Pharma													
Intercept	0.041***	-0.042***	-0.021***	-0.018***	-0.005***	-0.002	0.000	0.000	0.004***	0.009***	0.017***	0.025***	0.044***
OVX	-0.035	-0.023**	-0.031***	-0.028***	-0.025***	-0.017***	-0.019***	-0.015***	-0.014**	-0.011*	-0.014*	-0.013*	0.005
InterestRate	0.002	0.0005	0.0007***	0.0004	0.0001	0.0000	0.0002*	0.0004**	0.0002	0.0000	-0.0004*	-0.0008**	-0.002*
ExchangeRate	-0.783***	-0.326**	-0.23**	-0.23***	-0.261***	-0.237***	-0.208***	-0.232***	-0.231***	-0.206***	-0.298***	-0.080	0.112
IT													
Intercept	-0.032***	-0.02***	-0.015***	-0.007***	-0.003**	0.001*	0.000	0.002	0.005***	0.009***	0.016***	0.022***	0.041***
OVX	-0.021	-0.041	-0.034***	-0.022***	-0.025***	-0.02***	-0.019***	-0.020***	-0.021***	-0.021***	-0.019*	-0.016*	-0.024
InterestRate	-0.0008	0.0000	0.0002	-0.0002	-0.0002	-0.0004	0.0001***	0.0002	0.0001	0.0000	-0.0001	-0.0002	-0.0012
ExchangeRate	-1.046	-0.371***	-0.195*	-0.12*	-0.055	-0.074	-0.073	-0.115*	-0.094	-0.173*	-0.093	-0.067	-0.013
Bank													
Intercept	-0.039***	-0.024***	-0.012***	-0.005***	0.000	0.001**	0.000	0.000	0.004***	0.008***	0.014***	0.02***	0.041***
OVX	-0.082	-0.049**	-0.041***	-0.037***	-0.043***	-0.041***	-0.033***	-0.036***	-0.032***	-0.027***	-0.027***	-0.032**	-0.054
InterestRate	0.0003	0.0004	-0.0005	-0.0006**	-0.0006***	-0.0006***	0.0001	0.0003	0.0003	0.0004	0.0005	0.0006	-0.0003
ExchangeRate	-0.986*	-1.2422***	-1.171***	-1.065***	-1.014***	-0.934***	-0.93***	-0.931***	-0.983***	-1.166***	-1.029***	-0.895***	-1.121*

Note: Significance levels: *** $p< 0.001$, ** $p< 0.01$, * $p< 0.05$, . $p< 0.1$

Table 2 shows that most of the quantile regression coefficients are significant and show a negative effect at all quantiles. We can observe that the negative effects of oil price volatility vary with the change of the quantiles. This implies that oil price volatility negatively affects the sectoral stock market in the bearish, normal, and bullish periods. However, as we can see from Figures 2 to 9, in most cases, it is evident that the increasing oil price volatility causes decreasing stock returns, and these effects are larger when the stock markets are more bearish. Figures 2 to 9 display the plots of the regression estimate for quantiles from 0.01 to 0.99 for all of the explanatory variables. In each plot, the horizontal axis indicates the quantile scale and the vertical axis indicates the relationship between the stock returns and one explanatory variable (coefficient values; $\beta_1, \beta_2, \beta_3$,), keeping other explanatory variables constant. In the plots, *OVX* represents the relationship between oil price volatility and stock returns (i.e. β_1), *Interest Rate* represents the relationship between interest rate and stock returns (i.e. β_2) and *Exchange Rate* represents the relationship between exchange rate and stock returns (β_3). The regression quantiles of $\beta_1, \beta_2, \beta_3$, are represented with a dashed black line and its bootstrapped 95% confidence band is represented by the grey shaded area. The straight solid red line and dashed lines denote the $\beta_1, \beta_2, \beta_3$ for the OLS model and its 95% confidence band, respectively.

Figure 2. Quantile regression results for NIFTY 50

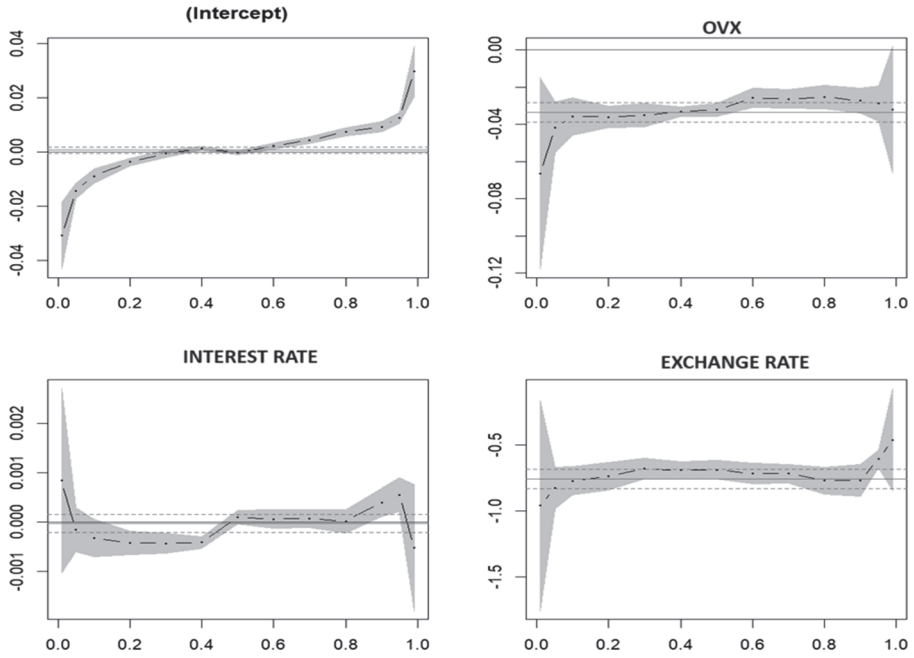
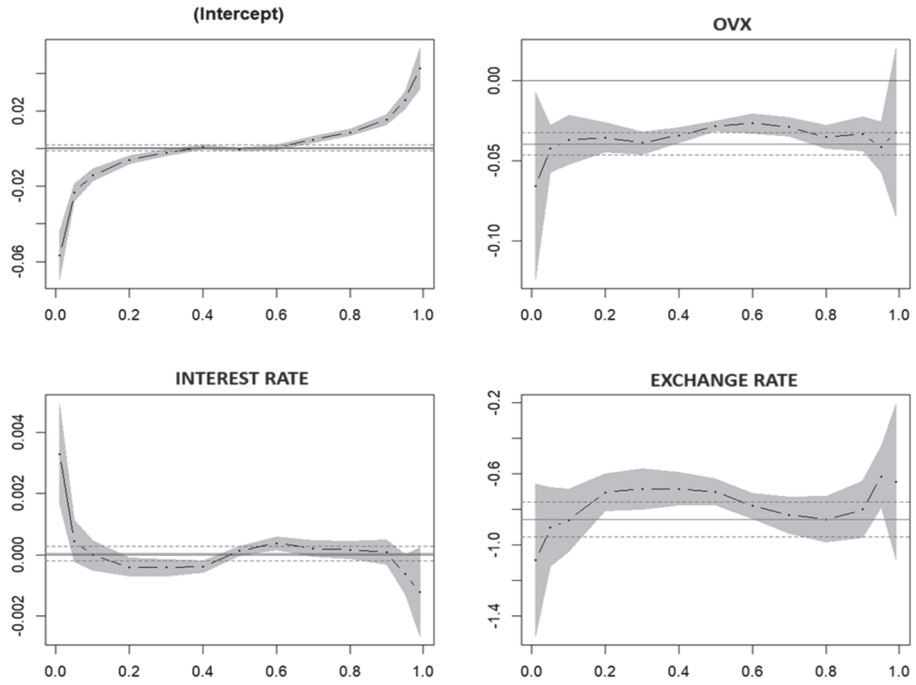


Figure 2 shows that oil price volatility has a significant and negative effect on aggregate stock returns, and the negative effect is much stronger during the bearish period. Interest rate changes also negatively affect stock market returns.

Figure 3. Quantile regression results for the automobile sector.



Oil price volatility has statistically significant negative effects for nearly all quantiles in the automobile sector, as can be seen in Figure 3, with the effect being stronger during the bearish period. The automobile sector being an oil-intensive sector, higher oil prices are associated with lower automobile manufacturer returns. This can be through either an increase in the demand for more energy-efficient vehicles (demand-side effects) or a rise in oil prices through the rise in production cost and profitability (supply-side effects) (Arouri, 2011).

Figure 4. Quantile regression results for consumer durables.

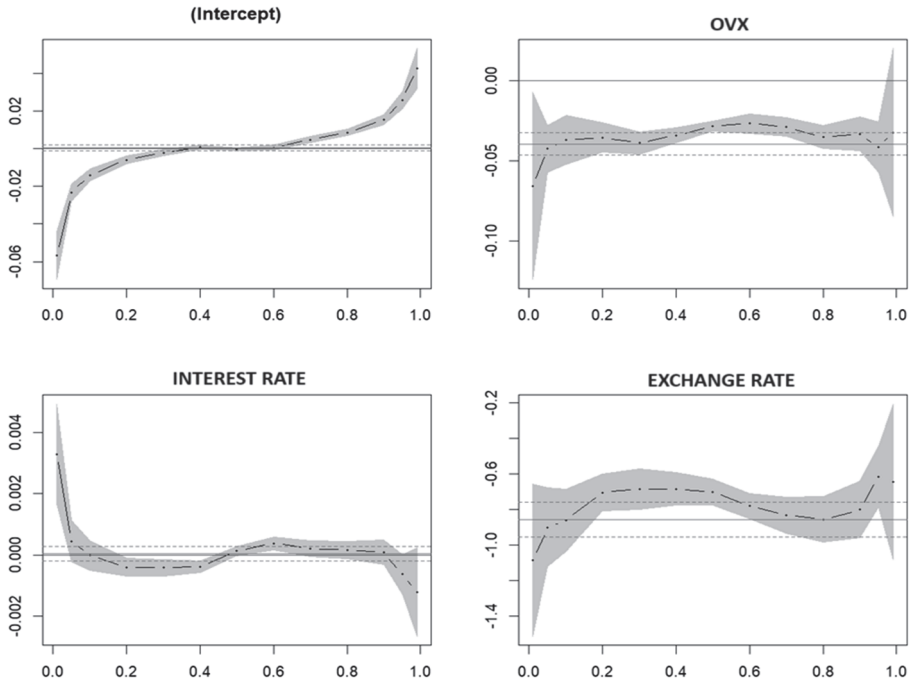


Figure 4 depicts the consumer-durable sector (non-oil-intensive sector). Oil price volatility has statistically significant negative effects for nearly all quantiles, but OVX is more negatively affected at the lower quantiles. It is evident from the figure that interest rate changes have more impact on the stock returns of consumer durables. Higher interest rates can increase the cost of borrowing for consumers, which can reduce their ability to purchase consumer durables, such as cars, appliances, and furniture. This can lead to lower sales and earnings for companies in the consumer durable sector, which can in turn negatively affect their stock returns.

Figure 5. Quantile regression results for finance.

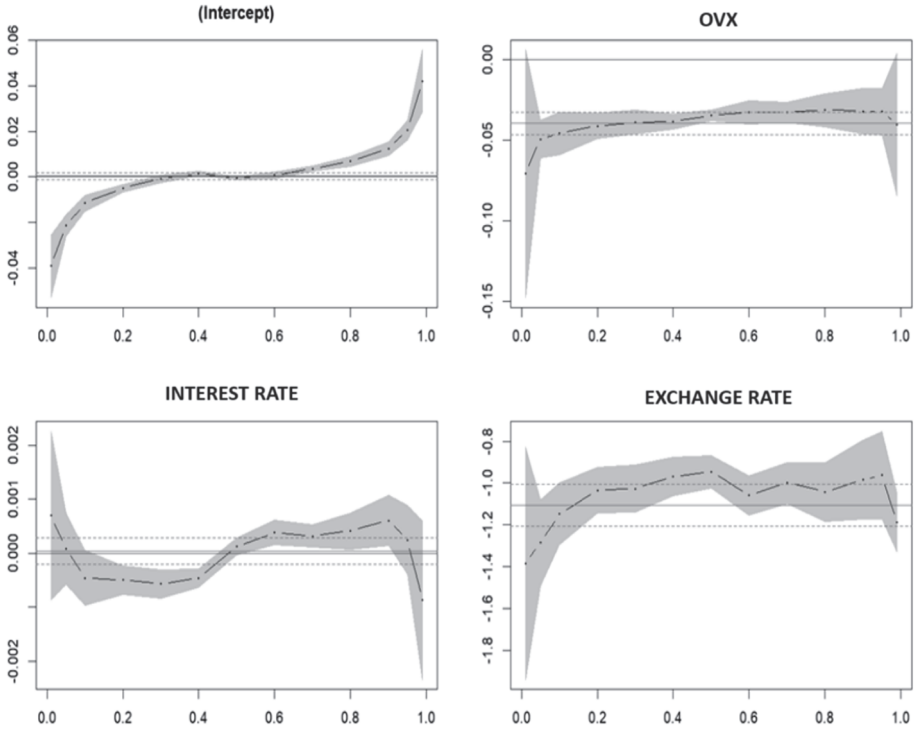
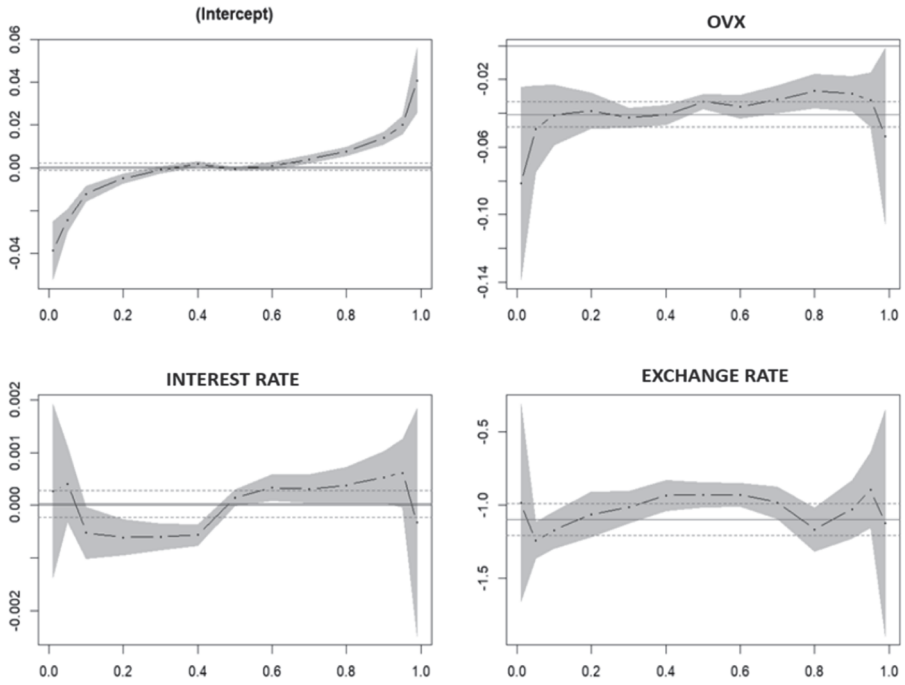


Figure 6. Quantile regression results for banking.



In the case of the financial service and banking sectors (non-oil-intensive sectors) in Figure 5 and Figure 6, oil price volatility has a significant and negative effect on stock returns at all quantiles and it is much stronger during the bearish period. The negative relationship between oil price changes and financial and banking sector stocks are mainly through two distinct channels: the inflation effect channel and the economic growth channel. Oil prices can be an indicator of inflation expectations. Higher oil prices or price volatility can lead to higher inflation expectations (Elder & Serletis, 2010), which can lead to higher interest rates and lower demand for financial and banking sector stocks. Oil prices can also be a proxy for economic growth expectations. Higher oil prices or price volatility can lead to reduced economic growth expectations, negatively affecting the financial and banking sectors, as they rely on strong economic conditions to drive demand and earnings.

Figute 7. Quantile regression results for pharmaceutical.

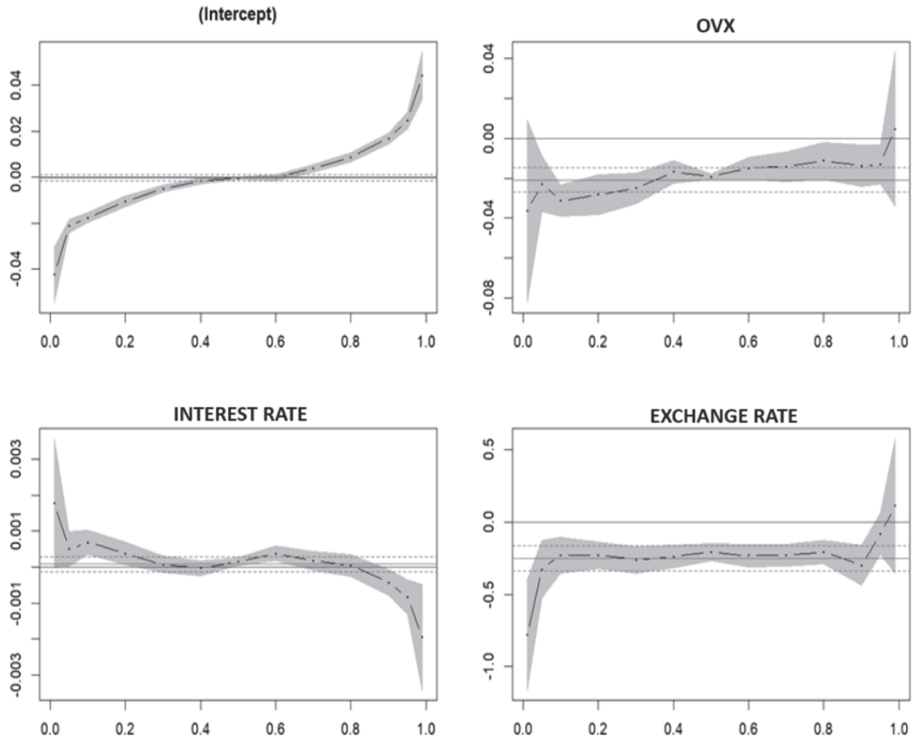


Figure 8. Quantile regression results for healthcare.

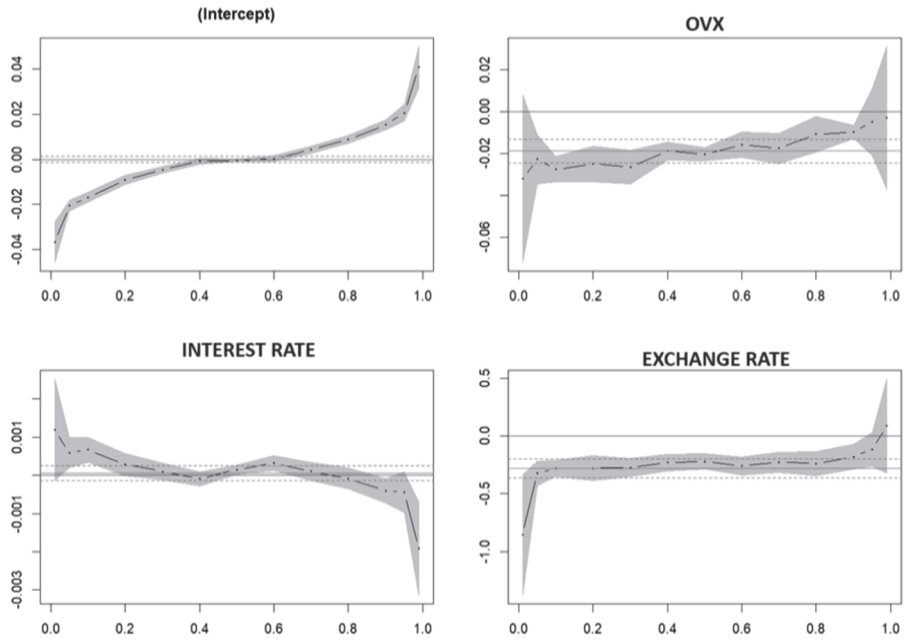
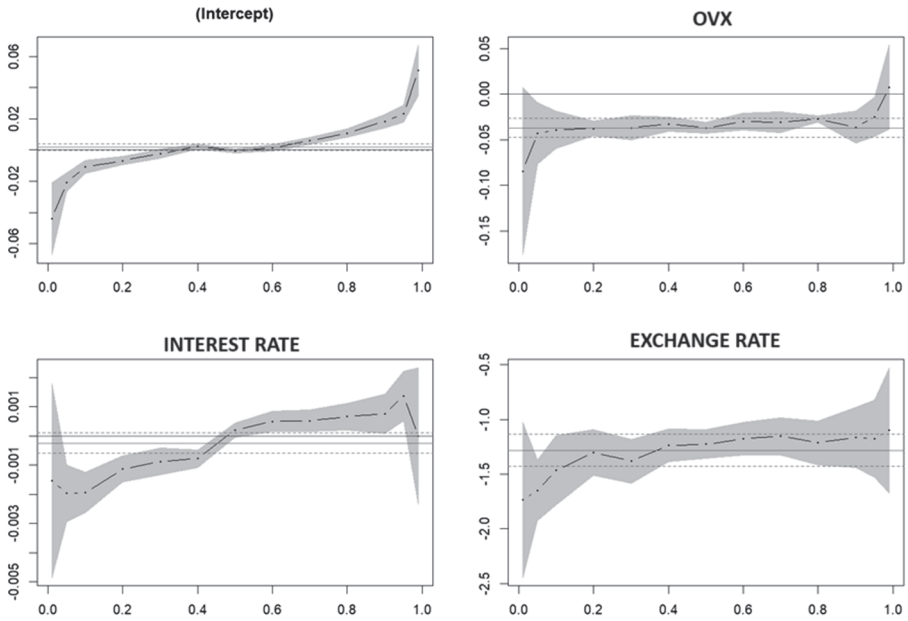


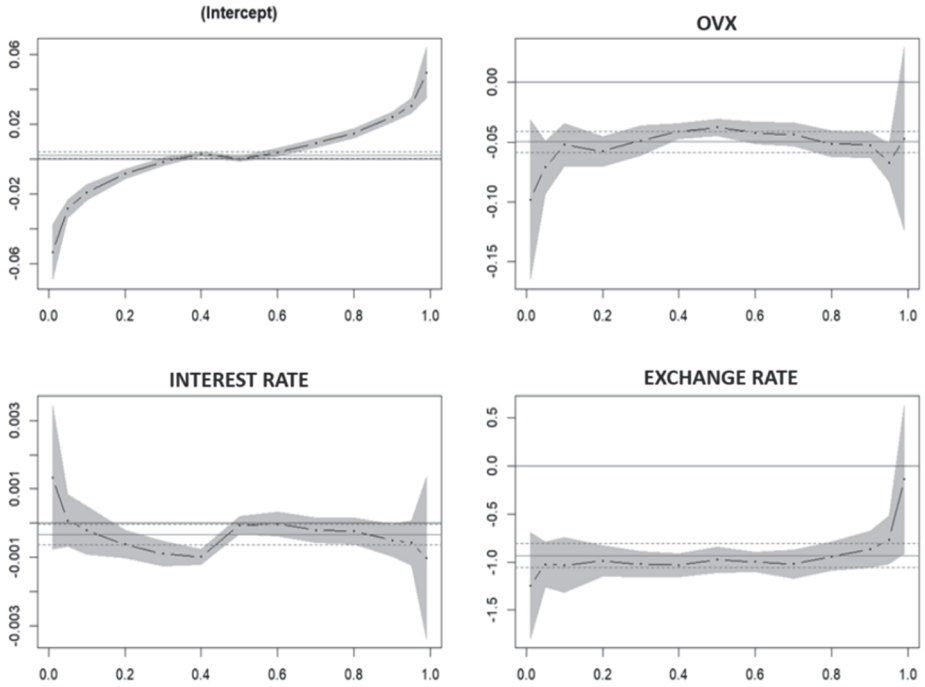
Figure 7 and Figure 8 show that oil price volatility has a significant negative effect on the pharmaceutical and healthcare sector (non-oil-intensive sectors) stock returns at all quantiles. Petroleum is used widely in health care – primarily as a transport fuel and feedstock for pharmaceuticals, plastics, and medical supplies – and few substitutes for it are available. This dependence theoretically makes healthcare vulnerable to petroleum supply shifts (Hess et al., 2011). The relationship between them is indirect; that is, higher oil prices raise the costs of production and transportation in these sectors, which in turn affects the profitability of the firms associated and, thus, their stock returns. Interest rate and exchange rate changes also affect the returns, mainly in the bearish and bullish periods. In the case of the exchange rate, since India is one of the largest exporters of pharmaceuticals and vaccine products, exchange rate changes have more impact on the stock returns and the negative effects are stronger in the bearish period.

Figure 9. Quantile regression results for realty.



It is evident from Figure 9 that oil price volatility has a significant and negative effect on the stock returns of the realty sector (non-oil-intensive sector) at all quantiles and is much stronger at the lower quantiles. Oil price volatility can be a signal of inflation expectation and economic instability and can lead to fluctuations in interest rates. Higher interest rates can increase borrowing costs for real estate companies, which can reduce their profitability and lower their stock return. Thus, from the figure it is clear that interest rate changes are strongly associated with realty sector stock returns.

Figure 10. Quantile regression results for metal.



As can be seen from the Figure 10, oil price volatility has a significant negative effect on the stock returns of the metal sector (oil-intensive sector) at all quantiles but it is much stronger in the bearish period. Metal and mining companies often require oil and other energy sources as inputs for their production processes. Higher oil prices or price volatility can increase the cost of production for metal companies, reducing their profit margins and stock returns.

Figure 11. Quantile regression results for IT.

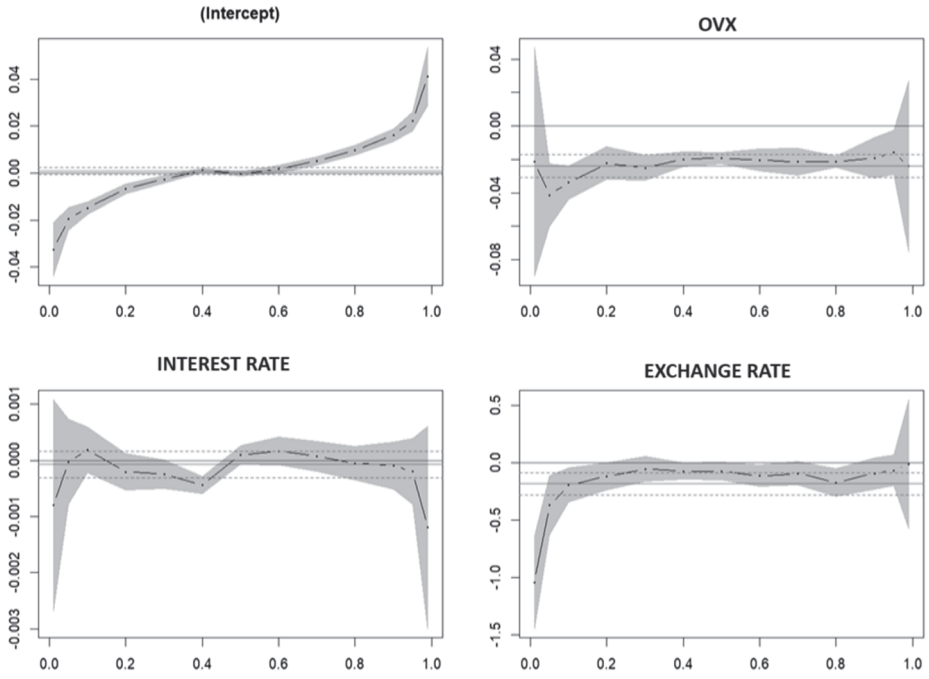
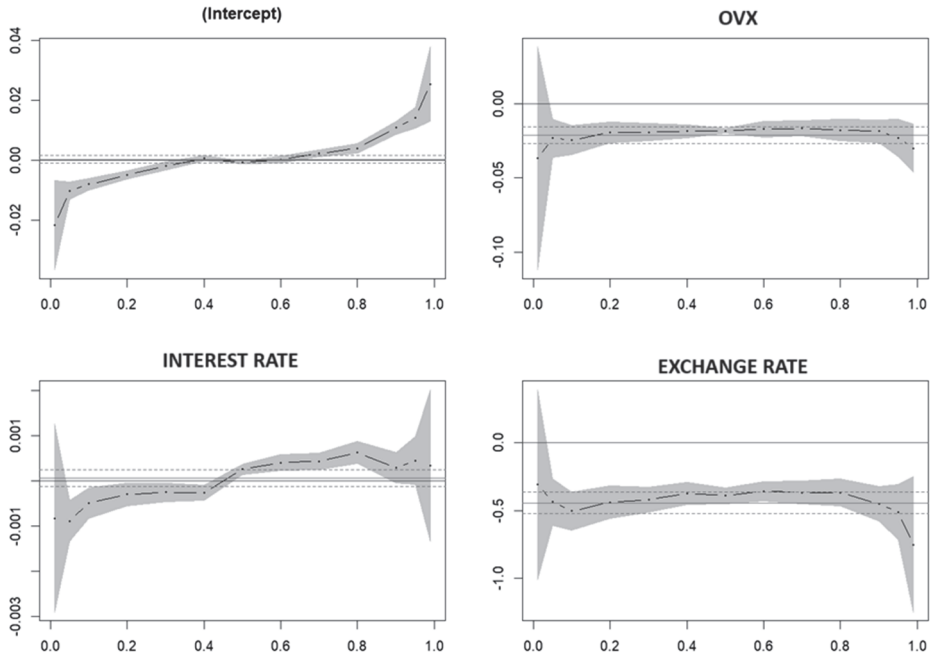


Figure 11 depicts the IT sector (non-oil-intensive sector). The impact of oil price volatility on stock returns is negative across all quantiles and more or less stable throughout, with a slightly stronger impact at the lower quantiles, i.e. in the bearish period. Such a result could be because IT is a non-oil-intensive sector; therefore, when the economy is in a bearish period, oil price volatility could be reflected in negative sectoral returns. However, as can be seen from the figure, exchange rate changes have stronger negative effects in the bearish period since India is a fast-growing software service exporter.

Figure 12. Quantile regression results for the FMCG sector.



As Figure 12 depicts, oil price volatility has a significant and negative effect on the stock returns of the FMCG sector (non-oil-intensive sector) at all quantiles, and its effect is more or less the same across all quantiles. Since the FMCG sector's demand is mostly inelastic, the oil price changes do not cause much change in the demand for these goods. This sector requires an agile logistics process. This leads to a rise in transportation and commercialisation costs, which reduces the profitability of the associated firms and, thus, the stock returns. Interest rate changes also significantly affect this sector and have stronger negative effects during the bearish period.

Table 3 and 4 report the results of the Wald test for quantile slopes of the 0.01 and 0.09 quantiles and the 0.05 and 0.99 quantiles. A quantile regression is particularly useful for capturing heterogeneous effects of independent variables on the dependent variable. By running an F-test for the equality of coefficients, we can identify whether these effects differ significantly across quantiles, providing insights into the conditional relationships between variables.

Table 3: Slope equality test for quantiles 0.01 and 0.99

SECTORS	Auto	Consumer	Metal	Finance	FMCG	Realty	Health	Pharma	IT	Bank	Nifty 50
β_1	0.481	0.734	0.407	0.572	0.883	0.141	0.361	0.255	0.959	0.548	0.359
β_2	0.001***	0.730	0.221	0.226	0.472	0.537	0.005**	0.008 **	0.804	0.716	0.321
β_3	0.232	0.698	0.054	0.577	0.396	0.25	0.019*	0.014 *	0.01395 *	0.8266	0.3523
F-statistic (combined)	0.004 **	0.958	0.035 *	0.515	0.751	0.120	0.002 **	0.004 **	0.053	0.931	0.357

Note: Significance levels: *** $p< 0.001$, ** $p< 0.01$, * $p< 0.05$, . $p< 0.1$

Table 4: Slope equality test for quantiles 0.05 and 0.95

	Auto	Consumer	Metal	Finance	FMCG	Realty	Health	Pharma	IT	Bank	Nifty 50
β_1	0.930	0.395	0.800	0.120	0.987	0.452	0.130	0.335	0.062	0.336	0.190
β_2	0.051	0.099	0.262	0.767	0.001**	0.000 ***	0.008 **	0.001***	0.766	0.717	0.036*
β_3	0.087	0.161	0.206	0.064	0.629	0.079	0.057	0.090	0.080	0.042*	0.034*
F-statistic (combined)	0.043 *	0.153	0.323	0.022 *	0.015 *	0.000 ***	0.0002***	0.000***	0.056	0.089	0.010**

Note: Significance levels: *** $p< 0.001$, ** $p< 0.01$, * $p< 0.05$, . $p< 0.1$

The null hypothesis is that the quantile slope coefficients are identical. It is evident from the table that for most of the sectors, the joint slope equality coefficient (F-statistic) is significant.

Overall it can be inferred that oil price volatility has a significant and negative effect on the stock returns of all sectors at all quantiles but it is much stronger in the bearish period. Regarding the statistical pattern of structure and degree of dependence, Hu (2006) also emphasises that the dependencies across the financial markets are left-tailed and unarguably asymmetric. Moreover, the strong lower-tail sensitivity could be an outcome of the fact that the influence of oil price shocks is more evident and tractable when markets are bearish than when markets are bullish (Zhu et al., 2016).

Further exchange rate and interest rate changes also affect the sectoral stock returns. This can be attributed to the flow-oriented theory, which states that exchange rate movements affect international competitiveness and trade balance, thereby influencing real economic variables such as real income and output. The exchange rate affects the values of the income and the costs of a company with considerable exports/imports and thus impacts the company's stock price.

As we can see from the analysis, oil price volatility affects the sectoral returns more when the economy is in the bearish period. In the normal and bullish periods, oil price volatility does not affect the stock returns greatly. Further interest rate and exchange rate changes substantially affect the sectoral returns in the bearish period as in the case of the pharmaceutical, healthcare, banking and finance, IT, FMCG, and consumer durables sectors. Thus, the impact of oil price volatility on sectoral returns is less than the influence of interest rate and exchange rate changes.

To capture the effect of systematic risk, market portfolio is added as one of the control variables in the quantile regression:

$$r_t = \alpha + \beta_1 OVX_t + \beta_2 IR_t + \beta_3 ER_t + \beta_4 MP_t + \varepsilon_t \quad (4)$$

Here, all other variables are the same as in Eq.(3); additionally, β_4 is the coefficient for market portfolio.

Table 5. Quantile regression results including market portfolio

QUANTILES													
SECTORS	**0.01**	**0.05**	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**0.95**	**0.99**
AUTOMOBILE													
Intercept	-0.024***	-0.018***	-0.011***	-0.007**	-0.003***	-0.001	0.000	-0.001***	0.002*	0.006***	0.012***	0.018***	0.029***
OVX	-0.014	-0.018**	-0.008	-0.006**	-0.003	0.000	-0.001	0.002	0.006	0.005	0.003	-0.003	-0.003
InterestRate	0.001	0.001***	0.0003***	0.0001	-0.000	-0.0001	-0.000	0.0002***	0.0003**	0.0001	-0.0003	-0.0007**	-0.002
ExchangeRate	-0.392	0.035	-0.062	-0.085 *	-0.096**	-0.060	-0.057.	-0.034	-0.08	-0.088*	-0.08	-0.039	0.108
Market Portfolio	0.930***	1.039***	1.003***	0.992***	0.988***	1.016***	0.995***	1.002***	0.995***	0.994***	1.015 ***	1.025***	1.167***
CONSUMER DURABLES													
Intercept	0.013***	-0.012***	-0.007***	0.004***	-0.002***	0.000	-0.000	-0.000	0.002**	0.005***	0.008***	0.012***	0.028***
OVX	0.011	-0.000	-0.002	-0.000	0.000	-0.001	0.002	0.001	-0.000	-0.005	0.001	0.007	0.017
InterestRate	-0.002***	-0.000	-0.001**	-0.000***	-0.000.	-0.000**	0.000	0.000*	0.000**	0.000*	0.001***	0.001	-0.000
ExchangeRate)	-0.430	-0.337**	-0.332***	-0.203***	-0.219***	-0.183***	-0.196***	-0.175***	-0.210***	-0.168**	-0.172*	-0.095	-0.175
Market Portfolio	0.792***	0.738***	0.718***	0.717***	0.697***	0.703***	0.707***	0.720***	0.702***	0.734***	0.716***	0.765***	0.859***
METAL													
Intercept	-0.013***	-0.012***	-0.007***	-0.004***	-0.002***	0.000	-0.000	-0.000	0.002	0.005***	0.008***	0.012***	0.028***
OVX	0.011	-0.000	-0.002	-0.000	0.000	-0.001	0.002	0.001	-0.000	-0.005	0.001	0.007	0.017
InterestRate	-0.002***	-0.000	-0.001**	-0.000**	-0.000	-0.000*	0.000	0.000**	0.000**	0.000**	0.001***	0.001	-0.000
ExchangeRate	-0.430*	-0.337**	-0.332***	-0.203***	-0.219***	-0.183***	-0.196***	-0.175***	-0.210***	-0.168**	-0.172*	-0.095	-0.175
Market Portfolio	0.792***	0.738***	0.718***	0.717***	0.697***	0.703***	0.707***	0.720***	0.702***	0.734***	0.716***	0.765***	0.859***
FINANCE													
Intercept	-0.017***	-0.010***	-0.007***	-0.004***	-0.002***	0.001**	-0.000	-0.001*	0.001	0.003***	0.007***	0.011***	0.017
OVX	-0.001	-0.001	-0.000	-0.001	0.002	0.000	-0.000	0.001	0.001	-0.000	0.005	0.007	0.020
InterestRate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000***	0.000***	0.000	-0.000	-0.000	-0.000
ExchangeRate	-0.246	-0.234**	-0.243***	-0.186***	-0.200***	-0.166***	-0.143***	-0.133***	-0.127***	-0.149***	-0.152***	-0.183*	-0.398
Market Portfolio	1.190***	1.221***	1.214***	1.188***	1.192***	1.191***	1.191***	1.196***	1.204***	1.220***	1.256***	1.252***	1.272
FMCG													
Intercept	-0.013***	-0.009***	-0.006***	-0.006***	-0.003***	-0.001	-0.000*	-0.001**	0.000	0.003***	0.006***	0.012***	0.024***
OVX	-0.004	-0.004	0.002	0.002	0.000	0.002	0.002*	0.001	0.001	-0.001	-0.002	0.006	0.028
InterestRate	-0.001**	-0.001**	-0.000**	-0.000**	-0.000	-0.000	0.000**	0.000***	0.001***	0.001***	0.001***	0.000	-0.000
ExchangeRate	0.313	0.162**	0.052	0.052	0.039	0.041	0.019	-0.021	0.0104	0.014	-0.049	-0.019	-0.087
Market Portfolio	0.644***	0.672***	0.652***	0.652***	0.661***	0.639***	0.643***	0.628***	0.648***	0.635***	0.649***	0.657***	0.741***
REALTY													
Intercept	-0.021***	-0.019***	-0.013***	-0.007***	-0.003*	-0.0004	0.000	0.000	0.004**	0.008***	0.014***	0.020***	0.041***
OVX	0.017*	0.009	0.004	0.005	0.010	-0.000	0.004**	0.005	0.002	0.006	0.016	0.020	0.053

InterestRate	-0.003***	-0.001*	-0.001**	-0.001**	-0.001***	0.006	-0.000	0.000*	0.000	0.000	0.000	0.001	0.000
ExchangeRate	-0.803	-0.445*	-0.184	-0.223*	-0.185*	-0.000	-0.275***	-0.373***	-0.393***	-0.374***	-0.283**	-0.487**	-0.684
Market Portfolio	1.145***	1.338***	1.353***	1.333***	1.298***	-0.230	1.264***	1.243***	1.229***	1.253***	1.316***	1.320***	1.105***
HEALTH													
Intercept	-0.032***	-0.016***	-0.013***	-0.009***	-0.006***	-0.002**	-0.000	-0.001	0.002**	0.006***	0.013***	0.022***	0.038***
OVX	-0.008	0.003	0.002	0.001	-0.001	-0.002	0.000	0.001	-0.002	0.003	0.003	0.013	0.017
InterestRate	0.001	0.000	0.000*	0.000**	0.000**	0.000	0.000*	0.000***	0.000	0.000	-0.000*	-0.001***	-0.002**
ExchangeRate	0.189	0.217	0.284**	0.157***	0.212***	0.189***	0.178***	0.162***	0.124**	0.119**	0.106	0.083	0.328**
Market Portfolio	0.607***	0.598***	0.618***	0.588***	0.583***	0.583***	0.592***	0.597***	0.603***	0.599***	0.623***	0.587***	0.449***
PHARMA													
Intercept	-0.042***	-0.016***	-0.015***	-0.010***	-0.006***	-0.003***	-0.000	-0.002**	0.002**	0.007***	0.014***	0.023***	0.046***
OVX	-0.014	0.001	-0.003	0.004	-0.001	-0.004	-0.001	-0.002	-0.002	0.006	-0.002	0.005	0.005
InterestRate	0.002**	0.000	0.001**	0.001***	0.000**	0.000	0.000	0.001***	0.000**	0.000	-0.000	-0.001**	-0.003***
ExchangeRate	0.259	0.257	0.277**	0.201***	0.237***	0.222***	0.216***	0.165***	0.157**	0.169***	0.161***	0.220	0.302
Market Portfolio	0.621***	0.666***	0.607***	0.603***	0.588***	0.587***	0.592***	0.595***	0.600***	0.621***	0.623***	0.574***	0.549***
IT													
Intercept	-0.027***	-0.015***	-0.011***	-0.007***	-0.003**	0.000	-0.000	0.001	0.003***	0.006***	0.012***	0.017***	0.032***
OVX	0.032	0.004	0.005	0.001	0.001	0.003	0.000	0.003	-0.001	-0.002	0.004	-0.002	-0.001
InterestRate	-0.001	-0.000	-0.000	-0.000	-0.000	-0.000**	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.001
ExchangeRate	0.353	0.449**	0.466***	0.398***	0.342***	0.327***	0.331***	0.369***	0.369***	0.457***	0.351***	0.592***	0.630
Market Portfolio	0.888***	0.812***	0.793***	0.743***	0.722***	0.726***	0.710***	0.705***	0.742***	0.763***	0.747***	0.819***	0.805***
BANK													
Intercept	-0.016***	-0.011***	-0.008***	-0.005***	-0.003***	-0.001*	0.000	-0.001**	0.002**	0.004***	0.009***	0.011***	0.020***
OVX	-0.003	0.003	-0.001	-0.001	-0.001	0.002	0.002	0.002	0.001	0.003	0.009	0.010	-0.002
InterestRate	-0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000	0.000***	0.000*	0.000	-0.000	0.000	-0.000
ExchangeRate	-0.111	-0.191	-0.161**	-0.149***	-0.136***	-0.096**	-0.096***	-0.103**	-0.108**	-0.210***	-0.142	-0.237**	-0.299
Market Portfolio	1.213***	1.255***	1.247***	1.240***	1.224***	1.228***	1.227***	1.230***	1.237***	1.244***	1.285***	1.302***	1.306***

Note: Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, . $p < 0.1$

Table 5 shows that after including market portfolio as one of the explanatory variables in the quantile regression analysis, market portfolio picks up most of the variations in sectoral returns, which is expected as systematic and non-diversifiable risk component drives sectoral returns. However, oil price volatility becomes insignificant in most of the cases. It could be due to the fact that oil price volatility affects the entire market as a whole, which is confirmed by Luo and Qin (2017) and Joo and Park (2021), and then spills over to a particular sector. Although fluctuations in oil price changes represent a source of systematic risk affecting aggregate market returns, the level of exposure to this risk differs among various sectors (Lee et al., 2012). Studies by Xiao et al. (2018) and Sreenu (2022) have shown that oil price volatility affects the sectoral returns. So this indirect channel of spillover could be the possible reason for the insignificance of oil price volatility when we include market portfolio as one of the control variables.

5. CONCLUSIONS

This paper examines the heterogeneous effect of oil price volatility on the Indian sectoral stock returns for the period January 2011 to September 2022 using the quantile regression method. The study aimed to analyse how oil price volatility affects sectoral returns during different market conditions: bearish, normal, and bullish periods. The results find that the total and sectoral stock returns are negatively affected by oil price fluctuations, and the negative effect is stronger during the bearish period. This finding is consistent with the results of Sreenu (2022), signifying that the uncertainty fluctuations in the crude oil market mainly hurt the Indian stock returns during unperforming periods, and also with those of Joo and Park (2021), whose results show that OVX has a statistically significant negative effect on the stock returns of oil-importing countries and this negative impact is stronger at the lower quantile levels than at the medium or higher quantile levels of stock returns. As expected, oil-intensive sectors, such as the automobile and metal sectors, are more affected by oil price volatility because of demand- and supply-side effects (Arouri, 2011). This finding is supported by Gogineni (2010), who concludes that sensitivity of industry returns to oil price changes depends on both the cost-side and demand-side dependence on oil and that the relative effects of these factors vary across industries. In the case of non-oil-intensive sectors, interest rate changes strongly affect some sectors more than oil price volatility, such as banking and finance, consumer durables and the

FMCG sectors. Similarly exchange rate changes have a greater impact than oil price volatility in the case of the pharmaceutical and IT sectors. Furthermore, one of the findings of this study is that market portfolio picks up most of the variations in sectoral returns, as it is a systematic and non-diversifiable risk component. Initially, the oil price volatility affects the entire market as a whole, as confirmed by Luo and Qin (2017) and Joo and Park (2021), and then spills over to a particular sector. This implies that there exists an indirect channel through which oil price volatility affects sectoral returns.

Crude oil price uncertainty is a significant problem faced by India due to many political and economic conditions at the global level. Since India is a huge oil import-dependent country, stockholders are very apprehensive about the influence of this ambiguity on the sectoral stock market. Consequently, this study has significant and valuable inferences for investment choices, risk management, and portfolio diversification. For those investors who have invested in energy intensive sectors such as the automobile and metal sectors, over and above hedging against normal market risk, it is also important to hedge against oil price volatility risks. The method of quantile regression is considered superior to ordinary regression in order to capture heterogenous dependence; however, it requires a large amount of data to obtain reliable estimates, and the model specification should be appropriate to obtain unbiased estimates.

Moreover, as India is an emerging market with distinctive growth opportunities and challenges, it represents a valuable case study for analysing the response of industry portfolios to oil price shocks. Investigating how the Indian industry portfolio reacts to fluctuations in oil prices can provide crucial insights into the behaviour of emerging market economies and their resilience to external economic factors. The Indian market may exhibit unique volatility patterns in response to oil price changes which can differ from those observed in other global markets. Understanding these patterns can assist international investors in evaluating the risk-return profile of Indian assets during periods of oil price uncertainty.

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THE DISABILITY GAP IN EMPLOYMENT IN DEVELOPING ECONOMIES: EVIDENCE FROM THE NIGERIAN LABOUR MARKET

ABSTRACT: *A viable and functional labour market is a sin qua non for economic development. This study thus examines the evidence of disability-related employment discrimination in Nigeria. Utilising the Fairlie decomposition technique in analysing households' data elicited from wave 4 of the General Household Survey, the study found that the disability gap in employment was plausibly existent in Nigeria. The study therefore suggested, among other viable options, that policies aimed at promoting the elimination of physical obstacles in workplaces while also ensuring equitable training opportunities for individuals with disabilities should be rigorously pursued. There is a need to enact more stringent anti-discriminatory policies in Nigeria, with individuals having functional difficulties being the focal target.*

KEY WORDS: *discrimination; employment; disability; Fairlie decomposition; labour*

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1. INTRODUCTION

The labour force of any economy is the fulcrum of economic growth and development, given that it comprises essential human capital, which ensures productivity in any economy. Accordingly, a healthy labour force is a prerequisite to enhanced productivity (Efayena & Buzugbe, 2016; Efayena et al., 2018; Ichoku, 2015; Ichoku et al., 2014). This has resulted in countries investing immensely in healthcare infrastructure to ensure a sound and healthy labour force, which will potentially drive development by determining the level of labour force participation rate (Nwosu, 2018; Nwosu & Wooland, 2017), since individuals with fewer functional difficulties tend to participate more in the labour market.

However, there has been a lingering debate on the issue of discrimination against individuals experiencing disabilities in the employment process. Discrimination often takes place during the hiring process, leading to the elimination of some individuals from the process. Although employers of labour might express justifiable reasons to streamline individuals with functional difficulties from the employment process or even stigmatise these in the job, discrimination occurs when an employee is biased against despite having the same or more capability or productivity than another individual participating in an economic activity.

Globally, the OECD (2022) reported that the disability gap in employment remains large. Collectively, individuals with disabilities experienced a 27-percentage-point lower employment rate compared to those without disabilities. This trend also exists in developing economies. For instance, in Nigeria, prior to the COVID-19 health pandemic, the employment disability gap stood at 28.1 per cent. This suggests that the employment rate of individuals with disabilities in the working-age population was 54.1 per cent, compared to 82.2 per cent for those without disabilities (Olusola, 2021). Even if individuals manage to secure employment, they often face the predicament of being typecast into specific tasks or employed merely as symbolic gestures (Eleweke & Ebenso, 2016), with the argument that such individuals require greater supervision to perform, and may result in increased health insurance premiums, more sick leave, and increased hospital expenses that may burden the employers. This has a long-term effect on health expenditure decisions (Efayena & Olele, 2020; Olele & Efayena, 2023) as well as labour decisions, such as the 2018 *Discrimination Against Persons with Disabilities (Prohibition) Act*.

In spite of prevailing disability-related discrimination in the Nigerian labour market, the majority of labour market-related studies focus on the effects of education, gender, and religion on the labour market (Adeyem et al., 2016; Olowa & Adeoti, 2014). Some other studies focus on the effect of disability on labour force participation (see Machio, 2014; Nwosu, 2018). The paucity of studies on the disability gap in employment has far-reaching implications for productivity in Nigeria and other developing economies. This constitutes the crux of this study.

Overall, this study contributes to the existing health and labour literature by closely examining the nexus between functional difficulties and employment discrimination in Nigeria. Our study makes a two-fold contribution to existing knowledge. First, it investigates the empirical evidence of a disability gap in employment in Nigeria utilising households' dataset derived from the General Household Survey (National Bureau of Statistics, 2019). The study employs the Fairlie decomposition method to identify whether there is a potential disability gap in employment or not. Second, the study proffers possible policy implications and inferences on improving labour market outcomes in Nigeria. From an empirical perspective, the findings of the study highlight the importance of propagating viable labour market policies to ensure productivity. Following the introductory section, Section 2 presents relevant previous studies on labour market discrimination across economies as well as identifying gaps in these studies. Sections 3 and 4 of the study outline the methodology employed and present the empirical findings. Section 5 concludes the study.

2. A BRIEF REVIEW OF THE LITERATURE

In both developed and developing countries, the emphasis has been on the premise that good health exerts a substantial positive impact on labour market outcomes (Chinara, 2018; Jones & Wildman, 2008; Karlsdotter & Martín, 2012). However, an important perspective that requires equal attention is the discrimination of individuals with disabilities in employment or in the process of gaining entry into the labour market. In spite of various governments' legislation on non-discrimination against individuals suffering from functional difficulties and the fact that individuals who have a disability that does not limit their abilities should not face discrimination, as they are as equally productive as their peers,

several cases of such discrimination have been observed in several countries, including Nigeria (Imam & Abdulraheem-Mustapha, 2016).

Discrimination arises when two individuals of equal productivity receive unequal earnings (Becker, 1957). For instance, researchers attribute the unexplained portion of the wage gap between individuals without functional difficulties and those with functional difficulties to discrimination, despite the possibility of unobservable productivity differences (Deleire, 2001; Gannon & Munley, 2009; Jones, 2006; Madden, 2004). Discrimination against workers with disabilities may stem from prejudice or a misguided perception of their productivity. Since individuals with disabilities may have impairments that impact their productivity, it becomes challenging to distinguish between wage effects resulting from functional difficulties and those stemming from discrimination. If wage discrimination does exist, it can potentially discourage individuals with disabilities from actively engaging in the labour market.

It is imperative to state that the majority of disability-related labour market discrimination studies have focused on wages and earnings as an outcome (Aleksandrova et al., 2020; Averett, 2019; Baldwin & Choe, 2014; Bright, 2021; Flores & Kalwij, 2019; Gao et al., 2018; Halima & Rococo, 2014; Jeon, 2017; Kioko et al., 2013; Vaalavuo, 2021). However, there are several empirical studies that have investigated disability-related employment discrimination (Bajorek & Bevan, 2019; Baldwin & Johnson, 1995; Kungu et al., 2019; Reavley et al., 2017; Stuart, 2006; Vallejo-Torres et al., 2018; Yearby, 2019), with studies carried out in most developing countries showing lower employment rates among those with functional difficulties relative to individuals with disabilities (Hoogeveen, 2005; Palmer et al., 2012; Trani & Loeb, 2012).

An overview of the empirical studies shows that the disability-related discrimination debate is largely inconclusive. While some studies asserted that disability does not result in substantial discrimination, other studies showed that there is obvious discrimination against individuals with functional difficulties, even if their productivity level is the same as that of employees without functional difficulties. For instance, Keramat et al. (2021) investigated the nexus between obesity, disability, and employment discrimination in Australia, utilising four waves of household surveys. Their findings indicated that over one in ten (12.68

per cent) Australians encountered employment discrimination. Specifically, adults with disabilities had 1.89 times higher odds of facing discrimination compared to their peers without disabilities.

In the same vein, Enemchukwu (2018) examined the effects of physical disabilities on the labour market in Tanzania, using data from the 2010–2011 Tanzania National Panel Survey (TZNPS). The study found employment differentials between disabled and non-disabled labour market participants. The study also found that the unexplained gap was indicative of employment discrimination due to disabilities. A similar conclusion was reached by Maroto and Pettinicchio (2014), who utilised data from the 2011 American Community Survey and found that individuals with disabilities who are employed encounter employment discrimination that restricts their potential earnings.

Caliendo and Lee (2013) found that despite more job applications and training programmes in Germany, there are indications suggesting that women who are obese face more unfavorable employment outcomes compared to women of normal weight. Additionally, obese women who manage to secure employment tend to receive significantly lower wages compared to women of normal weight.

A comparative study by Trani and Loeb (2012) among households in Afghanistan and Zambia employing the logistic regression technique found evidence of lower access to the labour market for individuals with functional difficulties. A household survey study by Arlette (2012) in Cameroon revealed a significant employment gap between non-disabled and disabled individuals, regardless of gender or the institutional sector being considered, thus prompting the study to conclude that the gap is due to discrimination arising from functional difficulties.

Drydakis (2010) carried out a study in Greece to investigate the correlation between variations in productivity and/or discrimination and the disparities in earnings among male workers with disabilities. The study found discrimination against individuals with disabilities, regardless of their productivity level.

Baldwin and Johnson (1994) conducted a study to estimate disabled men's level of market discrimination. The study revealed a significant disparity in employment rates between men with disabilities and those without disabilities, with the former being slightly lower than the latter. The same conclusion was

reached by Jones (2006), Madden (2004), and Kidd et al. (2000) in the UK, as well as Échevin (2013) in Cape Verde.

There are several empirical studies on employment and disability using functional measures. For instance, Maia and Garcia (2019) investigated the relationship in Brazil in the 2000–2010 period. The study divided disability status into two categories: (i) severely disabled individuals [high levels of sensorial, physical, or cognitive limitations] and (ii) mildly disabled individuals [mild levels of functional difficulties]. The study found that the employment level of individuals with high levels of functional difficulties was more severely affected. Henly et al. (2023) examined the usefulness of evaluating physical and mental abilities in relation to self-reported job tasks to determine which aspects of worker functioning are most likely to hinder the fulfilment of certain occupational needs. The study adapts six measures and quantitatively analyses both physical and mental function to investigate the correlation between functioning and job responsibilities. The study revealed that individuals with functional challenges encounter obstacles in their capacity to sustain employment in specific occupations that require such abilities.

Using survey data from 2004 to 2006, Carr and Namkung (2021) found that functional difficulties adversely limit employment levels in the United States. The study employed functional difficulties including lifting or carrying objects; bathing or grooming oneself; climbing stairs; stooping, kneeling, or bending; walking; vigorous activities; and moderate activities. The response categories include the following: *a lot*, *some*, *a little*, and *not a little*. Umucu (2021) investigated whether higher levels of functional difficulties are associated with employment opportunities for individuals with chronic and disability-related conditions. The hierarchical logistic regression technique used showed that functional difficulties had a negative impact on employment outcomes.

Mitra (2018) used longitudinal data from Malawi, Uganda, Ethiopia, and Tanzania to investigate disability and some selected economic variables. The study categorised the disability variable into functional difficulties using the following classifications: severe, moderate, and none. The study found that functional difficulties severely and significantly limit the possibility of returning to employment or securing employment opportunities. Mizunoya et al. (2016)

employed a binary disability variable in which the variable assumed a value of 1 if an individual was experiencing at least one functional difficulty, and 0 otherwise. Their study adapted a non-linear Blinder-Oaxaca decomposition technique and found that functional difficulties adversely contribute to the employment gap.

The above review reveals that disability-related employment discrimination is highly plausible. In other words, individuals may experience discrimination either at entry level or during the employment stage due to the disabilities that they suffer from. This study aims to formally investigate this. With reference to empirical studies in Nigeria, the emphasis in the past has largely been on the disability–labour force participation nexus (Agu, 2016; Ahuru & Akpojubar, 2020; Mohammed et al., 2020). Employment discrimination has received minimal attention, particularly in studies that use decompositions. This is the motivation behind this study. By employing data from fourth wave of the General Household Survey, the study will utilise the rich longitudinal dataset to investigate the existentiality of disability-related discrimination in the Nigerian labour market.

3. METHODOLOGY

3.1. Model Specification

3.1.1. Fairlie Decomposition (Non-Linear) Technique

In most previous studies, the Blinder-Oaxaca (B-O) decomposition method has been utilised to identify and measure the distinct contributions of group disparities in quantifiable attributes such as marital status, experience, geographical variations, and education to the gaps in outcomes based on race and gender (Enemchukwu, 2018; Machio, 2014; Nwosu, 2015). However, in relation to this study, given that the outcome is binary and the estimates are derived from a logistic model, the direct application of the B-O decomposition method is not feasible. Thus, to decompose the dichotomous employment variable, this study used the Fairlie (1999, 2006) model, which employs logistic models, for decomposing indicator variables. The standard B-O decomposition can be expressed as follows when analysing the gap in the average value of the dependent variable, *Y*:

$$\bar{Y}^H - \bar{Y}^S = \left[(\bar{X}^H - \bar{X}^S)\hat{\beta}^S\right] + [\bar{X}^H(\bar{X}^H - \bar{X}^S)], \quad (1)$$

where $\bar{Y}^j$ is the average probability to be employed for group j [j = without functional difficulties (H) and with functional difficulties (S)], N^j is the sample size of population j, β^{H} and β^{S} are, respectively, the estimated coefficients from the binary regressions among H and S, and X_i^{H} and X_i^{S} represent the observed characteristics in each group, respectively. X^j represents the average values of the independent variables' row vector, and $\hat{\beta}^j$ is the coefficient estimates vector for disability category j. Following Fairlie (1999), the nonlinear equation decomposition for $Y = F(X\hat{\beta})$, is given as:

$$\bar{Y}^H - \bar{Y}^S = \left[\sum_{i=1}^{N^H} \frac{F(X_i^H\hat{\beta}^H)}{N^H} - \sum_{i=1}^{N^S} \frac{F(X_i^S\hat{\beta}^H)}{N^S}\right] + \left[\sum_{i=1}^{N^S} \frac{F(X_i^S\hat{\beta}^H)}{N^S} - \sum_{i=1}^{N^S} \frac{F(X_i^S\hat{\beta}^S)}{N^S}\right]. \quad (2)$$

This alternative expression for the decomposition is used because $\bar{Y}$ does not necessarily equal $F(\bar{X}\hat{\beta})$. If the logit model incorporates a constant term, Equation (2) will accurately hold due to the requirement that the average value of the dependent variable matches the average value of the predicted probabilities within the sample. In this equation, F represents the cumulative distribution function derived from the logistic distribution. In both equations (1) and (2), the first term in brackets represents the part of employment participation (work) that is influenced by group differences in the X distributions. The second term in brackets encompasses the part showing the differentials in the group processes determining levels of Y. The second term also encompasses the portion of the employment gap that can be attributed to group distinctions in unmeasurable or unobserved characteristics or attributes.

Explicitly, $\sum_{i=1}^{N^S} \frac{F(X_i^S\hat{\beta}^H)}{N^S}$ is an average of counterfactual predicted probability that would be observed if the individuals with functional difficulties had the coefficient vector of individuals without functional difficulties. The first bracket in equation (2) pertains to the portion of the gap that can be ascribed to disparities between types in the distribution of X. This portion can be labelled as the *explained part*. This portion quantifies the potential reduction in the observed difference if the between-type differences in the distribution of circumstance

variables were eliminated. On the other hand, the second bracket represents the term attributable to the between-type differences in the function determining levels of *Y*. This part is termed the *unexplained part*. The unexplained part denotes the remaining portion of the observed difference that cannot be accounted for by the between-type difference in the distribution of *X*.

Furthermore, the initial term in equation (2) offers an estimation of the impact of ability across the complete set of independent variables on the disability gap observed in the dependent variable. Assessing the overall contribution is relatively straightforward, requiring the calculation of two sets of predicted probabilities and determining the difference between their average values. However, identifying the contribution of group differences in specific variables to the disability-related employment gap is a more complex task.

It is important to acknowledge that the contribution of each variable to the gap is determined by the change in the average predicted probability resulting from replacing the distribution of the sick or individuals with functional difficulties with the distribution of the individuals without functional difficulties for that specific variable, while keeping the distributions of other variables constant. Unlike in the linear case, the independent contributions of a variable are contingent upon the values of other variables. This implies that selecting a variable is potentially significant when calculating its contribution to the gap. The Fairlie decomposition technique offers an advantage in that the total contribution from all variables evaluated using the complete sample will equal the sum of contributions from individual variables.

3.2. Data Sources and Variable Description

Data for the analysis were elicited from the fourth wave of the General Household Survey. Table 1 presents a description of the variables. The study employs a different disability variable compared to previous studies (Arlette, 2012; Nwosu, 2018; Nwosu & Woolard, 2017). In this study, the selection of the disability variable was based on the understanding that in countries such as Nigeria, where a significant number of people lack access to healthcare, using morbidity as a measure of disability may not be reliable. This is because many individuals may not be aware of their symptoms or health concerns (Case & Deaton, 2005). In addition, functional difficulties can arise from birth (e.g., low vision) and do not

necessarily imply poor health. They could be due to a variety of reasons beyond illness, such as accidents.

As a result of the above, this study implemented a functional status assessment. Functional status refers to the ability of people in optimal physical health to execute a variety of tasks. Due to the complex nature of the utilised dataset, the study adopted the recommendation of Hanass-Hancock et al. (2023). Hanass-Hancock et al. (2023) proposed that when the sample sizes of individuals with varying levels of difficulty are too small for further disaggregation or breakdown by functional domain, it is more suitable to categorise individuals into two groups: (i) those with at least one functional difficulty and (ii) those without any functional difficulty. This approach allows for a better understanding of disability status. Consequently, we used a binary system to classify individuals. The General Household Survey consists of six questions related to functional impairments, including whether an individual has difficulty in seeing, hearing, walking or climbing steps, remembering or concentrating, taking care of oneself (washing all over or dressing, feeding, toileting, etc.), and communicating. This study thus developed a disability variable based on the presence or absence of these functional difficulties (Stewart et al., 1981).

Specifically, an individual's disability status receives a score of 1 if he reports at least one of the mentioned functional difficulties. Otherwise, the disability variable receives a score of 0. This classification technique holds several advantages. For instance, using smaller scores could summarise it succinctly, resulting in higher score reliability. In addition, the ability to estimate the functional status of individuals who fail to respond to all the functional questions would be enhanced (Stewart et al., 1981).

Table 1: Variable description & definitions

Variables	Code	Description
Disability Status	DS	*Dummy Variable*: 1 = functional difficulties, 0 if otherwise
Employee	Employee	*Dummy variable*: 1 if the individual is employed in a non-farm job outside the home, and 0 if unemployed and looking for a job.
Age	***age15–24 has been taken as the reference age group***	
	Age	*Ordinal Variable*: 1 = 15–24 years; 2 = 25–34 years; 3 = 35–44 years; 4 = 45–54 years; 5 = 55–60 years.
Gender	sex	*Dummy Variable*: 1 if the individual is male, 0 if otherwise
Geographical Dummy	rural	*Dummy Variable*: 1 if the individual resides in a rural area, 0 if otherwise
Marital status	mar	Dummy Variable: 1 if the individual is in any form of union (married [monogamous], married [polygamous] & informal union), 0 if otherwise (divorced, separated, widowed & never married)
Educational status	***[No education] has been taken as the reference educational status***	
	edu	*Ordinal Variable*: 1 if the individual has no education, 2 if the individual has primary education, 3 if the individual has secondary education, 4 if the individual has tertiary education.
Region	***[North Central, NC] has been taken as the reference region***	
	reg	1 if the individual lives in North East (NE); 2 if the individual lives in North West (NW) 3 if the individual lives in South East (SE); 4 if the individual lives in South South (SS) 5 if the individual lives in South West (SW)

Source: Authors' compilation

4. FINDINGS AND DISCUSSION

4.1. Descriptive Analysis

In carrying out the descriptive statistics, the sample was restricted to respondents aged at least 15 years and not older than 60 years. This was necessitated by the need to exclude likely non-labour force participants from the analysis. Table 2 shows the descriptive statistics for both the entire population and the population broken down by functional status. The population that reported being without functional difficulties and with functional difficulties was 85.4 per cent and 14.6 per cent, respectively. About 61 per cent of the 15–60-year-old population were employed in the full population. Sixty-two per cent of the population were males, and about 52 per cent resided in rural areas. This implies that a greater percentage of the population resides in rural areas. Table 2 also shows the spatial distribution of the population across the regions. Of the population, 15, 16, 11, 17, 26, and 14 per cent reported residing in the North Central, North East, North West, South East, South South, and South West regions, respectively.

In terms of age, 26, 22, 18, and 7 per cent were within the 25–34, 35–44, 45–54, and 55–60 year limits, respectively. Also, 54 per cent of individuals were married or cohabiting, which implied that 46 per cent were unmarried in the full sample. With regards to education, 14 per cent reported having primary education; 43 per cent, secondary education; 35 per cent, tertiary education, while 8 per cent reported having no formal education.

There are also several findings about the population disaggregated by functional status. For example, employment accounted for approximately 65 and 21 per cent of the population without functional difficulties and with functional difficulties, respectively. Comparatively, a greater proportion of individuals without functional difficulties were employed than individuals with functional difficulties. Moreover, 61 per cent of those who reported having no functional difficulties were male. This implies that 39 per cent of the population without functional difficulties was female. Of those who reported having functional difficulties, 59 per cent were male and 41 per cent were female.

Table 2: Descriptive statistics

Variable	Full	Without functional difficulties	With functional difficulties	Difference
Employee	0.61 (0.5)	0.65 (0.5)	0.21 (0.3)	0.44 [0.00]***
Gender (male = 1)	0.62 (0.5)	0.61 (0.5)	0.59 (0.5)	0.02 [0.00]***
Region (rural = 1)	0.52 (0.5)	0.56 (0.5)	0.63 (0.5)	-0.07 [0.00]***
Regions				
NC	0.15 (0.4)	0.22 (0.5)	0.16 (0.3)	0.06 [0.00]***
NE	0.16 (0.4)	0.18 (0.4)	0.21 (0.4)	-0.03 [0.11]
NW	0.11 (0.3)	0.12 (0.3)	0.09 (0.3)	0.03 [0.01]***
SE	0.17 (0.3)	0.15 (0.3)	0.22 (0.5)	-0.07 [0.00]***
SS	0.26 (0.5)	0.21 (0.5)	0.28 (0.5)	-0.07 [0.00]***
SW	0.14 (0.3)	0.12 (0.3)	0.05 (0.3)	0.07 [0.01]***
Marital status	0.54 (0.5)	0.57 (0.5)	0.69 (0.5)	-0.12 [0.00]***
Age group				
15–24	0.27 (0.5)	0.28 (0.5)	0.19 (0.4)	0.09 [0.00]***
25–34	0.26 (0.5)	0.26 (0.5)	0.21 (0.5)	0.05 [0.11]
35–44	0.22 (0.5)	0.20 (0.5)	0.27 (0.5)	-0.07 [0.00]***
45–54	0.18 (0.4)	0.18 (0.4)	0.21 (0.5)	-0.03 [0.00]***
55–60	0.07 (0.3)	0.08 (0.3)	0.12 (0.3)	-0.04 [0.00]***
Educational status				
none	0.08 (0.3)	0.10 (0.3)	0.47 (0.5)	-0.37 [0.00]***
primary	0.14 (0.4)	0.28 (0.4)	0.29 (0.5)	-0.01 [0.00]***
secondary	0.43 (0.5)	0.23 (0.5)	0.15 (0.3)	0.08 [0.00]***
tertiary	0.35 (0.5)	0.39 (0.5)	0.09 (0.3)	0.03 [0.01]***
No. of observations	7,197	6,144 (85.4%)	867 (14.6%)	-

***Source*:** GHS wave 4; author's computations; sample adjusted for national representativeness using post-stratification weights.

Note: ****, **, and * have statistical significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively. Standard deviations are in round brackets; p-values are in square brackets.*

Age-wise, there were differences between those who reported having no functional difficulties and those who reported experiencing functional difficulties. For instance, while 28, 26, 20, 18, and 8 per cent were within the 15–24, 25–34, 35–44, 45–54, and 55–60-year limits, respectively, in the population

that reported experiencing no functional difficulties, the population that reported having functional difficulties accounted for 19, 21, 27, 21, and 12 per cent of those within the 15–24, 25–34, 35–44, 45–54, and 55–60-year limits, respectively. Furthermore, in the population that reported experiencing no functional difficulties, 57 per cent were married or cohabiting. Table 2 shows that among the population that reported having functional difficulties, 69 per cent reported being married or cohabiting.

A greater percentage of the disaggregated population resided in rural areas, with 56 per cent of those reporting no functional difficulties and 63 per cent of those reporting some functional difficulties living in these areas, respectively. Education-wise, most of the respondents had some form of formal education: 29, 15, and 9 per cent of the individuals with functional difficulties reported having primary education, secondary education, or tertiary education, respectively, while 47 per cent indicated they had no form of education. In contrast, 10, 28, 23, and 39 per cent of the individuals without functional difficulties reported having no form of education, primary education, secondary education, or tertiary education, respectively. Ceteris paribus, the expectation that increasing educational status reduces the detrimental effects of functional disabilities makes this plausible (Nwosu, 2015).

Table 2 also shows the spatial distribution of the population across the regions. For the individuals stating they have no functional difficulties, 22, 18, 12, 15, 21, and 12 per cent reported residing in the North Central, North East, North West, South East, South South, and South West regions, respectively. Of the individuals who reported having functional difficulties, 16, 21, 9, 22, 27, and 5 per cent lived in the North Central, North East, North West, South East, South South, and South West regions, respectively. Table 2 also indicates that there were statistically significant differences in the variables across individuals with and without functional difficulties.

Table 3 presents a comparison of the employment gap between individuals with and without functional difficulties across the waves.

Table 3: Relationship between functional status and employment status: Analysis of variance (ANOVA)

Source	SS	df	MS	F	p > F
Between groups	9.15	1	8.09	32.64	0.00***
Within groups	1733.61	7195	0.27		

***Source*:** Authors' computations.

Note: ****, **, and * denote statistical significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively; statistics are corrected for survey design and national representativeness; df, SS, MS, F, and p denote degrees of freedom, sum of squares, mean sum of squares, F-statistic, and p-value, respectively.*

The results indicate that there was a statistically significant difference between the mean employment score for individuals with and without functional difficulties (F = 32.64, p =.00). This may indicate some evidence of disability-related disparities in employment. However, we cannot assert that disability-related discrimination is the cause of these disparities until we undertake a more formal analysis. This next section focuses on determining potential discrimination.

4.2. Econometric Analysis

The Fairlie decomposition estimate coefficients are presented in Table 4. The study used employment of individuals without functional difficulties as the non-discriminatory norm. Path dependence is a possible issue associated with Fairlie's sequential decomposition, which refers to the potential for different results when the order of variables in the decomposition is altered (Erdem, 2019; Fairlie, 2016; Fairlie & Robb, 2007; Schwiebert, 2015). Stated differently, the primary issue with the non-linear model stems from its sensitivity to the order of variables incorporated into the decomposition process. The Fairlie technique attempts to solve the problem by randomly ordering the variables across replications of the decomposition (Fairlie, 2016). To mitigate this concern, this study employed a substantial number of simulations to approximate the average decomposition across all possible orderings of variables while ensuring the preservation of the summing-up property. In order to test the sensitivity of the decomposition estimates to variable re-ordering, the study randomly shuffled the order of variables in the decomposition using 1000 replications, which is the minimum recommended number for most applications. (Fairlie, 2016; Jann, 2006).

The individual variables' signs have specific implications. A positive contribution on the part of a covariate signifies that the covariate contributed to widening the employment gap between individuals with and without functional difficulties, while a negative contribution indicates that it contributed to reducing the gap. The Fairlie decomposition concentrates on assessing how group differences in attributes influence the difference in employment rates between individuals with and without functional difficulties. This approach allows analysis of nonlinear outcomes. The estimates of dummy variables with several categories are calculated as a sum instead of categorically estimating them. It can also be observed in Table 4 that there is no significant difference in the outcomes of the pooled (column A) and non-discriminatory norm (column B).

The employment rate among individuals with no functional difficulties is about 19 percentage points (p.p.) greater than among individuals with functional difficulties (65.9 per cent against 46.9 per cent). In other words, the difference in employment between the two groups is about 0.19. The Fairlie decomposition shows that only 3.16 p.p. of that differential, which corresponds to 16.63 per cent of the total differential, may be explained by the endowments included in the model. The results are indicative of the fact that if the individuals with functional difficulties had the characteristics of the individuals without functional difficulties, their employment rate would increase (Arlette, 2012).

Based on the results of the Fairlie decomposition, the difference in group differences between people who do not have any functional difficulties and those who do have functional difficulties in all the model's covariates only makes up less than 20 per cent of the employment gap. Unobserved variables associated with employment may account for some of the gap. However, previous studies have opined that most of the unexplained gap may be attributed to discrimination (Arlette, 2012; Kidd et al., 2000). In other words, ceteris paribus, individuals with functional difficulties have disadvantages in employment compared to individuals without functional difficulties. Expressed differently, discrimination between the subgroups, among other omitted determinants of employment, could partly explain the employment gap. The decomposition of the employment gap revealed that the gap cannot be entirely attributable to observable characteristics (Arlette, 2012). For instance, functional difficulties impose productivity constraints that may not fully account for the observed

characteristics, contributing to a portion of the difference. Others may include a lack of social networks and a low quality of education. That said, it is likely that at least some of it was the result of employment discrimination due to individuals' disabilities.

Table 4: Decomposition of disability-related employment disparity

	(A) Individuals with/without function difficulties pooled		(B) Individuals without functional difficulties	
Variable	**Estimate**	**Share (% of total gap)**	**Estimate**	**Share (% of total gap)**
Mean prediction among individuals without functional difficulties	0.659		0.655	
Mean prediction among individuals with functional difficulties	0.469		0.463	
Total gap (A)	0.190		0.192	
Total explained gap (B)	0.0316	16.63	0.0252	13.13
Contribution of variable groups				
gender	0.0132***	6.95	0.0131***	6.88
	(0.0001)		(0.0000)	
rural	0.0309***	16.26	0.0311***	16.20
	(0.0000)		(0.0001)	
educational status	-0.0071*	-3.74	-0.0080*	-4.27
	(0.0554)		(0.0552)	
age	-0.0151**	-7.95	-0.0205**	-10.68
	(0.0433)		(0.0429)	
marital status	-0.0019***	-6.26	-0.0022***	-6.35
	(0.0013)		(0.0005)	
region	0.0216*	11.37	0.0218**	11.35
	(0.0610)		(0.0415)	
Observations	7,197		6,144	

***Source*:** Authors' computations.

Note: ****, **, * denotes significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively. The p-values are reported in brackets. Estimates and standard errors are generated from 1000 bootstrap samples. The sample was adjusted for national representativeness using post-stratification weights. Fairlie decomposition routine estimates follow Jann (2006). The outcome variable, employee, has a value of 1 if the individual holds a non-farm job outside their home, and 0 if they are unemployed and actively seeking employment.*

The finding that disability-related discrimination makes a substantial contribution to the employment gap is similar to conclusions reached in some previous studies. For instance, Mizunoya and Mitra (2013) found that people with disabilities have lower employment rates and attributed such employment rates to discrimination. Enemchukwu (2018) found a similar result in Tanzania. Several studies affirm that the employment gap is largely due to the functional difficulties of employees, with employers often harbouring pessimistic views about the work-related abilities of these individuals (Gold et al., 2012; Kaye, 2001; Lengnick-Hall et al., 2008). According to these studies, the employment gap is often explained by biased behaviour by employers and "pre-market" discrimination, which largely depend on the functional status of the individual.

The covariates have several economic implications. There is a disability-related employment gap between individuals with and without functional difficulties associated with their region of residence. The region in which an individual resides contributes to widening the employment gap between individuals with and without functional difficulties. Specifically, the region widens the gap by about 11.37 per cent. In the same vein, residing in a rural location widens the employment gap between individuals with functional difficulties and those without functional difficulties by 16.26 per cent.

Gender-wise, being male widens the employment gap by 6.95 per cent. This might possibly be caused by the fact that employment between males and females differs due to women's engagement in house management and other family commitments. The results show that education narrows the employment gap between individuals with and without functional difficulties. In other words, education contributes to the narrowing of the employment gap between the two groups. As educational attainment advances, the gap narrows. This is plausible since better educational qualifications improve employment outcomes, ceteris paribus (Lang & Manove, 2011). The findings of our study are consistent with some previous empirical studies (Asafu-Adjaye, 2012; Kuepie et al., 2006), but contrast with others (Fasih, 2008; Riddell & Song, 2011). In the same vein, age contributes to a narrowing of the employment gap. This is expected given that age is a reasonable proxy for experience, which may help reduce the employment gap between individuals with and without functional difficulties.

The marital status variable made a negative contribution to the employment gap. This is an indication that marital status played a role in reducing the disability-related employment gap. This may be due to the higher possibility of sick spouses enjoying more optimal treatment and follow-up care (Syse & Lyngstad, 2017), as well as having a higher probability of earlier recovery and re-entry into employment. In addition, married or cohabiting individuals benefit from their spouses' networks to secure jobs.

Our study has shown that age group, marital status, gender, and the location effect were among the most important covariates of the employment gap in the Fairlie decomposition model. Closing the gap in the demographic and proximal characteristics of people with and without functional difficulties was not enough to end employment inequalities between them, as shown by the significant unexplained contribution. These findings have huge implications for labour market outcomes in Nigeria and other developing economies.

5. CONCLUSION

The paper investigated the existence of a disability gap in employment in Nigeria and its implications. The Fairlie decomposition technique was employed to explore the presence of any disability-related employment discrimination. The results revealed significant employment gaps associated with disabilities, over and above the contribution of the observed covariates. However, discrimination due to functional difficulties was likely a huge factor in the employment gap (due to a large component unexplained by the observed characteristics of the labour force). As indicated earlier, some of this unexplained employment gap may be due to unobserved characteristics such as innate ability and productivity. In other words, the Fairlie decomposition reveals that observed characteristics between individuals with and without functional difficulties do not adequately explain the employment gap overall.

Therefore, based on the study's findings, policies regarding work accessibility might be more effective than anti-discrimination laws. Nonetheless, policies that prohibit discrimination based on functional status and ensure equal opportunity in the labour market are essential. These policies safeguard individuals from unjust treatment or exclusion from employment opportunities because of their functional difficulties, promoting a workforce that is more inclusive and diverse.

In other words, it is important for employers to foster inclusive work environments that promote equal opportunities and treat individuals with respect regardless of their functional status. Anti-discrimination policies, education and awareness programs, and reasonable accommodation practices can help mitigate disability-related employment discrimination and create a more equitable workplace for all employees.

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CORRIGENDUM

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CORRECTION TO THE PAPER GASIMLI, V., HUSEYN, R, & HUSEYNOV, R. (2024)

Some terminological inaccuracies have been identified in the article "Economy-wide and environmental benefits of green energy development in oil-rich countries: Evidence from Azerbaijan' published Economic Annals, 2024 69(241):41-64. https://doi.org/10.2298/EKA2441041G. The sentence on page 42 "*It is attempting to implement a mega project that involves laying a pipeline under the Black Sea to export renewable energy to Europe after using it for oil and natural gas*" corrected as below: "**It is attempting to implement a mega project that involves laying a cable under the Black Sea to export renewable energy to Europe**".

INSTRUCTIONS TO AUTHORS

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Papers should be prepared as a single file (including text, notes, references, and tables) in MS-Word or .pdf format. Tables and footnotes should be included as they are intended to appear in the final version. Footnotes should be kept to a minimum and numbered as superscripts. Figures should be submitted as separate files in Excel format with the original data included in a separate sheet.

As a rule, submitted articles should not exceed 8,000 words. All pages apart from the first one should be numbered. Subtitles should be concise, clearly marked in bold, and numbered (up to two levels of numbering). No other entries should be bolded. Formulae should be numbered on the right-hand side of the page. In case of long proofs, these should be inserted in a separate Appendix, following the References. Tables and Figures must not use colour, and should be in a format easy to edit, for instance they should take half a page (or a full page) within the indicated margins. They should be clearly labelled at the top, with a legend at the bottom, and should be logically ordered, using Arabic numerals. Sources of the data should be given below tables and figures.

Papers should follow APA style guidelines: https://apastyle.apa.org/style-grammar-guidelines/references/examples#textual-works. Some key points watch out for are as follows. Parenthetic references in the text and in footnotes should be listed by the author surname, with the year of publication in parentheses; in case of more than one author use an ampersand, for instance: (Atkinson, Picketty & Emmanuel, 2011). Narrative citations within the text should use "and" rather than ampersand, for instance: Djankov, Glaeser and La Porta (2003). Use an ampersand in the list of references. When citing works with one or two authors, include the author name(s) in every citation. For works with three or more authors, include the name of only the first author plus "et al." in every citation (even the first citation). Include all author names in the list of references. If the author is unknown, the first few words of the reference should be used; this is usually the title of the source. For example: (*A guide for economy*, 2019). Multiple works by the same author are sorted by date in ascending order; if the works are in the same year they should be ordered alphabetically by title and allocated a letter (a, b, c,…) after the date. Only reference the works that you have cited in your text. Within the text, avoid long strings of citations; cite only those works which are relevant to the text that they inform. Before submitting your paper, check that all references cited in the paper are included in the reference list at the end of the paper, and that all papers included in the reference list have been cited in the text.

References should be left aligned in alphabetical order in the reference list, according to the following formats:

• Article in journals

Author surname(s), initial(s). (Year). Article title. Journal, Volume number (issue or part number, optional), page numbers. DOI.

Rodrik, R., Subramanian, D., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration in economic development. *Journal of Economic Growth*, 9(2), 131-165.

https://DOI: 10.1023/B:JOEG.0000031425.72248.85.

• Books

Author surname, initial(s). (Year). *Title*. Publisher location: Publisher

De Grauwe, P. (2020) *Economics of Monetary Union* (13th ed.). Oxford: Oxford University Press.

• Edited Book

Author surname, initial(s). (Ed(s).). (Year). *Title*. Publisher location: Publisher

Baltagi, B.H. (Ed.). (2003). *A Companion to Theoretical Econometrics*. Oxford: Blackwell

• Book with several authors

When there are multiple authors, list them all, with the addition of ampersand (&) before the last surname. If there are more than seven authors, list the first six, then write three full stops (…), and at the end write the last author.

Acemoglu, D., & Robinson, J.A. (2006). *Economic Origins of Dictatorship and Democracy*. Cambridge: Cambridge University Press.

Baumol, W. J., Panzar, J. C., & Willig, R.W. (1982). *Contestable Markets and the Theory of Industry Structure*. New York: Harcourt, Brace, Jovanovich, Inc.

• Chapter in Book

Last name of the chapter author, initial(s). (Year). Chapter title. In editor initial(s), surname (Ed.). *Title* (ed., pp.). Publisher location: Publisher

McMillan J., & Woodruff C. (2003) The central role of entrepreneurs in transition economies. In G. S. Fields, & G. Pfefferman (Eds.). *Pathways Out of Poverty* (pp. 105-121). Dordrecht: Springer. https://doi.org/10.1007/978-94-010-0009-3_6.

• E-Book

Author surname, initial(s). (Year). *Title*. URL

Perry, R.B. (1909). *The Moral Economy*.

https://manybooks.net/book/137844/read#epubcfi(/6/2[id00000]!/4/2[id00000]/1:0)

• Technical Reports or Working Papers

Individual authors

Author surname, initial(s) or corporate name. (Year). *Title*. (Report or Working Paper No.). URL.

Cătuți, M., Kustova, I. and Egenhofer, C. (2020) *Delivering the European Green Deal for Southeast Europe: Do we need a regional approach?* (CEPS Research Report No.2020/1). https://www.ceps.eu/wp-content/uploads/2020/06/RR_2020-01_European-Green-Deal-for-South-Eastern-Europe.pdf.

Corporate authors

American Psychological Association, Task Force on the Interface Between Psychology and Global Climate Change. (2009). *Report of the APA Task Force on the Interface Between Psychology and Global Climate Change*.

http://www.apa.org/science/about/publications/climate-change.aspx

• Newspaper Articles

Author surname, initial(s). (Year, Month Day). Title. *Title of Newspaper*, p. or pp. URL*

*only include if the article is online.

Note: the date includes the year, month and date.

Smialek, J. (2020, May 2). Hotel Group Will Return Tens of Millions in Small Business Loans. *The New York Times*, pp. 10.

https://www.nytimes.com/2020/05/02/business/economy/ashford-hotels-virus-monty-bennett.html

• Website

Author surname, initial(s). (Year, month day). *Title*. URL

Mitchell, J.A. (2017, May 21). *How and when to reference*.

https://www.howandwhentoreference.com