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The determinants of private savings in Turkey: The role of financial development

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Abstract

Purpose — Over the past two decades since the 2000s, Turkey's private savings rates have decreased, which has become a concern for policymakers. In addition to considering the key determinants of private savings, this study primarily aims to quantify the linear and nonlinear impacts of financial development on private savings from 1980 to 2015.

Method — This study uses Autoregressive Distributed Lag (ARDL) procedure and the Fourier Toda-Yamamoto causality framework.

Findings — The main findings are as follows: 1) The ARDL bounds test supports the presence of a long-run equilibrium relationship between private savings and its determinants; 2) Financial development affects private savings nonlinearly in an inverted U-shaped pattern, and 3) No causality relationship is observed between private savings and financial development.

Implication — As financial development has an inverted U-shaped relationship with private savings, indicating that the complementary effect of financial development is replaced with a substitution effect after a certain threshold level, Turkish authorities should consider this evidence when tailoring policies regarding financial markets.

Originality — This study is the first to identify whether the relationship between private savings and financial development is linear or nonlinear in the context of an emerging economy in Turkey.

Keywords — Private savings, financial development, Bounds Test, Fourier Toda-Yamamoto causality, Turkey

Introduction

The low savings rates in Turkey are a key feature of the Turkish economy. Indeed, private savings as a percentage of GDP has declined since the 2000s (Tunc & Yavas, 2016). For example, the private savings rate declined from 25.5% in 2001 to 10 % in 2015, representing a 61% decrease from 2001 to 2015 (Figure 1). According to Tatlıyer (2018) and World Bank (2011), the dramatic decline in private savings rates during this period could be explained by several factors. First, increased public savings crowded out private savings. Second, low inflation and real interest rates reduce economic uncertainty, which reduces precautionary savings. Third, expanding credit volume promotes consumption expenditures, thereby hampering private savings. Finally, a significant increase in social expenditure mitigated uncertainty and insecurity, thus encouraging spending rather than savings among households. Besides the factors above, the macroeconomic stabilization

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program "Transition to a Strong Economy," launched in the aftermath of the 2001 crisis, also played a significant role in this decline (World Bank, 2011).

The decline in private savings raises concerns about Turkey's ability to generate sufficient domestic resources to finance investment, which is critical for capital formation and economic growth. Accordingly, the lack of domestic savings has forced Turkey to borrow heavily abroad to close the savings-investment gap (Ertuğrul, Gebeşoğlu, & Atasoy, 2018). Table 1 presents the evolution of Turkey's savings-investment gap between 2000 and 2015. Over the same period, on average, Turkey's investment gap was 4.2% of GDP. By relaxing the constraints on domestic investment, foreign savings may fill the saving-investment gap but come with risks. Indeed, a greater inflow of foreign capital appreciates the national currency, which lowers the profitability and competitiveness of tradable sectors, deteriorates a country's balance of payments, and increases its external debt (Özatay, 2016).

Table 1. Savings-Investment Gap in Turkey (% GDP)

Years	Domestic Savings*	Domestic Investment*	Savings-investment gap
2000	18.4	21.2	-2.9
2001	18.4	15.5	2.9
2002	18.6	18.0	0.6
2003	15.5	18.0	-2.5
2004	16.0	19.8	-3.8
2005	16.0	20.4	-4.3
2006	16.7	22.4	-5.7
2007	15.6	21.4	-5.8
2008	16.9	22.1	-5.2
2009	13.3	15.3	-2.0
2010	13.6	19.8	-6.2
2011	14.4	23.8	-9.4
2012	14.6	20.4	-5.8
2013	13.5	20.9	-7.5
2014	15.2	20.3	-5.1
2015	14.3	18.4	-4.0
Average	15.7	19.9	-4.2

Source: Presidency of the Republic of Turkey: Presidency of Strategy and Budget, retrieved from. http://www.sbb.gov.tr/ekonomik-ve-sosyalgostergeler/#1540021349032-1be70108-294c, Table 2.5: The Shares of Total Domestic Savings and Gross Fixed Investments in GDP (1975-2015). (Accessed on August 13, 2020).
Note: * Public + Private

In addition to considering the key determinants of private savings, this study primarily aims to quantify the linear and nonlinear impacts of financial development on private savings. Three motivations motivated us to study Turkey. First, over the 2002-2015 period, although Turkey registered an average of 5.94 percent of real GDP growth (World Bank, 2020), this performance did not translate into higher savings. As mentioned, Turkey's aggregate private savings have been declining. Turkey's private savings rate is relatively low compared to the seven largest emerging market economies (EM7s) (Table 2). That said, over the 2002-2012 period, on average, with its 16% private savings, Turkey lagged far behind China (43%), India (33%), Russia (20%), Mexico (19%), and Brazil (19%) (Aizenman, Cheung, & Ito, 2019). The low level of domestic private savings urges Turkey to use foreign savings to finance investments to boost economic growth. Second, according to Svirydzenka's (2016) financial development index, Turkey's financial development performance is noteworthy (Figure 2). Indeed, the index increased from 0.13 in 1980 to 0.51 in 2015, corresponding to a 0.38-point increase for the 1980-2015 period. Moreover, in 2013, in terms of financial development, Turkey ranked 37 with a score of 0.537 out of 183 countries globally. However, these developments in the financial sector do not translate into growth in private savings. Finally, previous studies in Turkey, which explored the drivers of private

savings, have paid little attention to the nonlinear impact of financial development on private savings.

Understanding the drivers of private savings is essential because of the broader macroeconomic implications for Turkey and emerging economies. Turkey's low and declining private savings are concerns for at least two reasons (World Bank, 2011). First, low and declining private savings endanger the sustainability of economic growth. Second, low and declining private savings rates have increased Turkey's dependency on foreign financing, fueling the current account deficit and leaving Turkey vulnerable to at least three types of risk: macroeconomic risk, financial instability, and capital reversal. Indeed, in a recent study, Cavallo, Eichengreen, and Panizza (2018) found that foreign savings are not a good substitute for domestic savings and concluded that financing growth and investment out of foreign savings, while not impossible, is risky and is best pursued cautiously if at all.

Table 2. Private Savings for Seven Largest Emerging Markets (EM7s)[1] (% GDP)

Years	Brazil	China	India	Mexico	Russia	Turkey
2000	17	34	28	-	-	22
2001	18	39	29	-	-	26
2002	19	40	31	-	22	23
2003	19	42	33	18	22	20
2004	20	44	34	19	20	17
2005	19	43	35	18	17	13
2006	20	44	35	20	17	12
2007	21	46	36	20	19	13
2008	20	47	34	18	17	15
2009	18	46	36	19	18	14
2010	-	47	34	19	22	12
2011	-	45	32	20	21	11
2012	-	-	-	19	20	12
Average	19	43	33	19	20	16

Source: Data on Brazil, China, India, Mexico, and Russia from Aizenman et al., (2019). Data on Turkey from the Presidency of the Republic of Turkey: Presidency of Strategy and Budget, Retrieved From. http://www.sbb.gov.tr/ekonomik-ve-sosyalgostergeler/#1540021349032-1be70108-294c, Table 2.5: The Shares of Total Domestic Savings and Gross Fixed Investments in GDP (1975-2015). (Accessed on August 13, 2020).

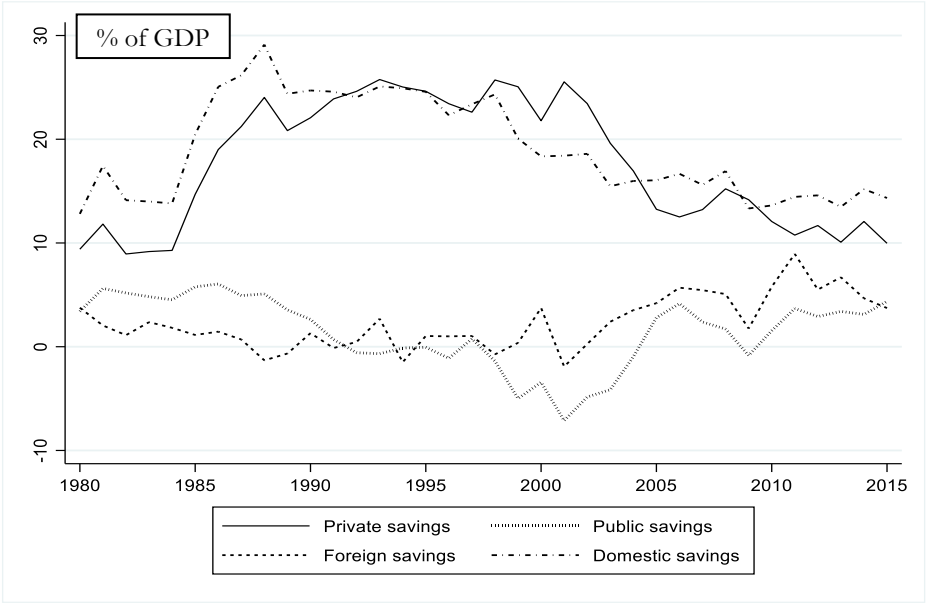
Note: Due to the unavailability of data, Indonesia, another member of EM7s, does not appear in the table.

This study contributes to the literature in at least four ways. First, few studies have explored private savings behavior in Turkey, and further studies are needed to shed new light on this topic. Second, previous studies (Gungor, Ciftcioglu, & Balcilar, 2014; Ozcan, Gunay, & Ertac, 2012; Van Rijckeghem, 2010) on Turkey examined only the impact of financial depth on private savings. Contrary to previous studies, we incorporate the financial development index developed by Svirydzenka (2016), which captures all dimensions of the financial sector (depth, access, and efficiency), into the private savings function within the context of Turkey. Third, it investigates both the linear and nonlinear effects of financial development on private savings. Prior studies on the determinants of private savings in Turkey have mainly focused on the linear impact of financial development and neglected nonlinear effects. Finally, to our knowledge, this is the first study to investigate the causal relationship between private savings and its determinants using a Fourier approximation.

Trends in Savings and Financial Development

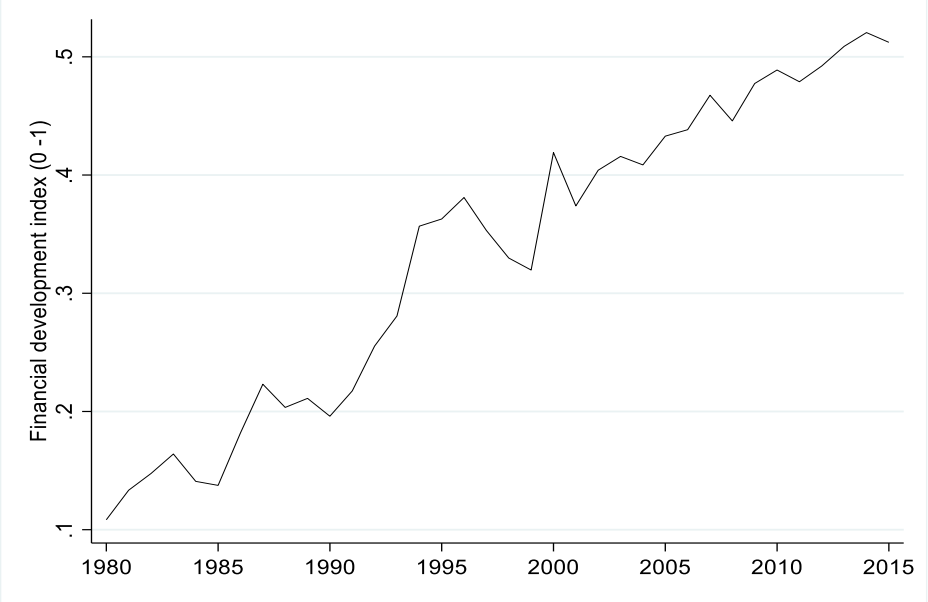
This section focuses on the patterns and stylized facts of Turkish savings and financial development. Figure 1 shows how Turkey's private, public, domestic, and foreign savings have evolved since 1980 and presents four important facts about savings behavior. First, the domestic savings rate has fallen steadily since 1989, reaching its second-lowest level (13.3%) in 2009. Second,

the public savings rate has declined continuously since 1986, and, in tandem with public saving, private saving has also fallen markedly since 1993. Third, in contrast to domestic savings, the foreign savings rate has risen significantly since 2001, and after 1997, foreign and public savings have exhibited similar movements. Finally, private and foreign savings are negatively associated. In other words, when foreign savings increase (decrease), private savings decrease (increase).



Source: Presidency of the Republic of Turkey: Presidency of Strategy and Budget. Table 2.5: The Shares of Total Domestic Savings and Gross Fixed Investments in GDP (1975-2015). Retrieved from. http://www.sbb.gov.tr/ekonomik-ve-sosyal-gostergeler/#1540021349032-1be70108-294c (Accessed on August 13, 2020).
Notes: Domestic savings = public + private, Private savings = household + corporate

Figure 1. Private, Public, Domestic, and Foreign Savings in Turkey (1975-2015)



Source: Svirydzenka (2016).

Figure 2. Financial Development Index in Turkey (1980-2015)

According to Gungor et al. (2014), Turkey registered noteworthy financial sector development after 1980, mainly due to the macroeconomic stabilization package - January 24, stability decisions - launched in 1980. Figure 2 presents an overview of the financial development

index[2] (fd) developed by Svirydzenka (2016) from 1980 to 2015. The financial development index increased from 0.13 in 1980 to 0.19 in 1983. The increase in the index in this period could be ascribed to the financial liberalization process, starting with a macroeconomic stabilization package in 1980. The index fluctuated between 1983 and 1989. From 1989 to 1994, it increased rapidly and reached 0.38 in 1996. The index decreased from 0.38 in 1996 to 0.31 in 1999, representing a decrease of 0.7. It reached 0.42 in 2000; though fluctuating, it exhibited a positive trend between 2001 and 2015. It seems that the macroeconomic stabilization program "Transition to a Strong Economy," initiated in the aftermath of the 2001 crisis, played a significant role in this positive trend (World Bank, 2011).

Private Savings and Financial Development

Two contending views on the linear impact of financial development on private savings prevail in the literature (Ito & Chinn, 2007). First, financial development may positively affect private savings by providing alternative savings instruments and more security to savers (firms and households). Second, financial development might negatively affect private savings by relaxing domestic liquidity constraints via greater access to consumer credit (borrowing) or housing finance and decreasing the need for precautionary savings. Emphasizing the role of industrialization, Aizenman et al. (2019) argue that financial development contributes positively to private savings in industrialized countries, while its impact is negative in developing countries. Improvements in credit conditions in developing countries have led to an increase in consumption, thereby reducing savings.

In addition to its linear impact, financial development may affect savings nonlinearly. According to Wang, Xu, and Xu (2011), if both firms and households face financial friction and financial development occurs first at the firm level and then expands to households, financial development can influence savings in an inverted U-shaped pattern. In other words, financial development initially promotes savings by enhancing firms' ability to borrow and invest but later hinders private savings by lowering households' precautionary saving motives. Thus, the overall impact of financial development on private savings a priori is undetermined.

Table 3. Summary of studies on Turkey

Author(s)	Period	Methodologies	Findings
Ozcan, Gunay, and Ertac (2003)	1968-1994	OLS	+ income; + financial depth + terms of trade shocks; + inflation
IMF (2007)	1980-2005	ECM	+ GDP per capita growth; + inflation - public saving
Van Rijckeghem (2010)	1988-2009	ECM	-public savings; + inflation
Matur et al. (2012)	1980-2008	OLS, Johansen co-integration	- public savings; - GDP growth rate; + inflation - banking credits to the private sector + real interest rate; - old dependency ratio
Ozcan et al. (2012)	1975-2008	OLS	+ income; + financial depth; + inflation + terms of trade shocks; - GDP growth rate
Gungor et al. (2014)	1960-2008	ARDL, PCA	-current account deficits; - old dependency ratio +financial development; + real interest rate, +per capita disposable income; + public savings
Tunc and Yavas (2016)	1999Q1-2014Q2	OLS, GMM	- consumer credit growth; - public savings, - real interest rate; + credits to the business sector; + GDP per capita growth + macroeconomic uncertainty

Notes: OLS - ordinary least squares; ECM - error correction model; ARDL -autoregressive distributed lag; PCA - principal component analysis; GMM - generalized method of moments.

Following the propositions mentioned above, empirical studies that tested the impact of financial development on savings yielded mixed results. For example, Grigoli, Herman, and Schmidt-Hebbel (2018) and Aizenman et al. (2019) find that financial development is negatively associated with savings. On the other hand, the evidence provided by Sahoo and Dash (2013),

Gungor et al. (2014), and Shawa (2016) shows that financial development promotes savings. Finally, Sahoo and Dash (2013) and Wang et al. (2011) documented an inverted U-shaped relationship between the two variables.

Understanding the determinants of private savings has been a fertile area for scholars. However, relatively few empirical studies have examined the potential determinants of private savings in Turkey, and these studies can be distinguished by whether they use macro-or micro-level data. Studies on Turkey that employed macro-level data are summarized in Table 3.

The literature review summarized above on Turkey shows that empirical research considers only the linear relationship between private savings and financial development and ignores the possibility of nonlinearity between the two.

Methods

Model and Data

This study's model is primarily based on those estimated by Aizenman et al. (2019), Grigoli et al. (2018), and Sahoo and Dash (2013).

$$pris_t = \lambda_0 + \lambda_1 y_t + \lambda_2 r_t + \lambda_3 pubs_t + \lambda_4 odr_t + \lambda_5 fs_t + \lambda_6 dem_t + \lambda_7 fd_t + \lambda_8 fd^2{}_t + \varepsilon_t \quad (1)$$

In the model, $pris_t$ stands for private savings (% GDP), y_t for real GDP per capita (in logarithm), r_t, for real interest rate[3], $pubs_t$, for public savings (% GDP), odr_t, for old-age dependency ratio (% of working-age population), fs_t, for foreign savings (% GDP) measured by the negative value of current account balance, dem_t for democracy[4], fd_t, for financial development, and ε_t for residual. The square of financial development (fd^2) is also incorporated into the model to account for a possible nonlinear relationship between private savings and financial development.

For instance, the existence of $\lambda_7 < 0$ and $\lambda_8 > 0$ suggests a U-shaped relationship between private savings and financial development. In this case, financial development negatively impacts private savings until a certain threshold level is reached, after which the impact is positive. However, $\lambda_7 > 0$ and $\lambda_8 < 0$ confirm an inverted U-shaped relationship between the two. In this case, financial development positively impacts private savings until a certain threshold level is reached, after which the impact is negative. The turning point that maximizes the effect of financial development on private savings for an inverted U-shaped relationship is

$$\frac{\partial(pris_t)}{\partial(fd_t)} = \lambda_7 - 2\lambda_8 fd_t = 0 \rightarrow fd_{\max} = \frac{\lambda_7}{2\lambda_8} \quad (2)$$

Note that the computed threshold from Equation (2) must be contained over the interval of $[fd_l, fd_h]$, where $[fd_l]$ and $[fd_h]$ represent the lowest and highest values of financial development, respectively.

It should be noted that the variables used in our model are not the only factors that influence savings behavior. Since our sample size (36 observations) is small, and due to the degrees of freedom available and to avoid multicollinearity problems, we excluded some other determinants of private savings from the model. For instance, inflation is omitted from the model to mitigate the collinearity problem between inflation and real interest rate.

Regarding data sources, private, public, and foreign savings data are obtained from the Presidency of the Republic of Turkey, the Presidency of the Strategy and Budget. The source of the democracy data is that of Marshall, Gurr, and Jagger (2018). GDP per capita, old-age dependency ratio, and real interest rate data are extracted from the World Bank World Development Indicators database (World Bank, 2020). Finally, financial development data are obtained from Svirydzenka (2016). In the literature, financial system deposits, liquid liabilities (M3 to GDP), stock market capitalization, and private credit to GDP are commonly used as indicators of financial development (Fromentin, 2017). However, it is worth mentioning that these indicators reflect only the depth (size) of the financial sector. Accordingly, we employed the financial

development index (*fd*) introduced by Svirydzenka (2016). This index is unique in that it captures financial institutions' and markets' depth, access, and efficiency dimensions.

Although the private saving-financial development nexus is the primary purpose of this study, macroeconomic, demographic, and institutional factors may also alter private saving behavior. The absolute income hypothesis (Keynes, 1936) and Permanent Income Hypothesis (PIH) (Friedman, 1957) assume a positive association between current income and savings. Therefore, we expect the coefficient of the GDP per capita to be positive.

The relationship between private savings and real interest rate remains a puzzle in the literature. The PIH and Life Cycle Hypothesis (LCH) hold that the positive and negative impacts of the real interest rate depend on the magnitude of income, substitution, and human wealth effects (Aizenman et al., 2019). If the substitution and human wealth effects dominate the income effect, the impact of the real interest rate on private savings is positive. On the other hand, if the income effect outweighs both the substitution and human wealth effects, the impact of the real interest rate on private savings is negative. Thus, the influence of real interest on private savings is ambiguous.

The Ricardian-Equivalence Hypothesis (REH) or debt neutrality hypothesis (Barro, 1974) ascertains that an increase in budget deficits is entirely offset by private savings, suggesting a negative association between public and private savings. Not only economic but also demographic factors can alter private saving behavior. According to the LCH, retired people accumulate assets during their working-age years and spend them during their retirement years (Ando & Modigliani, 1963). Since retired people finance their consumption expenditure with their accumulated savings, a higher old-age dependency ratio decreases private savings; thus, its coefficient is expected to be negative.

In theory, two major arguments debate the relationship between foreign savings (foreign capital) and private savings. First, foreign savings may contribute to a nation's total savings as an external source without substituting domestic savings. Therefore, foreign savings can supplement domestic savings. However, according to Cavallo et al. (2018) and Inter-American Development Bank (2016), foreign savings are not a good substitute for domestic savings, leading to costly macroeconomic crises and higher sovereign risk. Second, provided that foreign savings are used for consumption rather than productive investments, it may reduce private savings.

Sirowy and Inkeles (1990) argue that by securing property rights, strengthening the rule of law, and protecting basic freedoms and civil liberties, democracy can provide a friendly environment for economic agents to work, save, and invest. Moreover, according to Freytag and Voll (2013), institutional and political environments may alter saving behavior (individual and national levels). Therefore, we expect a positive association between democracy and private savings.

Over the 1980-2015 period, Turkish economy experienced a significant earthquake, financial and economic crisis, and global financial crisis, leading to a significant structural shift. Because conventional unit root tests do not account for structural breaks, we use unit root tests with structural breaks, as introduced by Zivot and Andrews (1992). Accordingly, a dummy variable (*dum*) that takes one after the structural break and zero before the structural shift is incorporated into the model.

Empirical Estimation

To study the cointegration between private savings and its determinants, this study implements the ARDL bounds testing approach (Pesaran, Shin, & Smith, 2001). Compared to conventional cointegration tests, ARDL has several advantages, such as (i) it can be applied for the variables integrated of order zero I(0) or one I(1) but not for variables integrated of order 2, I(2); (ii) it concurrently estimates short- and long-run parameters; and (iii) by selecting optimal lags, it eradicates residual correlation, alleviating the endogeneity problem. The last feature of the ARDL procedure is important because it enables researchers to estimate models even when endogenous regressors (Pesaran & Shin, 1999).

The ARDL model for Eq. (1) is as follows:

$$\Delta pris_t = \omega_0 + \sum_{i=1}^{q1} \omega_{1i} \Delta pris_{t-i} + \sum_{i=1}^{q2} \omega_{2i}\, \Delta y_{t-i} + \sum_{i=1}^{q3} \omega_{3i}\, \Delta r_{t-i} + \sum_{i=1}^{q4} \omega_{4i}\, pubs_{t-i} + \sum_{i=1}^{q5} \omega_{5i}\, \Delta odr_{t-i} + \sum_{i=1}^{q6} \omega_{6i}\, \Delta fs_{t-i} + \sum_{i=1}^{q7} \omega_{7i}\, \Delta dem_{t-i} + \sum_{i=1}^{q8} \omega_{8i}\, \Delta fd_{t-i} + \sum_{i=1}^{q9} \omega_{9i}\, \Delta fd^2{}_{t-i} + \psi_1 pris_{t-1} + \psi_2 y_{t-1} + \psi_3 r_{t-1} + \psi_4 pubs_{t-1} + \psi_5 odr_{t-1} + \psi_6 fs_{t-1} + \psi_7 dem_{t-1} + \psi_8 fd_{t-1} + \psi_9 fd^2{}_{t-1} + v_t \quad (3)$$

For example, to test the co-integration among the variables in Eq. (3), the null hypothesis of no cointegration $(H_0: \psi_1 = \ldots = \psi_9 = 0)$ should be tested against the alternative hypothesis$(H_1: \psi_1 \neq \ldots \neq \psi_9 \neq 0)$. The ARDL procedure proposes the Wald test (*F*-statistics) to establish the long-run equilibrium relationship between the I (0) or I (1) variables. Accordingly, two critical values (lower and upper) are generated by Pesaran et al. (2001) for I (0) and I (1) variables. The null hypothesis can be refuted if the computed *F*-statistic exceeds the upper critical value.

The ARDL procedure estimates $(q+1)^k$ the number of regressions, where *q* and *k* denote the maximum number of lags and number of variables, respectively. Information criteria, such as the Akaike (AIC), Schwarz Bayesian (SBC), and Hannan-Quin (HQ) information criteria, can be used to select the optimal lag lengths of each variable. Once cointegration is achieved, Eq. (4) can be estimated to obtain the short-run results.

$$\Delta pris_t = \psi_0 + \sum_{i=1}^{q1} \psi_{1i} \Delta pris_{t-i} + \sum_{i=1}^{q2} \psi_{2i}\, \Delta y_{t-i} + \sum_{i=1}^{q3} \psi_{3i}\, \Delta r_{t-i} + \sum_{i=1}^{q4} \psi_{4i}\, \Delta pubs_{t-i} + \sum_{i=1}^{q5} \psi_{5i}\, \Delta odr_{t-i} + \sum_{i=1}^{q6} \psi_{6i}\, \Delta fs_{t-i} + \sum_{i=1}^{q7} \psi_{7i}\, \Delta dem_{t-i} + \sum_{i=1}^{q8} \psi_{8i}\, \Delta fd_{t-i} + \sum_{i=1}^{q9} \psi_{9i}\, \Delta fd^2{}_{t-i} + + \psi_{10} ect_{t-1} + u_t \quad (4)$$

We use the Fourier Toda–Yamamoto causality (FTY) framework introduced by Nazlioglu, Gormus, and Soytas (2016) to investigate the causality relationship between private savings and its determinants. The main advantage of this framework is that it captures structural shifts in time-series data. Simply put, FTY is based on VAR ($p+d_{max}$), which can be specified as follows:

$$y_t = \varphi(t) + \beta_1 y_{t-1} + \ldots + \beta_{p+d} y_{t-(p+d)} + u_t \quad (5)$$

In Eq (5), $\phi(t)$ indicates the intercept as a function of time and shows any structural shifts in the dependent variable (y_t). To account for structural shifts, number, and form of breaks, the Fourier approximation is specified as follows:

$$\varphi(t) = \varphi_0 + \sum_{k=1}^{n} \gamma_{1k}\, sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \gamma_{2k}\, cos\left(\frac{2\pi kt}{T}\right) \quad (6)$$

In Eq (6), *n* represents the number of frequencies γ_{1k} and γ_{2k} gauges the size of the frequency and changes in frequency, respectively.
Eq (6) can be specified as a single Fourier frequency component as:

$$\varphi(t) = \varphi_0 + \gamma_1\, sin\left(\frac{2\pi kt}{T}\right) + \gamma_2\, cos\left(\frac{2\pi kt}{T}\right) \quad (7)$$

In Eq (7), *k* represents frequency for the approximation.
Finally, the FTY with single Fourier frequency causality can be obtained by substituting Eq (7) into Eq (5).

$$y(t) = \varphi_0 + \gamma_1\, sin\left(\frac{2\pi kt}{T}\right) + \gamma_2\, cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \ldots + \beta_{p+d} y_{t-(p+d)} + u_t \quad (8)$$

To conduct the Granger non-causality test, Nazlioğlu et al. (2016) suggested using *F*-statistics instead of the Wald test.

Results and Discussion

The ARDL procedure cannot be applied to variables integrated of orders higher than I(1). Thus, it is crucial to perform stationary tests to ensure that no variable is I(2). If a variable is integrated of degree two, the *F*-statistics calculated by Pesaran et al. (2001) are invalid. The results of the Phillips and Perron (1988) and Zivot-Andrews (1992) unit root tests are reported in Table 4. The PP test results show that *pris, y, r, pubs*, and *fd* are I(1), whereas *odr*, *fs*, and *dem* are I (0). On the other hand,

the Zivot-Andrews test results indicate that while *pris*, *y*, *r*, *pubs*, *fs,* and *dem* are I(I), the rest of the variables are I(0). Hence, it is confirmed that the variables are not I(2). These findings pave the way for the application of the ARDL bound test approach in empirical analysis. Moreover, the breakpoint (2007) obtained from the Zivot-Andrews (1992) test for private savings, which can be attributed to the global financial crisis of 2007-2008, is included in the model as a dummy variable.

Table 4. Stationarity tests with and without structural break

Variable	PP			Zivot-Andrews				
	Level	1st dif.	Summary	Level	Break date	1st dif.	Break date	Summary
Pris	-1.497	-4.939***	I(1)	-4.051	1985	-5.710***	2007	I(1)
Y	-2.379	-6.368***	I(I)	-4.236	1999	-6.662***	2003	I(I)
R	-0.920	-6.501***	I(1)	-3.661	2002	-8.876***	1995	I(1)
Pubs	-1.334	-5.535***	I(1)	-3.691	2004	-6.753***	2002	I(1)
Odr	-3.827**	-	I(0)	-4.580*	1987	-	-	I(0)
Fs	-3.955**	-	I(0)	-4.136	2004	-7.296***	2008	I(1)
Dem	-4.090***	-	I(0)	-2.828	1989	-7.141***	1986	I(0)
Fd	-1.668	-6.479***	I(1)	-6.234**	1998	-	-	I(0)

Note: ***, **, * indicted significant at 1%, 5%, and 10% level.

After determining the integration characteristics, the ARDL bounds test is employed to detect the cointegration between private savings and its potential determinants. Subsequently, a bound F-test is applied to Eq. (3) to confirm the cointegration in the linear and nonlinear models, and the results are presented in Table 5.

Table 5. Results of bound tests

Models	*k*	*m*	*F*-Stat.	*F*-Critical Values			
				%5		%1	
				I(0)	I(1)	I(0)	I(1)
F(pris | y, r, pubs, odr, fs, dem, fd)	7	2	9.637***	2.32	3.5	2.96	4.26
F(pris | y, r, pubs, odr, fs, dem, fd, fd^2)	8	2	12.534***	2.22	3.39	2.79	4.1

Notes: The critical values from Pesaran et al., (2001). *** indicte significant at 1%. k and m represent the number of regressors and optimal lag length, respectively. The appropriate number of lags for both models is determined by the Schwarz Information Criterion.

Given that the *F*-statistics reported in Table 5 are greater than the upper critical bounds value, the cointegration relationship between private savings and their potential determinants is confirmed for the linear and nonlinear models. Table 6 reports the long- and short-run results for the linear and nonlinear models. Broadly speaking, the long-run results are consistent with the economic theory.

First, we investigate the linear relationship between private savings and financial development with other determinants of private savings, documenting that financial development does not significantly affect private savings. Regarding the control variables, public savings and the old-age dependency ratio are negatively related to private savings, whereas GDP per capita and democracy are positively associated with private savings. Finally, real interest rates and foreign savings do not significantly affect private savings.

As Wang et al. (2011) and Sahoo and Dash (2013) argue, the relationship between private savings and financial development could be nonlinear. Accordingly, we examine the possible nonlinearities between private savings and financial development by incorporating the square of the financial development index in the model. According to the inverted U-shaped hypothesis, one would anticipate a positive coefficient for the financial market development index level and a negative coefficient for the quadratic term.

To preview the long-run results of the nonlinear model, we document that financial development has a statistically significant and inverted U-shaped relationship with private savings.

The threshold beyond which financial development reduces private savings is 0.29. This result implies that private savings increase at the early stage of financial development, and after a threshold (0.29), financial development decreases private savings. As a robustness check, we use Lind and Mehlum's (2010) U test for non-monocity. The findings in Table 7 confirm an inverted U-shaped relationship between private savings and financial development, which is in line with Wang et al. (2011) and Sahoo and Dash (2013).

Table 6. Results and diagnostic tests

Linear model (Model 1)				Quadratic model (Model 2)			
A) Long-run	ARDL (1, 0, 0, 0, 0, 0, 2, 0)			ARDL (1, 0, 0, 0, 0, 0, 2, 0, 0)			
Regressors	Coefficient	t- stat.	p-value	Regressors	Coefficient	t-stat.	p-value
Y	13.183**	2.125	0.045	y	8.567**	2.124	0.045
R	0.011	0.721	0.478	r	0.008	0.765	0.452
Pubs	-0.889***	-6.852	0.000	pubs	-0.630***	-3.697	0.001
Odr	-4.231**	-2.481	0.021	odr	-2.808**	-2.580	0.017
Fs	-0.407	-1.371	0.184	fs	-0.378*	-1.832	0.081
Dem	0.543***	4.277	0.000	dem	0.456***	4.167	0.000
Fd	-5.359	-0.448	0.658	fd	90.235***	3.185	0.004
				fd^2	-154.635***	-3.396	0.002
B) Short-run							
Regressors	Coefficient	t-stat.	p-value	Regressors	Coefficient	t-stat.	p-value
Δdem	-0.039	-0.449	0.657	Δdem	-0.140*	-1.911	0.069
Δdem (-1)	-0.504***	-4.823	0.000	Δdem (-1)	-0.490***	-5.683	0.000
dum2007	-0.171	-1.693	0.345	dum2007	1.218**	2.787	0.011
constant	-45.571***	-10.050	0.000	constant	-39.568***	-12.433	0.000
ecm_{t-1}	-0.776***	-10.081	0.000	ecm_{t-1}	-0.907***	-12.481	0.000
C) Diagnostic Tests			p-value			Value	p-value
R^2		0.78	-	R^2		0.84	-
Adjusted R^2		0.75	-	Adjusted R^2		0.82	-
F -Statistics		26.220***	0.000	*F* -Statistics		40.099***	0.000
Serial correlation		0.126	0.938	Serial correlation		0.954	0.620
Functional form		1.019	0.319	Functional form		0.910	0.373
Normality		1.472	0.478	Normality		1.825	0.401
Heteroscedasticity		0.631	0.729	Heteroscedasticity		0.150	0.927
Cusum/Cusumq		Stable/Stable -		Cusum/Cusumq		Stable/Stable -	

Notes: ***, **, * indicte significant at 1%, 5%, and 10% level.

Table 7. Lind-Mehlum test results

Dep. variable: *pris*	
Data range for financial development	[0; 1]
Lower bound slope	26.6.29**
	(2.165)
Upper bound slope	-48.601 **
	(-1.855)
Lind-Mehlum U test	1.86**
	(0.0373)
Turning point	0.29
95% Confidence interval Fieller method	[0.211; 0.647]

Notes: H_0: Monotone or U-shaped vs. H_1: inverse U-shaped. ***, **, * indicte significant at 1%, 5%, and 10% level.

Turning to the control variables, an increase in GDP per capita in both models is positively correlated with private savings in the long run, implying that as economic agents' incomes rise, they tend to save more money. Therefore, it validates the Keynesian absolute income hypothesis and is consistent with Grigoli et al. (2018), IMF (2007), Matur et al. (2012), and Ozcan et al. (2012).

Although the coefficients of real interest rates are positive, they are not statistically significant in the long run in either model, indicating that neither income nor substitution effects hold in Turkey. This result is aligned with the results of Ozcan et al. (2003) but contradicts the findings of Gungor et al. (2014) and Tunc and Yavas (2016).

The results also reveal that public savings crowd out private savings in the long run in both models. For example, in the nonlinear model, a one percentage point increase in public savings leads to a 0.63 percent of GDP decrease in private savings in the long run. This result aligns with the findings of Van-Rijckeghem (2010), Matur et al. (2012), and Ozcan et al. (2012) that observe the Ricardian offsetting coefficients lie between -0.38 and -0.77 in the context of Turkey.

The old-age dependency ratio seems to affect private savings negatively and significantly in both models in the long run, meaning that the non-working old-age population tends to save less in Turkey, corroborating the LCH and in line with Ozcan et al. (2003), Matur et al. (2012), and Grigoli et al. (2018). This finding further suggests that Turkish policymakers should reconsider institutional arrangements such as legislation on social security provisions and retirement age.

Foreign savings crowd out private savings only in the nonlinear models. Quantitatively, a 1% increase in foreign savings creates a 0.37 % decline in private savings, reflecting the substitution of foreign savings for domestic private savings. One way of reading this finding is that greater access to foreign savings increases the liquidity that spurs consumption, particularly imported goods, thereby reducing private savings rates. Therefore, Turkish authorities should consider the gains and losses from overreliance on foreign savings. The studies by Bulíř and Swiston (2006) and Sahoo and Dash (2013) also find an inverse relationship between private and foreign savings.

Democracy is strongly associated with private savings in both models, suggesting that a democratic environment is conducive to private savings and lending support to the arguments of Freytag and Voll (2013) and Sirowy and Inkeles (1990), who state that saving behavior may be affected by institutions and the political environment.

The short-run results from the nonlinear model show that the coefficient of the dummy (*dum*) variable is positive and statistically significant, suggesting that structural breaks induce private savings. Moreover, the error correction terms with the expected sign (negative) are statistically significant in both models. For example, the error correction term equals 0.90, and is significant at the 1 percent level, implying that private saving adjusts almost entirely to its desired long-run level in the first year in the nonlinear model. Further, the diagnostic tests reported in Table 6 show that the estimated models are clear of serial autocorrelation, heteroscedasticity, and non-normal errors, and are correctly specified.

Table 8. Fourier Toda -Yamamoto test results

Direction of Causality	$p+d_{max}$	k	F-stat	*Bootstrap p-value*
$fd \neq> pris$	3	2	2.388	0.302
$pris \neq> fd$	3	2	2.856	0.239
$fs \neq> pris$	3	2	1.460	0.481
$pris \neq> fs$	3	2	7.309**	0.025
$y \neq> pris$	3	2	2.294	0.317
$pris \neq> y$	3	2	2.860	0.239
$r \neq> pris$	3	2	4.798*	0.090
$pris \neq> r$	3	2	1.436	0.487
$pubs \neq> pris$	3	2	2.044	0.359
$pris \neq> pubs$	3	2	0.860	0.650
$odr \neq> pris$	3	2	9.714***	0.007
$pris \neq> odr$	3	2	1.405	0.495
$dem \neq> pris$	3	2	3.633	0.162
$pris \neq> dem$	3	2	3.157	0.206

Notes: $\neq>$ indicates the null hypothesis of Granger non-causality. k denotes the frequency of the approximation. ***, **, * indicte significant at 1%, 5%, and 10% level.

Furthermore, given some structural breaks in the sample data, we checked for the Fourier causality relationship between private savings and its determinants. The results in Table 8 show one-way causality from old-age dependency and real interest to private savings and from private savings to foreign savings. Moreover, there is no causality between private savings and financial development, GDP per capita, public savings, or democracy.

Conclusion

Over the last two decades, the Turkish economy has witnessed a significant decline in private savings rates. This decline has become a concern for policymakers because it threatens to achieve the 2023 goals and jeopardizes the domestic private savings rates targeted (30% of GDP) in the 11th development plan period (2019-20023). Relying on the ARDL and Fourier causality approaches, we analyze the determinants of private savings in Turkey from 1980 to 2015. The quantification of the linear and nonlinear impacts of financial development on private savings is of particular interest.

Our key finding is that financial development has an inverted U-shaped effect on private savings. In other words, financial development has a declining marginal effect on private savings after a certain threshold, suggesting that financial development reduces private savings after this turning point. Regarding the other determinants, public savings, foreign savings, and the old dependency ratio are negatively related to private savings, while GDP per capita and democracy are positively associated with private savings. The real interest rate is not significantly associated with private savings.

The policy implications of this study are as follows: 1) financial development has an inverted U-shaped relationship with private savings, indicating that the complementary effect of financial development replaces a substitution effect after a certain threshold level. Turkish authorities should consider this evidence when tailoring policies regarding financial markets; 2) GDP per capita positively influences private savings, which indicates that overall economic growth is conducive to private savings. Therefore, Turkey should undertake growth-oriented policies; 3) lack of domestic savings forces Turkey to use foreign savings, but greater use of foreign savings displaces private savings. This increases the dependency on external financing and leads to a widening current account deficit, contributing to the risk of an external crisis. Therefore, Turkish authorities should place a particular emphasis on stimulating domestic private savings because, compared to foreign savings, domestic savings lower macroeconomic risks and influence external imbalance, notably with the least negative effect on economic growth; 4) since the old dependency is a drag on private savings, the Turkish government should provide tax incentives such as tax-exempt retirement accounts for retirees. The Turkish government initiated a voluntary private pension scheme in 2003 to encourage private savings for retirement. Although the number of participants in the voluntary private pension system is increasing, this is not at the desired level. Moreover, in Turkey, the pension funds stood at 5.5% of GDP in 2014, relatively lower than the weighted average of OECD countries (OECD, 2015). Accordingly, new policies such as decreasing fund management fees and introducing public awareness campaigns about the system should be implemented to increase the participation rate; 5) since public savings crowd out private savings, Turkish policymakers should implement policies aimed at reducing budget deficits to increase saving rates; and 6) given that democracy is positively associated with private savings, Turkish authorities should strive to maintain democratic institutions that protect property rights and strengthen the rule of law.

As with all academic studies, our study has some limitations. First, this study focuses on total private savings; future studies can investigate the sub-components of private savings separately, namely, households and corporations. Second, our study investigates the linear and nonlinear impacts of the general financial development index on private savings; future studies can follow the same analysis for the sub-indices of the general financial development index (financial market development index and financial institution development index). Finally, further research investigating the asymmetric impacts of general financial development and its sub-indices on private savings would be valuable.

Notes

1) EM7s included Brazil, China, India, Indonesia, Mexico, Russia, and Turkey.
2) The index ranges from 0 to 1, where 0 denotes the lowest level of financial development and one refers to the highest level of financial development.
3) Following Aizenman et al. (2019), the real interest rate is measured as r = ln[(1+i) / (1+ inf)], where ln refers to the natural logarithm; i to the nominal deposit rate, and inf to the inflation rate respectively.
4) Measured by polity2, based on the Polity IV project. The score gauges the level of democratic institutions and ranges from -10 to 10, with -10 to -6 indicating "autocracies" and +6 to +10 "democracies."

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Empirical analysis of the impact of Turkish bilateral official development assistance on export

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Abstract

Purpose — The main objective of this study is to explore the relationship between bilateral official development assistance and the export of Turkey to 18 Turkish aid recipient countries between 1998 and 2019.

Methods — The study employs the gravity model of international trade to capture the effect of official development assistance on Turkish export to its aid recipient countries and utilizes Panel data econometric analysis.

Findings — The official development assistance (ODA) remains statistically significant across the models, indicating that ODA is one of the significant drivers of Turkish bilateral trade with the aid recipient countries.

Implications — The study argues that Turkey applied ODA as a foreign policy tool to access new markets in the Middle East, Balkans, Africa, and Asia. Turkish exports to developing countries increased due to the upsurged country's foreign aid donation to its recipients.

Originality — This study deviates from other studies in the literature by empirically examining the relationship between bilateral Official development assistance and the export of Turkey.

Keywords — Gravity model, official development assistance, export, Turkey.

Introduction

Developed countries frequently use foreign aid to further their foreign policy goals in developing and least-developed nations. Although each donor has a different foreign assistance policy, most give bilateral aid to nations with which they have colonial links, a common official language, and, most crucially, strong cultural and historical ties (Nilsson, 1998). Indisputably, economic and political interests have also shaped donors' foreign aid allocations. The strategic interests of a donor, such as security and political influence, also play a vital role in foreign aid allocations. These strategic interests are often associated with commercial objectives (Arvin & Baum, 1997).

Over the years, the relationship between foreign assistance and trade attracted substantial academic attention and has been studied in different dimensions and contexts. Generally, the existing literature highlights a positive association between foreign aid and trade; this association is robust to different restrictions in the case of donor exports but not recipient exports (Martínez-Zarzoso, Nowak-Lehmann, Parra, & Klasen, 2014; Martínez-Zarzoso, Nowak-Lehmann, & Klasen, 2017).

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Trade is impacted differently by various types of international aid. For instance, tied foreign aid has been perceived as a tool used by donors to increase their exports to aid recipient countries, whereas untied development aid, technical assistance, and humanitarian aid foster goodwill between donors and recipients, which in turn, spurs bilateral trade and investment. Generally, foreign aid can affect bilateral trade between donor and recipient through several channels. Firstly, donors can apply foreign assistance as a 'market entry policy' to create or fortify the official relationship and portray themselves as reliable donors. Secondly, a donor may provide aid for trade devoted to improving infrastructure, production capability, or easing bilateral trade. These methods decrease trade costs and boost bilateral trade. Thirdly, the idea that foreign assistance increases recipient countries' income and purchasing power raises the possibility that exports from donors to recipient countries will rise (Martinez-Zarzoso, 2019).

The paper investigates whether bilateral official development assistance encourages Turkey's export to aid recipients. Although Turkey is not a member of the DAC, it has been reporting to the OECD and providing official development assistance to developing countries since 1990. Over the past 20 years, Turkey's official development assistance has drastically expanded, from 85 million in 2002 to 8.121 billion in 2017. Moreover, according to Turkish Cooperation and Coordination Agency (TIKA), in 2015, Turkey was rated as the most generous country in the OECD. Similarly, according to the Global Humanitarian Report 2018, Turkey has the biggest expenditure on humanitarian aid, totaling $8.0 million.

Immense studies are devoted to the relationship between foreign aid and foreign trade in the literature (Martínez-Zarzoso, Nowak-Lehmann, Klasen, & Johannsen, 2016; Nowak-Lehmann, Martínez-Zarzoso, Herzer, Klasen, & Cardozo, 2013; Otor & Dornan, 2017; Skärvall, 2012). These studies examined the relationship between international trade and aid from various angles. The literature extensively discusses themes like donors providing foreign aid out of a sense of compassion to share their wealth with less fortunate countries (Gulrajani & Calleja, 2019). However, many empirical studies demonstrated that bilateral foreign aid had been applied to achieve foreign policy objectives; economic, trade, political, and strategic interest (Apodaca, 2017).

Different traditional and emerging donors have different foreign policy tools and endings; hence, they practice different foreign assistance compatible with their foreign policy. This heterogeneity among donors' political, economic, and strategic interests obstructs drawing clear distinctions between and within donors' foreign aid targets. For instance, according to Alesina and Dollar (2000), Norway and France have significant variations in their foreign aid motives. In contrast to France, Norway strongly emphasizes recipient needs such as income level, recipient merit, openness, and institution quality. Instead, France favors providing aid to its former colonies, regardless of how poor the destination country is.

Martinez-Zarzoso (2019) argues that foreign assistance can promote exports from donor countries to recipient countries at the bilateral level in several ways. Firstly, donors can implement foreign assistance as a policy instrument for exploring new trade partners to create or strengthen official relations and to improve the country's international image by representing themselves as a trustworthy and humanistic donor. Secondly, a donor country may offer foreign assistance for trade purposes devoted to improving trade infrastructure, and it may minimize trade costs and enhance exports. Thirdly, assuming foreign assistance stimulates trade, it increases demand for imported products from donors.

Arvin and Baum (1997) developed a foreign assistance model and endeavored to explain how different forms of foreign aid enhance donor's export to recipient countries. The study analyzed a sample of seventeen OECD countries from 1972-1990. It shed light on donors persistently offering substantial untied foreign aid to create a stock of goodwill, improving their export to aid recipient countries. Donors usually politicize the development of foreign assistance, particularly tied aid to accomplish their political, strategic, and economic interests. Bilateral official development assistance (ODA) has been employed to boost the export volume to aid recipient countries. It is where the two broad concepts of foreign aid and trade intersect. Hence, Inmaculada Martínez-Zarzoso et al. (2014), using advanced panel data methods, examined whether bilateral aid was effective in fostering bilateral exports to recipient countries during 1988–2007 and to what

degree adjustments in aid policies have influenced this relationship. The findings indicated that donors' bilateral foreign assistance has positively affected their exports to developing states. The study also highlighted the effects of bilateral foreign assistance on export changes over time and across donors. Martínez-Zarzoso et al. (2017), using a dynamic gravity model, also estimated the impact of Dutch development aid on the aggregate export of Dutch in different periods across aid recipient nations. The findings revealed that $1 of development aid expenditure created a range of returns from $0.26 to $0.40 from 1964 to 1999. The study's estimates also revealed that aid is not statistically significant across periods and countries.

Martínez-Zarzoso, Nowak-Lehmann, and Klasen (2010), using the gravity model of international trade, investigated how multilateral and bilateral foreign aid affects donor's exports to recipient states and compared estimates across donors. The results indicated an overall positive relationship between multilateral aid and exports of all donors. Notably, findings also revealed that a multilateral form of foreign aid only positively affects export in the short run. However, bilateral foreign aid has a positive effect on export both in the short & long term.

Noh and Heshmati (2017) examined the link between Korean bilateral official development assistance (ODA) and its export to aid recipient countries from 1996 to 2014. Using the traditional gravity model, the results disclosed that humanitarian assistance and loan forms of ODA positively affect export. Likewise, Martínez-Zarzoso et al. (2016) applied an augmented gravity trade model to explore the linkage between German development assistance and sectoral-level exports from Germany to aid recipient countries with data from 1978–2011. The results suggested that in the long run, each dollar of German foreign aid leads to an average upsurge of $ 0.83 in German goods exports. On the other hand, Skärvall (2012) endeavored to investigate the association between bilateral trade and official development assistance (ODA) and the aid for trade (AFT) of Sweden. The study used a gravity model of international trade to analyze data which comprises 126 aid recipient countries from 1996 to 2009. The estimates indicated that bilateral trade between Sweden and its aid recipients improves as the official development assistance increases. In contrast, Zarin-Nejadan, Monteiro, and Noormamode (2008) indicated that the impact of Swiss official development assistance on its export is ambiguous, and it takes time to materialize it.

One way to understand the effect of foreign assistance on recipient economies is to examine the indirect impact of ODA on income through international trade and the transformation of local production. The literature on the impact of official development assistance on developing countries' economies shows abstruse conclusions. Estimates of a cross-section study covering 33 donors and 125 recipient countries showed that developmental aid substantially directly affects donors' exports to recipient countries. However, the effect on recipient export to the donor is not robust (Martinez-Zarzoso, 2019). These findings align with existing literature that repeatedly reported a negative association between aid and recipient export to the donor (Nowak-Lehmann, et al., 2013).

Most studies on developmental aid conducted in the Turkish context have focused on foreign aid's political implications and drivers. For instance, Güngör (2021), Korkmaz and Zengin (2020), and Mehmetcik and Pekel (2020) showed that Turkish foreign assistance is primarily determined by historical linkages, foreign policy goals, religious solidarity, and, most crucially, economic interest.

We reviewed the literature about the linkage between foreign aid and bilateral trade in the above section. However, only some articles addressed the potential link between the Turkish economy and bilateral foreign aid. In the early 2000s, Turkey's foreign aid policy changed dramatically from co-ethnic to global or Muslim Ummah oriented. It was only 85 million in 2002 but jumped to 8,121 billion in 2017. During the Post-2000 era, Turkey applied foreign aid as an effective diplomatic instrument to influence countries and make strategic allies in developing countries, particularly in the Muslim world (Kavakli, 2018). The political implications of Turkish foreign aid have been tremendously discussed in the literature, but its economic and trade implications have yet to get substantial attention from academia. Therefore, this study aims to fill this gap and examine the link between bilateral Turkish official development assistance and export from Turkey to aid recipient countries.

Methods

The gravity equation is a simple econometric model for studying bilateral trade flows between countries. The model describes the trade flow between two countries or a group of countries as directly proportional to their economic mass (GDP) and inversely proportional to the distance. The gravity model of international trade is comparable to the Newtonian physics equation that describes the force of gravity. Pöyhönen (1963) and Tinbergen (1962) are the prior scholars who stipulated the gravity model equation as follows:

$$\mathrm{Exp_{ijt}} = \frac{\mathrm{GDP_{it}} * \mathrm{GDP_{jt}}}{D_{ij}} \quad (1)$$

In multiplicative form, equation (1) can be rewritten as follows;

$$\mathrm{Exp_{it}} = \mathrm{GDP_{it}}^{\beta_1} * \mathrm{GDP_{jt}}^{\beta_2}{}_{\mathrm{jt}} * \mathrm{D_{ij}}^{-\alpha} \quad (2)$$

where (Exp_{ij}) stands for the export value between countries i and j, GDP_i, and GDP_j are the national incomes of countries i and j, respectively. The distance variable ij is used to capture the physical distance between country i and j and is a constant of proportionality.
The logarithm form of the gravity model equation (1), the linear form of the model, and the equivalent estimable equation become:

$$\mathrm{Ln}\big(\mathrm{Exp_{ijt}}\big) = \alpha_0 + \beta_1 \mathrm{Ln}(\mathrm{GDP_{it}}) + \beta_2 Ln\big(\mathrm{GDP_{jt}}\big) + \alpha_1 \mathrm{Ln}(\mathrm{D_{ij}}) + \varepsilon_{\mathrm{ij}} \quad (3)$$

α_1, β1, and β2 stand for coefficients of the parameters to be estimated. The error term $\varepsilon_{\mathrm{ij}}$ captures another determinant of bilateral trade between countries. Equation (3) is the main gravity model equation where export is expected to be a positive function of income and a negative function of distance.

The Model

The above-elaborated literature review summary shows that studies related to drivers of bilateral trade usually apply the gravity model. Similarly, this study applies a gravity model of international trade to comprehend the possible relationship between export and bilateral Turkish official development assistance. The gravity model in our case is constructed; export from Turkey as a country (i) to trade partner as a country (j) is a function of GDPs, and the geographic distance and hence can be written as:

$$\begin{aligned}\mathrm{Ln}\big(\mathrm{Exp_{ijt}}\big) = {} & \beta_0 + \beta_1 \ln(\mathrm{Tur\_GDP_{it}}) + \beta_2 \ln(\mathrm{Re\_GDP_{Jt}}) + \beta_3 \ln\big(\mathrm{TC_{ij}}\big) + \beta_4 \ln(\mathrm{ODA_{ijt}}) + \\ & \beta_5 \ln(\mathrm{Tur\_Pop_{it}}) + \beta_6(\mathrm{Rec\_Pop_{jt}}) + \beta_7 \ln(\mathrm{Tur\_Infl_{it}}) + \beta_8(\mathrm{Rec\_Infl_{jt}}) + \\ & \beta_9 \mathrm{Ottm_{ij}} + \beta_{10} \mathrm{Relg_{ij}} + \varepsilon_{ijt}\end{aligned} \quad (4)$$

where Ln (Exp_{ijt}) is the log of export from country i to country j in a particular year t. LnGDP_i represents the gross income of Turkey, and GDP_J is the gross income of the trade partner of Turkey or aid recipient. Ln (TC_{ij}) is the geographical distance between Turkey and the aid recipient country. Ln (ODA_{ij}) represents the Turkish Official Development Assistance from Turkey to the aid recipient country. The Ln $Infl_{it}$ is Turkey's natural log of Inflation in year t, and $Infl_{Jt}$ is the natural log of Inflation of the aid recipient country in year t. The ln $(Pop_{it}\ and\ Pop_{Jt})$ represents the population of Turkey and the aid recipient country in year t, respectively. The $Ottm_{ij}$ represents Ottoman members; it is a dummy variable that takes a value of 1 if the recipient country was a member of countries under Ottoman Empire leadership or 0 otherwise. $\mathrm{Relg_{ij}}$ is also a dummy variable which takes a value of 1 if 60% of the aid recipient country's population believes in the Islamic religion and otherwise 0.

The reason for including GDP and distance (trade cost) variables in the equation is that these variables are parts of the standard gravity model specification. The GDP of Turkey and its aid recipients in time t are used as a measure of economic size. The GDP is expected to be positively

correlated with export in line with the gravity model hypothesis. Trade cost or distance variable is employed in the analysis as a proxy for transportation cost between Turkey and the aid recipients. The trade cost variable is expected to be negatively related to export. The longer the distance between countries, the higher the trade cost, other things being constant.

To check the effect of Inflation on export from Turkey to her aid recipients, we used Inflation as a proxy for the GDP deflator in our model. Inflation is anticipated to have a negative effect on export. Official Development Assistance (ODA) is the amount of foreign aid given to aid recipient countries for economic development purposes annually. The official development assistance is generally divided into tied and untied to trade, but we are not studying separately in this study. Since official development assistance improves the goodwill and diplomatic relationship between the country, official development will positively affect the export of donors.

The impact of population on bilateral has been viewed differently. For instance, Brada and Méndez (1985) demonstrated how the population might be considered a bilateral export booster. Inançli and Mahamat Addi (2019) argued that greater populations represent larger domestic markets, so the population may correlate negatively with trade flows. A larger population implies larger import and demand. We also included the population of Turkey and the aid recipient country of year t. The population is employed as a proxy for the market size and is expected to impact bilateral trade positively.

We utilized two dummy variables in our regression: Ottoman empire membership and religion. Religion is a dummy or binary variable; if 60% of the aid recipient population believes in Muslim as a religion, it takes the value of "1" and otherwise "0". The shared Islamic religion promotes mutual trust and lower export sunk costs (Lo Turco & Maggioni, 2018). We used Ottoman membership instead of common colonial ties to capture the effects of the historical relationship on the export of Turkey to aid recipient countries. The hypothesis is that countries with similar historical ties tend to trade more and vice versa.

Sample Size and Data Source

We selected those countries that consistently received official development assistance from Turkey. The dataset is a balanced panel comprising annual export, GDP, distance, Inflation, population, official development assistance, and dummies of Turkey and 18 of its aid recipients (see Appendix 2). The data is collected for the period ranging from 1998 to 2019.

Panel Cross-Section Dependence (CD) test

Before estimating the gravity model, the Cross-section dependent test (CD) should be tested to check whether the data is cross-sectionally dependent. If not, depending on the assumptions (Breusch & Pagan, 1980; M Hashem Pesaran, 2021), the estimates of our gravity equation would be biased and contradictory. In harmony with the time and cross-sections in our gravity equation, Pesaran's (2004) residual CD test is calculated as the following;

$$cd = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{I=1}^{N-1}\sum_{J=I+1}^{N}\hat{\rho}_{IJ}\right) \underset{\sim}{\overset{ASY}{}} N(1,0) \quad \text{i,j=1,2….N} \tag{5}$$

The bias-adjusted version of the above is;

$$LM = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{I=1}^{N-1}\sum_{J=I+1}^{N}\hat{\rho}_{IJ}\right)\frac{(T-K)\hat{\rho}^2{}_{ij} - E(T-K)\hat{\rho}^2{}_{ij}}{Var(T-K)\hat{\rho}^2{}_{ij}} \tag{6}$$

Where ρ_{ij} is the sample estimate of the pair-wise correlation of the residuals obtained by OLS.

Since the CD test cannot define time-invariant variables (Nasre Esfahani & Rasoulinezhad, 2017), we computed the CD test only for time-variant variables in our gravity equation. Using the result of Pesaran's (2004) CD test in Appendix 1, the null hypothesis of no CD can be rejected at the 5% level. It indicates that all the panel time series have solid evidence for cross-sectional dependence. Appendix 1 shows that we failed to accept the null hypothesis of no cross-section dependence

(CSD). Therefore, we can apply the Second-Generation Unit root test, the Cross-section Augmented Dickey-Fuller test (CADF), and Hadri Kurozumi.

Second Generation Panel root test

First, we tested the hypothesis of no cross-section based on two basic criteria; first, if the null hypothesis of cross-section dependence is not rejected, the first-generation unit root test is applicable. Second, if the null hypothesis of no cross-section dependence is rejected, then the second-generation unit root test is appropriate. We rejected the null hypothesis of no cross-section dependence, as Appendix 1 shows, so we applied the second-generation unit root test. The main panel unit root tests are the Cross-section Augmented Dickey fuller test, Hadri Kurozumi, and Bias adjusted CD. The null hypothesis of the Cross-section Augmented Dickey-Fuller test is that sample data has a unit root, while the null hypothesis of Hadri Kurozumi is stationary. Hadri Kurozumi test was calculated as follows;

$$Z_A{}^{SPC} = \sqrt{\frac{N(\overline{ST_1} - \xi)}{\varsigma}} \tag{7}$$

and

$$Z_A{}^{LA} = \sqrt{\frac{N(\overline{ST_2} - \xi)}{\varsigma}} \tag{8}$$

Where

$$\overline{ST}_1 = N^{-1} \sum_{I=1}^{N} ST_i{}^{SPC} \qquad ST_i{}^{SPC} = \frac{1}{\sigma_{iSPC}{}^{T^2}} \sum_{i=1}^{t} S^*{}_{it} \sum_{j=1}^{t} \hat{\varepsilon}_{ij} \tag{10}$$

$$\overline{ST}_2 = N^{-1} \sum_{I=1}^{N} ST_i{}^{LA} \qquad ST_i{}^{LA} = \frac{1}{\sigma_{iLA}{}^{T^2}} \sum_{i=1}^{t} S^*{}_{it} \sum_{j=1}^{t} \hat{\varepsilon}_{ij}$$

$$\xi = {}^{1}/_{6} \quad \text{and} \quad \varsigma = {}^{1}/_{45}$$

For CIPS test

$$CIPS^*(N,T) = N^{-1} \sum_{i=1}^{N} S^*{}_{it}(N,T)$$

Since all moments of $S^*{}_{it}(N,T)$ exist by construction, it follows that conditional on W_F.

$$CIPS^*(N,T) = N^{-1} \sum_{i=1}^{N} CAD\, F^*{}_{it} + 0_\rho \text{ (1)}$$

Where $CADF^*{}_{if}$ is given

$$\begin{cases} CADF^*{}_{if} = CADF_{if,} & if - K_1 < CADF_{if} < K_2 \\ CADF^*{}_{if} = -K_1, & if\ CADF_{if} \le -K_1 \\ CADF^*{}_{if} = K_2, & if\ CADF_{if} \ge K_2 \end{cases}$$

The Cross-section Augmented Dickey fuller test (CADF) is two parts: CADF and CIPS.

The CIPS test null hypothesis is the unit root, and ZA^{la} and ZA^{spc} tests null hypothesis is stationary. The critical values for the CIPS tests are found in Pesaran (2007). The basic criteria are; to reject H0 of stationarity if ZA^{la} and ZA^{spc} are greater than 1.645 (obtained from the Pesaran table), and the opposite is true (see Appendix (2)).

Result and Discussion

Model selection method

As demonstrated in the model specification section, we have ten variables – about both donor and aid recipients. We employed General to Specific modeling estimation to choose the appropriate model.

Table 1. Model Selection

Variables	(1) Robust-OLS	(2) OLS	(3) PPML	(4) fe	(5) two-way fixed	(6) Genspec
lnTurGDP	0.407**	0.407**	0.0324	0.741***	5.793**	0.495***
	(0.160)	(0.189)	(0.020)	(0.132)	(2.545)	(0.090)
lnGDP_Reci	0.974***	0.974***	0.083***	0.627***	0.580***	0.963***
	(0.164)	(0.047)	(0.004)	(0.080)	(0.083)	(0.046)
lnDistant	-1.039***	-1.039***	-0.087***			-1.042***
	(0.250)	(0.054)	(0.006)			(0.054)
LnRe_pop	-0.391**	-0.391***	-0.033***	1.159***	1.168***	-0.378***
	(0.169)	(0.056)	(0.004)	(0.232)	(0.228)	(0.055)
LnTurPop	0.027	0.027	0.018	-1.485***	-1.226	
	(1.002)	(0.783)	(0.08)	(0.554)	(8.279)	
LnTurInfl	-0.098*	-0.098	-0.011	-0.126***	0.328	
	(0.050)	(0.072)	(0.008)	(0.045)	(0.697)	
LnRinfl	-0.088	-0.088	-0.010	0.113	0.108	
	(0.300)	(0.114)	(0.011)	(0.078)	(0.077)	
LnODA	0.097**	0.097***	0.007***	0.044***	0.038**	0.101***
	(0.043)	(0.018)	(0.001)	(0.016)	(0.016)	(0.018)
Ott	0.351	0.351***	0.031***			0.358***
	(0.296)	(0.085)	(0.008)			(0.084)
Reli	0.948***	0.948***	0.074***			0.955***
	(0.227)	(0.067)	(0.006)			(0.067)
Constant	-8.552	-8.552	0.503	-15.416**	-158.809	-11.008***
	(17.193)	(11.301)	(1.09)	(7.471)	(131.823)	(2.158)
Observations	393	393	393	393	393	393
R-squared	0.892	0.892	0.863	0.873	0.883	0.891
Time-effect					yes	

Note: Robust standard errors in parentheses. ***, **, and * indicate significant at the 1%, 5%, and 10% level.

Table 1 shows six models: Robust OLS, OLS, Poisson pseudo-maximum likelihood (PPML), One-way Fixed effect, Two-way Fixed effect, and General to Specific Modelling. The General to Specific modeling in column (6) shows which variables significantly affect export from Turkey to aid recipient countries. Turkey's GDP and recipient countries' GDP positively affect export, and distance negatively affects export, which is in line with the main hypothesis of the traditional gravity model. The recipient population is also significant, but it carries ambiguous signs. The Official development assistance is significant in all models, specifically General to Specific modeling. Historical ties (Ott) and shared religion between Turkey and aid recipient countries are also significant determinants of the export of Turkey.

In the Table 2, we will execute a model consisting of only variables which General to Specific modeling indicated as significant. We executed six different models to check if the variables selected by using the General to Specific modeling remain significant across the models.

In the Table 3, we implemented Robust OLS, OLS, PPML, One-way fixed effect, Two-way fixed effect, and least-squares dummy variables (LSDV). In the LSDV, we want to capture the effect of historical ties on export using the membership of the Ottoman empire as a proxy variable of historical linkage between the donor (Turkey) and recipient countries. We also controlled the effect of Islamic religion since Turkey's ruling party is Islamist and propagates global cooperation of the Muslim Ummah agenda. Both religion and Ottoman membership are significant in LSDV. This is in line with previous studies such as Korkmaz and Zengin (2020), which explained that Ottomanism plays a crucial role in Turkey's foreign aid distribution.

Our models of interest – the LSDV and PMML show a significant positive relationship between ODA and export. The coefficient of ODA ranges from 0.0078 in PPML model to 0.049 in LSDV models. This implies that a 1 % increase in ODA increases the export of Turkey to aid recipient countries by 0.01 – 0.05%.

Table 2. Robust Output

Variables	(1) Robust-OLS	(2) OLS	(3) PPML	(4) Fe	(5) Two-way fixed	(6) LSDV
lnTurkGDP	0.495**	0.495***	0.044***	0.844***	4.717***	0.853***
	(0.225)	(0.090)	(0.008)	(0.100)	(1.187)	(0.100)
lnGDPReci	0.963***	0.963***	0.082***	0.586***	0.622***	0.579***
	(0.149)	(0.046)	(0.004)	(0.071)	(0.078)	(0.071)
lndistan	-1.042***	-1.042***	-0.087***			8.996***
	(0.246)	(0.054)	(0.006)			(1.765)
Lnrecip_pop	-0.378**	-0.378***	-0.032***	0.789***	1.153***	0.803***
	(0.153)	(0.055)	(0.004)	(0.212)	(0.228)	(0.212)
lnODA	0.101**	0.101***	0.007***	0.049***	0.036**	0.049***
	(0.045)	(0.018)	(0.001)	(0.016)	(0.016)	(0.016)
Ott	0.358	0.358***	0.032***			17.517***
	(0.295)	(0.084)	(0.008)			(2.974)
Reli	0.955***	0.955***	0.075***			0.374
	(0.222)	(0.067)	(0.006)			(0.275)
Constant	-11.008**	-11.008***	0.460**	-37.796***	-151.012***	-119.602***
	(4.772)	(2.158)	(0.190)	(3.348)	(32.972)	(18.501)
Observations	393	393	393	393	393	393
R-squared	0.891	0.891	0.861	0.866	0.883	0.884
Country						yes
Time effect					yes	

Note: Robust standard errors in parentheses. ***, **, and * indicate significant at the 1%, 5%, and 10% level.

Table 3. Final Robust Output

Variables	(1) Robust-OLS	(2) OLS	(3) PPML	(4) One-way fixed	(5) Two-way fixed	(6) LSDV
lnTur_GDP	0.804***	0.804***	0.070***	0.853***	4.614***	0.861***
	(0.203)	(0.083)	(0.007)	(0.102)	(1.227)	(0.102)
lnGDP_Reci	0.672***	0.672***	0.056***	0.658***	0.653***	0.653***
	(0.090)	(0.021)	(0.002)	(0.070)	(0.080)	(0.070)
lnDist	-1.221***	-1.221***	-0.103***			2.790***
	(0.210)	(0.050)	(0.005)			(0.655)
lnODA	0.085	0.085***	0.006***	0.064***	0.058***	0.064***
	(0.051)	(0.019)	(0.002)	(0.016)	(0.016)	(0.016)
ott	0.704**	0.704***	0.060***			6.925***
	(0.311)	(0.072)	(0.007)			(1.009)
Reli	0.840***	0.840***	0.066***			0.321
	(0.238)	(0.069)	(0.006)			(0.280)
Constant	-17.412***	-17.412***	-0.078	-26.787***	-129.846***	-52.958***
	(4.327)	(2.061)	(0.189)	(1.576)	(33.822)	(5.658)
Observations	393	393	393	393	393	393
R-squared	0.877	0.877	0.846	0.861	0.874	0.861
Country						yes
year					yes	

Note: Robust standard errors in parentheses. ***, **, and * indicate significant at the 1%, 5%, and 10% level.

Turkey has been implementing foreign aid as an instrument of foreign policy. Turkey applied state-based foreign aid, which intends to improve the country's international image – representing herself as a responsible and generous actor in resolving international burdens. There

is tremendous literature on Turkey's foreign aid as a foreign policy tool and instrument. For instance, Akpınar (2013), Baird (2016), Çevik, (2014), Çevik (2018), and Davutoğlu (2013). The post-2000 Turkish foreign policy on international development can be understood from the volume of aid to various developing countries, particularly new regions such as Latin America, Sub-Saharan Africa, and the Far east.

From the positive relationship between Turkish official development assistance and its export to aid recipient countries above, it signifies that increased Turkish official development over the years is followed by increased export volume to aid recipient countries. The positive and significant relationship between Turkish official development assistance (ODA) and export to aid recipient countries shows that ODA is a good strategy for export promotion and international market entry. The findings of this study are consistent with those from the traditional donors (Endo & Murashkin, 2022; Felicitas Nowak-Lehmann, Martínez-Zarzoso, Klasen, & Herzer, 2009)

Conclusion

This study aims to complement earlier studies that primarily focused on the political ramifications of Turkish foreign aid by capturing the relationship between official development assistance and export. The empirical framework of the study is based on an augmented gravity model of international trade in which foreign assistance is mainly stipulated in two ways in the literature. Firstly, foreign assistance is depicted as a part of the trade cost. Secondly, official development assistance is modeled as a transfer that positively contributes to the income of the recipient country. However, this study considers official development assistance as a foreign policy tool that improves the goodwill between the donor and recipient countries and that goodwill reflects in bilateral relationships such as bilateral trade.

Turkey applied for Official Development Assistance as a foreign policy tool to access new markets in the Middle East, Balkans, Africa, and Latin America. Following Turkey's foreign assistance to aid recipients, the volume of Turkish export to recipient countries also increased. The influence of Turkish foreign aid policy can be understood from the extreme flourishment of specific sectors in Turkey, such as health tourism, educational tourism, and merchandise business. Turkish foreign assistance diplomacy has established new bilateral trade friends with Turkey. In the long run, this may shrink Turkey's long lasted trade deficit.

The paper contends that Turkey used ODA as a foreign policy tool to access to new markets in the Middle East, Balkans, Africa, and Asia. Following Turkey's foreign aid to aid recipients, the volume of Turkish exports to those countries considerably increased. The prosperity of Turkey's economy, which was appreciated locally and globally, coincided with its reputation as an emerging global donor. The Turkish Lira has lost its value against other international currencies since 2018, and Inflation is at its highest point. Thus, the economic success that made it possible for Turkey to participate globally in international development stages is now a thing of the past.

This study should have covered the sectoral effects of Turkish foreign aid due to time constraints and data availability. Therefore, future researchers are advised to contribute to this topic by examining the effects of official development assistance on various export industries to determine which sectors substantially benefited from the country's involvement with international development affairs.

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Appendix

Appendix 1. Cross section dependence test

	Constant		Trend and intercept	
	test statis	Prob.	test statis	Prob.
CDLM1	383.981	0.000	418.092	0.000
CDLM2	13.204	0.000	15.154	0.000
CD	10.179	0.000	11.138	0.000
Bias-adjusted LM test	74.022	0.000	71.341	0.000

Appendix 2. Panel unit root tests results (Series in level)

	CIPS intercept	CIPS intercept+ Trend	ZA^{SPc} intercept	ZA^{la} intercept	ZA^{SPc} intercept+ trend	ZA^{la} intercept +trend	LM_D intercept	LM_AD Intercept+ trend
lnexprt	-2.153***	-2.7590***	-2.732	-2.658	-1.719	-1.052	3.583**	3.583**
Lngdp_Tur	-1.452***	-1.7803***	-2.541	-2.415	10.484	14.214*	3.583**	3.583**
lngdp_recip	-2.306	-1.7132	-0.062	2.414**	-2.238	13.163***	31.646***	22.824***
Lnds	-1.9881	-1.9775	0.726	1.232	4.88	26.52***	31.041***	24.010**
lnoda	-2.234**	-2.323***	-1.40	-2.263	3.924	2.752*	3.583**	3.583**
lnTu_p	-1.44**	-1.0824*	94.95	222.16	56.397	283.511	3.583**	3.583**
lnR_p	-1.2354	-1.7132	2.387**	22.89***	20.365***	94.381***	25.563***	22.824***
lnRfl	-0.2988**	-2.1335***	16.425	7.419	-2.298	-1.288	3.583**	3.583**
lnTurInf	-1.2101*	-1.6242***	-0.358	0.743	14.951	26.783	3.583**	3.583**

* Shows that statistics are significant at the 10% level of significance.
** Shows that statistics are significant at the 5% level of significance.
*** Shows that statistics are significant at the 1% level of significance.

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Will Indonesia enter the 2023 financial crisis? Application of early warning model system

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Abstract

Purpose — This paper estimates the possibility of a financial crisis in Indonesia using an early warning system (EWMS) model.

Method — A quantitative EWMS model has been developed to detect a potential financial crisis in 2023 based on the econometric logistic probability model (Logit)

Findings — Based on the model estimates, Indonesia is expected to enter a financial crisis without adequate macroeconomic policies in the next 12 to 24 months. In recent years, Indonesia has implemented prudent macroeconomic policies such as increasing the Bank Indonesia policy rate and sustaining the state budget to avoid the impact of a deep financial crisis.

Implications — To avoid the potential for further financial crises, Indonesia must implement a wider range of crisis mitigation policies.

Originality/value — Although many argue that financial crises are predictable, it has been demonstrated in the literature that little is known about how to prevent them. This paper contributes to providing empirical evidence to address these issues.

Keywords — Early Warning Model System (EWMS), probability of crisis, Indonesian economy, crisis pre-emptive and mitigation policies

Introduction

Greenwood et al. (2022) argued that a financial crisis is predictable. They examined historical data on post-war financial crises around the world. Indonesia experienced many financial crises, including the 1998 Asia financial crisis, the 2008 global financial crisis, and the COVID-19 pandemic in 2019/2020. The sources and impacts of each of these financial crises varied. The source of the crisis comes from within and outside the country. The depth of the crisis depends on fundamental macroeconomic conditions. In addition to strong fundamental conditions, macroeconomic policy targets are needed to deal with the financial crisis (Chen & Svirydzenka, 2021).

Financial and banking crises in 1997 seriously affected the Indonesian economy, such as the plunge of economic growth, skyrocketing poverty, and unemployment. The fiscal cost for bailouts of national banks at that time was 45% of GDP. The source of the 1997/1998 Asia

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financial crisis is the contagion of the monetary crisis in Thailand. This crisis spread because of the weak macroeconomic fundamentals in Indonesia at that time. Indonesian economy was also affected by the 2008 global crisis, which started with the subprime mortgage crisis in America. The bankruptcy of Lehman Brothers and many global financial institutions in the US and Europe worsened the crisis. There was a selloff from the Indonesian capital market and bond investors to the US. Fortunately, Indonesia and other ASEAN countries have strong fundamentals and are better prepared after the 1998 crisis (Kian Wie, 2012).

Strong Macroeconomic fundamentals do not guarantee resilience to crises. In the case of the Covid-19 pandemic, the Indonesian economy was hit by a serious crisis. The pandemic crisis has hit external trade and reduced purchasing power. The COVID-19 pandemic and geopolitical tension between Russia and Ukraine have severely affected the global economy and Indonesia. As business and consumer sentiment wane, domestic demand is expected to weaken (ADB, 2020).

Many studies found that the pre-crisis event and impact of the economic and financial crisis in a country can be detected by economic models (Greenwood et al., 2022; Reinhart et al., 2000; Goldstein et al., 2000; Bussiere & Fratzscher, 2002). If it is unpredictable, financial crises can cause severe economic costs in the form of slowing economic growth, decreased output, corporate bankruptcies, layoffs, financial sector instability, decreased credit distribution, and others (Krugman, 1999; Chen & Svirydzenka, 2021; Hutchison & Noy, 2006; Claessens et al., 2012; Claessens & Kose, 2013a; Claessens & Kose, 2013b; IMF, 2022; Pritsker, 2013).

A single-country model provides a better estimate as it captures the uniqueness of a country rather than the global or regional model. Van den Berg et al. (2008) argued that global or other regional models frequently have lower accuracy because panel data have different quality. Several researchers have developed an early warning system using a logit model for the emerging market, including a special case for Indonesia (Koo et al., 2005; Ferdous et al., 2022). For the Indonesian case, however, these papers used data till the recovery of the Asian financial crisis. On the other hand, the Indonesian economic structure changed. Therefore, developing the EWS model using a new data set likely improves the model's accuracy and can capture the full breadth of the dynamic Indonesian economic phenomenon.

This paper aims to identify the probability of a financial crisis in Indonesia within 12 to 24 months using an experimental parametric approach. It uses macroeconomic data from 2001 to 2021. This study estimates the probability of a financial crisis or financial distress from 2022 to 2023 by applying the early warning model system (EWMS) model.

The EWMS has been developed to detect financial crises. However, the EWMS model has many questions regarding its level of accuracy. EWMS has failed to identify the 2008 global financial crisis. Padhan and Prabheesh (2019) proposed reconstructing the EWMS model to increase the accuracy of financial crisis predictions. The early warning model is a way to see the probability of a crisis based on historical financial data. From this early detection, the probability of a crisis, how big and how strong it is, when it will occur, and how to respond to it can be calculated. Early warning system uses different approaches depending on data availability and the purpose in question. Every approach has advantages and disadvantages. Therefore, policymakers may use the appropriate approach with data availability and operational practicability.

The previous EWMS models were quite successful in predicting financial crisis probabilities. Frankel and Rose (1996) used a parametric model to estimate the probability of financial crisis using 105 developing countries from 1971 to 1992. This model uses 16 indicators, including domestic credit growth, foreign exchange reserves/M2 (broad money supply), and foreign interest rates. Since the data are annual, the use is limited. Meanwhile, Kaminsky et al. (1998) were pioneers in developing early warning systems using a set of leading indicators. They focused on monitoring several indicators (15 indicators) that will provide a signal when their values break the threshold. If the indicator gives a signal 24 months before the crisis occurs and the crisis indeed occurs, the signal is considered a good signal.

There has been extensive research on financial crises using probits or logits to detect the probability of a financial crisis against several free variables (indicators). The advantage of this logit or probit approach is that the results directly reflect the probability of a crisis from the selected

early indicators (independent variables) and can be carried out by standard statistical tests. Several studies of the balance of payments crisis using probit or logit, such as Eichengreen et al. (1996), used 20 industrialized countries' data; Frankel and Rose (1996) used 105 developing countries from 1971 to 1992. While Klein and Marion (1997) also used logit for Latin America, Berg and Pattillo (1999) conducted studies on various countries after the 1997 financial crisis in Asia.

Altunoz (2019) compared three financial early warning models for Turkey. The result showed that the early warning system is relatively accurate and can be used to identify financial health. In their research, Frankel and Rose (1996) used independent variables of 16 indicators, such as domestic credit growth, foreign exchange reserves/M2 ratio, and foreign interest rates. Since the data are annual, the use is limited. The following is the model's equation:

$$y_i = a + \sum_{i=1}^{16} \beta_i x_i + u_i \quad (1)$$

where, y_i = 1 when there is a crisis; 0 otherwise
x_i = 16 Indicators
u_i = error term

Meanwhile, Goldfajn and Valdés (1998) used data from 26 countries applying the logit model to predict the next month of chance of a crisis as a function of devaluation expectations and real exchange rates. Frankel and Rose's (1996) model differs from the IMF model. While the former uses annual data and 16 variables, the latter employs monthly data and 6 variables, namely the exchange rate to its trend, the inflation rate, the ratio of the balance sheet to gross domestic product, the decline in foreign exchange, the growth of exports, and the ratio of short-term debt to foreign exchange dollars.

Meanwhile, Berg and Pattillo (1999) show that the probit model outperformed the signal model, where the probit or logit model has generated some broader empirical studies, including Caramazza et al. (2000), Esquivel and Larraín (1998), Kamin et al. (2007), Milesi-Ferretti and Razin (2000), Mulder et al. (2002), and also Berg et al. (1999) including Goldfajn and Valdés (1998). Meanwhile, some researchers use specifications not only two options, i.e., crisis and not crisis but have some possibilities, e.g., not crisis, crisis, and post-crisis. Included in this group are Kaufmann et al. (2005), who use the probit sequence (order probit), while Bussiere and Fratzscher (2002) use multinomial logits. Their research generally uses panel data (time order and between countries), while Sachs, Tornell, and Velasco (1996) use interstate data to study the severity of the crisis. The studies used a number of independent variables recommended by the first and second-generation models, including political economy approaches.

In general, the results of such studies cannot predict the financial crisis that occurred in 1997. It could be because the model used is a general model that uses data panels, even though each country has different economic characteristics. In that connection, this paper tries to apply the single-country model as an experiment in developing an early warning system using the database after the Asian financial crisis.

While Koo et al. (2005), with data of ASEAN plus 3, developed a parametric model with a relatively short data range from 1981-1995 and specifically for Indonesia starting in May 1987. The results of the *fixed effect* logit and probit models are not good, meaning that they cannot predict the 1997 financial crisis in Indonesia. However, for the *random effect* logit and probit for the Indonesian case, the results are good enough to predict the 1997 financial crisis. This paper uses new data starting from January 2001 to June 2022. Thus, the early indicators will also differ because the economic structure has changed.

While EWMS largely failed to notice the 2008 global financial crisis, the current EWMS model adds to the dynamic nature of financial crises at all stages. The dynamic aspects associated with the various causes of the financial crisis, firstly, it can cross the country of origin or, secondly, spreads across its borders (Padhan & Prabheesh, 2019).

The current EWMS remains to use the logit and probit models. The main advantage of these logit and probit models is that they reflect all the information provided by the indicators to estimate the probability of a crisis. However, the downside is that they do not precisely measure

the forecasting capabilities of each indicator, although each indicator can provide a degree of significance. No specific literature on EWMS detects the financial crisis of the Covid-19 period. The causes and impact of the financial crisis from Covid are still unclear, but the EWMS model is hoped to predict the probability of a financial crisis.

Methods

A qualitative dependent variable model is an econometric analysis using dependent variables as discrete/dummy variables that are valued at 1 and 0. While the independent variables are non-discrete, the dependent variables are discrete or binary (No crisis = 0 and crisis = 1), then the logit model specifications are as follows:

$$P = F(Z) = \frac{1}{1+e^{-Z}} = \frac{1}{1+e^{-(a+\beta x)}} \quad (2)$$

where P is a probability; F is a cumulative function of logistical probability valued from 0 to 1. X is the dependent and α variable and β is the parameter. The equation can change into:

$$ln\frac{P}{1-P} = Z = a + \beta x \quad (3)$$

Determining the definition of a crisis period to fill in the values of the dependent variables 1 and 0 is based on the following formulation:

$$Crisis\ Index = \frac{1}{\delta_e} \times \Delta e \quad (4)$$

δ_e = standard deviation from the change in exchange rate Rp/dollar
Δe = change in exchange rate Rp/dollar

From the formula above, the change used is the change to the previous month. Meanwhile, to determine whether the month is a crisis month period, the threshold of the Crisis Index is an average of the Crisis Index plus 2 standard deviations from the Crisis Index. If the value of the Crisis Index exceeds the threshold, then the month is considered to be the period of the crisis month, so the dependent variable's value is 1. While the month with no crisis, then it is given a value of 0.

In determining the period leading up to the crisis, for example, 24 months before the crisis, early indicators will give a signal, then the variable dependents in the previous 24 months are given a value of 1. Meanwhile, if the period of time limit for the period leading up to the crisis is 18 and 12 months, then the dependent variables on the previous 18 and 12 months are given a value of 1. Since the dependent variables are in categorical data, the estimation uses the likelihood of crisis using a logistic regression model. The baseline model can be presented as follows:

$$Window_{12,18,24} = ln\left\{\frac{\Pr(Y_i=1|X_i}{\Pr(Y_i=0|X_i}\right\} = \beta_0 + \beta_1 RGDP_t + \beta_2 BRENT_t + \beta_3 RER_t + \beta_4 IRES_t + \beta_5 FDEF_t + \beta_6 EXP_t + \beta_7 INVGDP_t + \beta_8 M2RES_t + \beta_9 CBCP_t + \beta_{10} DEFR_t + \varepsilon_t \quad (5)$$

Where $Window_{12,18,24}$ denotes our dependent variable, namely the window period before crisis based on the 12-Month, 18-Month, and 24-Month period; $\beta_{0,..,10}$ presented as the coefficient for both constant and variables' elasticity. Table 1 shows the name of the variables.

In the performance evaluation of the model, a threshold of probability values is determined to indicate the high probability of a crisis. For each month, the observed data will give results on whether the data belongs to an area that exceeds the probability threshold limit, which means giving a warning signal. This signal will be correct if 24 months later there is a crisis (or it falls into category A), or the signal is wrong if 24 months later there is no crisis (or it falls into category B), or it is called a type II error. By the same analogy, if the observed model does not give a signal, but within 24 months, a crisis occurs, and there is no signal (or falls into category C), it is called a type I error. In comparison, if there is no signal and no crisis 24 months later (or falls into category D).

Table 1. Data Description

Category	Variables	Definition	Data Source
Window Period	Window12 Window18 Window24	Categorical variables represent the window period before the crisis where 1 = period before the crisis and 0 = otherwise.	Author's Computation
Macroeconomic Conditions	INVGDP	The ratio of Foreign Direct Investment (FDI) to Nominal Gross Domestic Product	Bank Indonesia and CEIC Database; Author's computation
	RGDP	Annualized growth of Real Gross Domestic Product	CEIC Database; Author's computation
	EXP	Annualized growth of export	CEIC Database; Author's computation
International-Related Variables	RER	Real USD/IDR exchange rate. Calculated by employing the following formula: $RER = NER \times \frac{CPI_{ID}}{CPI_{US}}$ where *NER* is denoted as Nominal USD/IDR exchange rate, and CPI_{ID} and CPI_{US} represent consumer price index of Indonesia and USA, respectively.	International Monetary Fund (IMF); Author's computation
	BRENT	International oil price of BRENT	Federal Reserve Economic Data (FRED)
Central Government	FDEF	Ratio of fiscal deficit to Nominal Gross Domestic Product	Ministry of Finance; Author's computation
Monetary-Related Variables	IRES	Annualized growth of international reserves	IMF; Author's computation
	M2RES	Ratio of broad money (M2) to international reserves	CEIC Database and IMF; Author's computation
	CBCP	Ratio of central bank credit to the public to Nominal Gross Domestic Product	Bank for International Settlements; Author's computation
	DEFR	Spread between Indonesian deposit rate and effective federal funds rate	CEIC Database and FRED; Author's computation

Table 2. Summary of Crisis Probabilities

	The Crisis Occurred 24 Months Later	No Crisis 24 Months Later
Signal	A	B
No Signal	C	D

Source: Goldstein et al. (2000)

From the matrix above, a good model falls into categories A and D. What belongs to category A is the model that gives a signal warning of a crisis, and a crisis indeed occurs. Meanwhile, category D includes the model that does not provide a warning signal because no crisis will happen. On the contrary, what falls into category C is a model that does not give a signal but turns out to be a crisis. While those included in category B are models that give signals, but no crisis occurs.

Kaminsky et al. (1998) created an optimal threshold limit for abnormal regions to be minimal, which is called *the noise-to-signal ratio* (NSR). *NSR* is defined as a comparison of the probability of an indicator giving a signal during a non-crisis time to the probability of an indicator giving a signal during a crisis. The formula of the NSR is as follows:

$$NSR = \frac{\left[B/(B+D)\right]}{\left[A/(A+C)\right]} \quad (6)$$

Results and Discussion

The features of the data are in Table 3. Descriptive statistics and other statistics results are also provided.

Table 3. Descriptive Statistics

Variable	Mean	S.D.	Skewness	Kurtosis	JB-Stat	*p*-Value	Obs.
$Window_{12}$	0.100	0.307	2.583	7.672	521.610	0.000	258
$Window_{18}$	0.150	0.359	1.948	4.793	197.700	0.000	258
$Window_{24}$	0.200	0.399	1.518	3.305	100.120	0.000	258
$RGDP$	6.500	6.115	-0.108	3.165	0.800	0.672	258
$BRENT$	66.780	29.012	0.337	2.125	13.130	0.001	258
RER	11729.960	4719.400	0.318	1.487	28.940	0.000	258
$IRES$	8.680	14.881	1.223	4.660	93.980	0.000	258
$FDEF$	-20.040	13.042	-0.283	4.208	19.130	0.000	258
EXP	9.080	21.374	0.474	2.500	12.330	0.002	258
$INVGDP$	28.690	4.659	-0.678	1.970	31.200	0.000	258
$M2RES$	35.980	8.564	0.627	2.307	22.050	0.000	258
$CBCP$	85.260	8.057	0.133	2.562	2.820	0.244	258
$DEFR$	6.280	2.587	1.003	3.995	53.870	0.000	258

Note: S.D. stands for Standard Deviation; JB-Stat and *p*-value represent Jarque-Berra statistics and corresponding probability, respectively; Obs. represents the number of observations.

The estimation of the logistic probability regression model is based on a sample from January 2001 to June 2021 to evaluate the effect of certain variables in increasing (decreasing) the probability of a crisis period. In addition, the estimation uses three different dependent variable window periods. The first is the 12-month window period (Model I), the second is the 18-month window period (Model II), and the third is the 24-month window period (Model III). These 12-Month, 18-Month, and 24-Month window periods mean the number of months that provide a signal before the onset of a crisis or distress.

The results for models with January 2001-June 2021 samples are satisfactory for the three different window periods. All independent variables are significant at 10%. Even some independent variables are significant at 5% and 1%. The independent variables in Models I and II are all significant in explaining the increase (decrease) in crisis probability during the onset of a crisis.

The meaning of the sign goes against the theory. These variables are growth in gross domestic product, growth in foreign exchange reserves, the ratio of the money supply (M2) to foreign exchange reserves, and the ratio of Central Bank credit to the public to GDP. However, some of the six variables are correctly marked and provide a strong measure of crisis probability because the coefficients are large. These variables are oil prices, budget deficits, exchange rates, and export growth, investment ratios, and central bank policy rates. However, four variables have wrong signs and are not as expected in Model II.

McFadden R-Squared is 0.6616, indicating that all independent variables explain 66.16% of the variability of the pre-crisis window period. However, it is interesting to note that all model estimates have the McFadden R-Squared greater than 0.50, indicating a high fit in examining the pre-crisis window period. Furthermore, when assessing the goodness of fit for all models, it was suggested that Model II be the best model in terms of R squared.

For Model II, the price of Brent crude oil affects the possibility of a financial crisis. This increase in crude oil affects the domestic economy in two ways. First, it will have an impact on imported inflation. Second, it will affect the budget because the price of several types of fuel is subsidized. Therefore, a budget deficit will occur because of this factor, and the probability of a crisis will increase.

The real exchange rate (RER) also influences the possibility of a crisis because a too-high Rupiah exchange rate against the USD will weaken export competitiveness. Finally, exports will decrease and affect foreign exchange reserves. The budget deficit to GDP ratio also affects the probability of a crisis. The budget deficit increase will affect domestic interest rates because the increased demand for budget financing will increase interest rates. Export growth will affect the possibility of a crisis because the decline in export growth will affect foreign exchange reserves. The ratio of investment to GDP also impacts the probability of a crisis, as it is critical to fostering sustainable growth. The spread of the policy rate over the effective Federal funds rate will influence the crisis probability. The lower the spread, the higher the probability of a crisis. This condition will increase the risk of capital outflow (Park, 2008; Fratzscher, 2011).

Table 4. Logistic Regression Results

	Model I	Model II	Model III
Variables	Window $_{12}$	Window $_{18}$	Window $_{24}$
$RGDP$	0.592***	0.736***	0.272**
	[0.005]	[0.000]	[0.030]
$BRENT$	0.094***	0.072***	0.064***
	[0.000]	[0.003]	[0.000]
RER	0.002***	0.0021***	0.001***
	[0.001]	[0.000]	[0.004]
$IRES$	0.138***	0.072*	0.026
	[0.007]	[0.082]	[0.365]
$FDEF$	-0.124**	-0.125***	-0.075***
	[0.014]	[0.001]	[0.004]
EXP	-0.193***	-0.204***	-0.096***
	[0.000]	[0.000]	[0.001]
$INVGDP$	-1.324***	-1.177***	-1.060***
	[0.000]	[0.000]	[0.000]
$M2RES$	-0.328*	-0.590***	-0.295
	[0.079]	[0.003]	[0.133]
$CBCP$	-0.223***	-0.306***	-0.070
	[0.000]	[0.000]	[0.312]
$DEFR$	-0.476**	-1.441***	-1.408***
	[0.036]	[0.002]	[0.000]
$Constant$	31.847***	48.203***	29.916***
	[0.000]	[0.000]	[0.003]
McFadden R-Squared	0.588	0.678	0.576
LR-Statistics	100.130	145.850	144.690
[Probability]	[0.000]	[0.000]	[0.000]

Note: Number of observations employed are 246; The *p*-value of coefficients are presented in brackets; ***, **, and * denote the level of significance at 1%, 5%, and 10%, respectively.

All models do not substantially differ in terms of R squared, and the number of variables are with the correct sign and statistically significant. For Model III, four of the variables have wrong signs, but three of the variables are not significant. Only one variable, GDP growth, is significant. Therefore, policymakers will use a longer window period because they have time to take financial crisis prevention measures.

Forecasting outside the sample period to see crisis probabilities is carried out using the three models from July 2021 to June 2022. Based on these three models, Model III shows an increase in the probability of crises in the next 24 months. This means that in the next 24 months

there will be a financial crisis. The other models (Model I and Model II) also show an increased probability of a crisis, but the probability of a crisis is only a few months leading up to June 2022.

Overall, the best model is Model II. However, there are no substantial differences among the three models based on many different evaluation tools. The next section presents detailed model performance. Model III shows that the probability of a crisis increases during July 2021-June 2022 (see Figure 3), meaning that a crisis is likely to go up using a 24-month window. Therefore, as the probability of a crisis increases, in the next 24 months, there will be a financial crisis. However, no one knows exactly when a financial crisis will occur. This early warning system model cannot be used to predict precisely when a financial crisis will occur. However, this early warning system model can indicate how likely a financial crisis is to occur if the initial indicators used show a large change in magnitude in the selected pre-crisis period (e.g. 24 months) as proposed by Kaminsky et al. (1998).

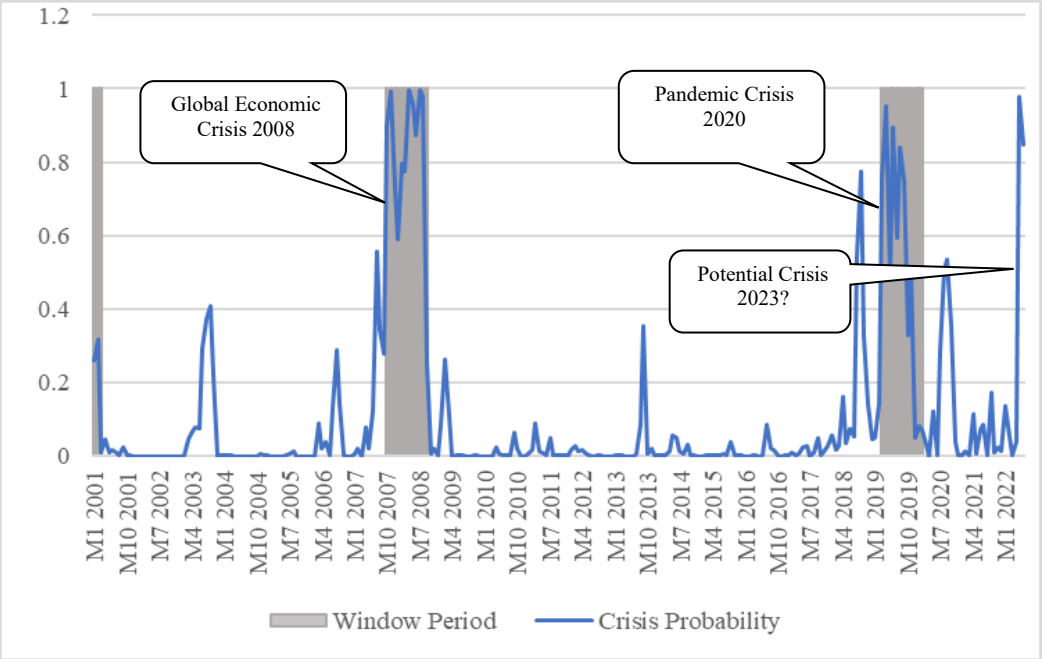

Figure 1. Logit Model Estimation Result (12-Month Window Period)

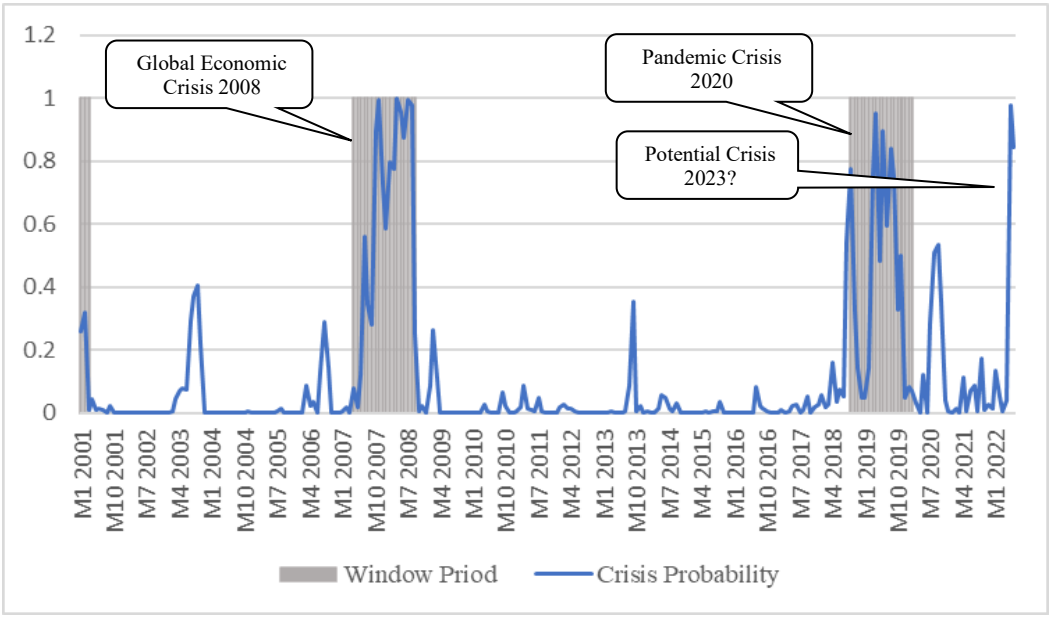

Figure 2. Logit Model Estimation Result (18-Month Window Period)

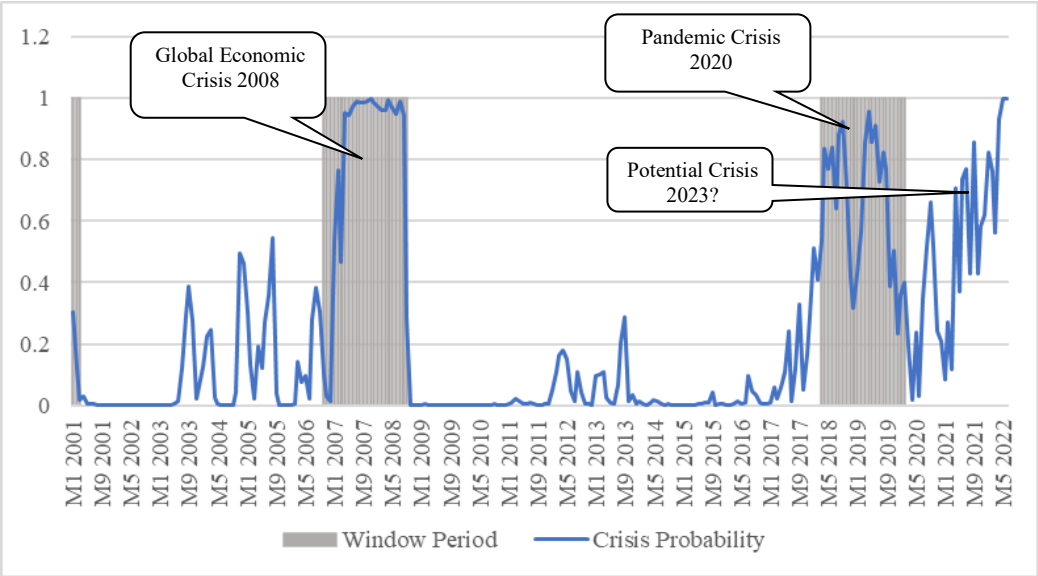

Figure 3. Logit Model Estimation Result (24-Month Window Period)

Model Evaluation

Figures 1, 2, and 3 show that the performance of the developed model is sufficient to foresee the financial distress in 2008, including the pandemic crisis of 2020. This is indicated by the ever-increasing level of probability since the pre-crisis period (with 24 months leading up to the crisis). In addition, this current model can predict the pandemic crisis in March 2020. The crisis coincided with the onset of the pandemic. Some macroeconomic indicators do not look good, and the pandemic worsens the condition.

Therefore, the pandemic provides synergistic effects on the financial crisis.

The accuracy of forecasting the probability of a financial crisis occurring is the proportion of observations that correctly predict the crisis period, and the non-crisis period will be measurable. Model performance can be measured by calculating the mean of quadratic probability score (QPS). Meanwhile, the accuracy of forecasting calibration is also measured with global squared bias (GSB).

The *quadratic probability score (QPS)* formula is as follows:

$$QPS = \frac{1}{T}\sum_{t=1}^{T} 2(P_t - R_t)^2 \quad (7)$$

Where, P= Forecasting; R= Realization; T=period

QPS ranges from 0 to 2, with a score = 0 reflecting very accurately.

Meanwhile, the calibration of probability forecasting is related to the accuracy of probability forecasting and the relative frequency observed. Calibration compares the forecasting of the average probabilities against the average realization. The formula is as follows:

$$GSB = 2(\bar{P} - \bar{R})^2 \quad (8)$$

Where,

$\bar{P} = \frac{1}{T}\sum_{t=1}^{T} P_t$ and $\bar{R} = \frac{1}{T}\sum_{t=1}^{T} R_t$

GSB values range from 0 to 2, with a score value = 0 reflecting perfect calibration.

Table 5 shows the accuracy and calibration values of probability forecasting within the sample covering January 2001 to June 2021. All measures indicate high predictive power with a probability threshold limit of 70 percent. A crisis period provides a good signal if the probability of a crisis passes or is equal to a predetermined threshold limit of 70 percent according to the number of months (12, 18, and 24 months) leading up to the impending crisis. Every option to

determine the window period has advantages and disadvantages. The longer the window period used, the better for policymakers. The policymaker has a longer period to make pre-emptive policy action.

Table 5. Evaluation of the Financial Crisis Model

	Window period 12 months Cut off probability=0.7	Window period 18 months Cut off probability=0.7	Window period 24 months Cut off probability=0.7
A=Good Signal for Crisis (months)	15	25	31
B=False Signal (months)	1	1	2
C=Missed Signal (months)	12	14	20
D=No Signal Tranquil time (months)	218	206	193
Number of observation	246	246	246
% of pre-crisis period that gives signals [A/A+C]	55.56%	64.10%	60.78%
% False Signal [B/(B+D)]	0.46%	0.48%	1.03%
% No signal in Tranquil time [D/(B+D)]	99.54%	99.52%	98.97%
NSR = [B/(B+D)]/[A/(A+C)]	0.0082	0.0075	0.0168
Goodness of fit	0.9472	0.9390	0.9106
UP	0.1098	0.1585	0.2073
QPS	0.1057	0.1220	0.1789
GBS	0.0040	0.0056	0.0107

Source: Authors' Computation

Policy Implications

This model analysis provides significant results regarding Indonesia's probability of entering a financial crisis in the next 24 months. However, this financial crisis can be avoided if there are policies to mitigate financial crises. Therefore, the results can be used to develop a series of pre-emptive policies, although there is no guarantee of success (Greenwood et al, 2020).

Many studies find that even though pre-crisis events and the impact of economic and financial crises in a country can be detected, there is not much evidence that these countries provide a series of successful crisis prevention policies. Nonetheless, pre-emptive policies are still needed to avoid a severe economic downturn (Greenwood et al., 2020; Reinhart et al., 2000). The failure of the preemptive policy is also due to the need for joint policies with other countries or global cooperation (Van den Berg et al., 2008).

Recently, a pre-emptive policy was issued in Indonesia to anticipate a global financial crisis (Bank Indonesia, 2023; Kementerian Keuangan, 2023). The policies designed can be analyzed qualitatively according to the variable causes and their impact on the domestic economy.

The world crude oil price, one of the early indicators, provided a significant factor. A continued increase in the price provided stronger potential risks of increasing the probability of a financial crisis. Hence, the world crude oil price can potentially trigger a financial crisis in Indonesia (Sasmitasiwi & Cahyadin, 2008). Unfortunately, the world oil prices are external factors that are beyond the control of the government, so anticipatory policies to overcome the increase in the world oil prices on the domestic economy, of course, must be carried out following the impact of world crude oil prices on the domestic economy.

In this case, there is a potential increase in subsidy expenditure in the government budget, so there is a potential risk of swelling the state budget deficit. In addition, rising world crude oil prices will provide the potential for inflation caused by rising costs *(cost-push inflation)*. Thus, the world crude oil price indicator may serve as a policy anticipation tool if this early indicator continues to provide high potential risks.

More open export and trade policies can promote export growth variables. The government should also facilitate finding new destinations and products to enter the world export market. Other significant variables, such as the budget deficit, can be adjusted with the plan to reduce the state budget deficit in 2023 (Kementerian Keuangan, 2023).

Another important policy is to maintain the stability of the exchange rate and BI's policy interest rate, which continues to adjust to the global economy while maintaining the competitiveness of Indonesian products (Bank Indonesia, 2023).

Based on the results, the matrix in Table 6 below describes the set of policies and policy actions that need to be implemented by Indonesia in order to mitigate the crisis in the next 12-14 months.

Table 6. Pre-emptive Indonesian Policy Respond and Goals

No	Variable	Policy Respond	Goals	Notes
1	Oil Price	Automatic Domestic Energy Price Policy	Ensures world oil prices have a positive net impact on the State Budget and Balance of Payments; and not pushing up the burden of inflation.	Partially Done
2	Budget Deficit	Reducing Budget Deficit	The 2022 budget deficit is relatively low, 2,38% of GDP, and provided a budgetary absorber to the economy. The 2023 budget has a downward trend towards a deficit target of 3% of GDP (Kementerian Keuangan RI, January 2023)	Done
3	Exchange Rate	Stable Exchange Rate	The rupiah exchange rate was kept stable, floating under control, following developments in world exchange rates and the competitiveness of Indonesian products (Bank Indonesia, 2023).	Done
4	Export Growth	Trade Policy to support Export Growth	Free or open trade policies have not been fully implemented, particularly in mining and mineral products. And the need to diversify export destination and promoting non-oil products export with higher value added.	Partly done
5	BI Policy Rate	BI Seven-Day Repo Rate (7D-RR) Adjustment	Bank Indonesia increased its Policy Interest Rate to maintain the interest rate spread with the US Fed Fund Rate (FFR). — Bank Indonesia's decision to raise 7DRR is a front-loaded, pre-emptive, and forward-looking policy. It is also a measure to continue declining inflation expectations toward a long-term inflation target of 3% (Bank Indonesia, 2023)	Done

In principle, the depth of a financial crisis depends on macroeconomic fundamentals. Indonesia already has macroeconomic policies to avoid a deep financial crisis. The Indonesian economy has demonstrated strong and solid macroeconomic fundamentals in recent years (World Bank, 2022). In addition to strong fundamental conditions, flexible but prudent macroeconomic policy targets are needed to deal with the financial crisis (Chen & Svirydzenka, 2021).

The macroeconomic policy mix was essential in promoting macro stabilization and economic recovery (Budiman et al., 2022).

The policy mix includes prudent monetary and sustainable fiscal policies implemented in 2021 and 2022. Although the experience of the macroeconomic policy mix in Europe can potentially be implemented, it is not easy to implement because the formula for policy instruments is unclear (Jones, 2022).

The macroeconomic policy mix will only succeed in the long run if sectoral reforms follow it. Unfortunately, policy reforms in Indonesia's energy, investment, and trade promotion sectors have not been fully implemented (World Bank, 2022).

Conclusion

This paper aims to make an early prediction of Indonesia's financial crisis after the pandemic. Researchers have widely used the EWSM model to detect a financial crisis in a single country (Van den Berg et al., 2008). The estimated EWM model has detected that Indonesia will enter a financial crisis in the next 12-24 months. However, this can be mitigated because Indonesia has implemented most pre-emptive policies. Based on observations, the Government and Bank Indonesia have implemented adequate policy responses and anticipation of the global financial crisis (Bank Indonesia, 2023; Kementerian Keuangan, 2023).

The parametric EWMS model developed in this case has fairly good performance. Various indicators used to see the model's performance provide quite good results. In addition, the model can be used to forecast the probability of a financial crisis in Indonesia in 2008 due to the global financial crisis. However, the impact is not very strong. The pandemic crisis in March 2020 can also be predicted using the model. Indeed, this parametric model must continue to be refined by adding or replacing early indicators more representative in contributing to the probability of a financial crisis or by changing the number of months of the pre-crisis period.

This model of early warning systems can be used not only to forecast or predict the probability of financial distress but also to diagnose the health of the economy in quiet times. It is possible that in quiet times, some early indicators show an increased magnitude but overall have not reached a high probability level for the occurrence of a crisis so that policymakers can make policies to improve economic performance in specific sectors that give a bad signal. Thus, economic performance will improve, and the continuous deterioration of economic performance leading to the financial crisis may be avoided.

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Disaggregated crude oil prices and stock market behaviour in Nigeria: Evidence from sectorial analysis

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Abstract

Purpose — This study differs from previous studies by examining the impact of oil price components, namely oil demand, global oil supply, and oil market-specific demand, on the stock returns of five sectors (Banking, Consumer goods, Industrial, Insurance, and Oil and Gas) listed on the Nigerian Stock Exchange.

Design/Method/Approach — The study employs the Autoregressive Distributed Lag (ARDL) model on monthly data between January 2000 and December 2019.

Findings — The paper finds evidence of a long-run relationship between sectoral market returns and oil price changes in Nigeria. Further evidence from the study reveals that oil-specific demand and global oil demand have positive and significant effects on the aggregate stock returns and the returns of the sampled sectors. On the other hand, the impact of the global oil supply is inconsequential on the aggregate stock returns and sectoral returns except for the Oil and Gas sector, where the effect of global oil production is positive and significant.

Implication — The study concludes that stock market returns in Nigeria are sensitive and vulnerable to changes in demand-side components of oil price. The study also highlights important policy implications to enhance the performance of the Nigerian stock market.

Originality/Value — The paper examines the impact of disaggregated oil prices on sectoral returns of the five listed sectors on the Nigerian Stock Exchange, which has not been explored in the literature.

Keywords — All Share Index, sectoral returns, oil supply, oil demand, oil specific demand, and ARDL.

Introduction

The importance of crude oil to the global economy cannot be overemphasized. Crude oil is one of the most internationally traded commodities, and its significance is felt by all countries irrespective of their trading position on the global oil market. Hence, fluctuation in the crude oil price would produce a spiral effect on the global economy. The effect of changes in the oil price is particularly felt in an oil-dependent and oil-exporting country like Nigeria, where the bulk of revenue is derived from oil. Oil has dominated the Nigerian economy at all levels since its discovery in 1956. Before this period, Nigeria was an agrarian society in which agriculture contributed to over 65% of the GDP. By the early 1970s, crude oil exploration came into the limelight, and oil became the country's primary revenue source. The dramatic change in the structure of the Nigerian economy as an oil-based economy led to a rapid increase in the inflow of revenue from oil export following the oil

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boom of the 1970s and a subsequent reduction in the contribution of agriculture to GDP to about 33% between 1981 and 1982 (Abeng, 2016).

Presently, Nigeria is the largest oil producer in Africa (Olayeni et al., 2020) and ranks as the 6th largest oil producer globally, with average daily production of 2.0 million barrels per day in 2019. These facts underscore the importance of crude oil to the Nigerian economy and the world due to its use in the energy supply and have become a major indicator of economic activity. Meanwhile, scholarly works such as Odusami (2009), Ojeyinka and Yinusa (2021, 2023) argue that volatilities in oil prices have significant implications for different economic activities. Recently, the reduction in the international oil price in 2020 due to demand-supply imbalances caused by the Covid-19 pandemic led to the sale of crude oil at discounts which was not experienced even during the global financial meltdown of 2009. The immediate and direct impact of the oil crisis in Nigeria was the downward review of the 2020 annual budget. Specifically, the crude oil price benchmark plummeted to $28 per barrel from $57, while the expected revenue was reduced from N8.42 trillion to N5.84 trillion, suggesting a 31% reduction in oil revenue in 2020. In the same vein, the country's exchange rate depreciated from N305 to N360 due to the devaluation of the official exchange rate by the Central Bank of Nigeria (CBN), while Nigeria's economic growth nosedived from 2.5% in December 2019 to -6.1% in the second quarter of 2020 (Ojeyinka & Yinusa, 2021). Consequently, a fall in oil price has multiple effects on the fiscal position of the country and major economic indicators such as exchange rate, inflation, and economic growth, most significantly, on the stock market (Wang, Umar, Afshan, & Haouas, 2022).

The significance of the stock markets to economic development has attracted the attention of scholars to empirically investigate its nexus with the global oil price. Researchers such as (Ashamu, Adeniyi, & Kumeka, 2017) assert that the operations and activities of the stock market feed directly into the developmental aspiration of a country. Thus, the stock market is essential in developing the world economy, as no economy can outgrow its stock market (Adaramola, 2012; Ajala et al., 2021). Besides, some economists regarded the stock market as the barometer of the national economy due to its linkage to other macroeconomic variables such as interest rate and inflation (Hu et al., 2018). Recently, the connection between oil price changes and stock market performance has dominated academic and policy discussions. On the empirical front, the effect of oil price shocks has been widely investigated for both oil-importing and oil-exporting countries. There are avalanches of studies on the oil price shocks-macroeconomic performance nexus with a specific focus on the stock market (Ajala et al., 2021; Kelikume & Muritala, 2019; Kisswani & Elian, 2017; Olayungbo, 2021; Salisu et al., 2017; Wang et al., 2022). However, these studies have concentrated on the impact of oil price shocks on stock market performance at the aggregate level without considering its impact at the sector-based level (see Asafo-Adjei et al., 2021; Karim & Masih, 2021; Obi et al., 2018). Similarly, a handful number of studies that focus on the impact of oil price shocks on the sectorial performance in Nigeria ignore other components of oil price shocks such as the oil supply shock and unanticipated oil demand shock (Abeng, 2016; Ashamu et al., 2017; Ebechidi & Nduka, 2017; Okere et al., 2021; Oyinlola & Oloko, 2018; Uzo-Peters et al., 2018). Like any other commodity, the interaction of demand and supply significantly affects the price, particularly for a volatile commodity such as crude oil. Thus, any shocks to the oil prices will exert a significant effect on the economic activities of an oil-producing country like Nigeria. This implies that for any policy on the energy sector to produce a meaningful effect on the economy, both the demand and supply factors driven by the crude oil price must be considered.

Empirically, the literature is awash with studies on the nexus between oil price changes and the performance of the stock market in both developed and developing countries (Ajala et al., 2021; Akinlo, 2014; Alaali, 2017; Alamgir & Amin, 2021; Kang, Ratti, & Yoon, 2015; Kilian & Park, 2009; Olayungbo, 2021; Onyeke et al., 2020; Salisu et al., 2017; Uzo-Peters et al., 2018). However, only a few of them decompose oil price changes into different components to examine the demand and supply factors influencing the movement in oil price and its impact on the stock market. The premier study by Kilian and Park (2009) disentangles the effect of oil price into crude oil demand and supply. It analyzes its effect on the US stock market with the Vector Autoressive (VAR) method and finds that oil supply shock has no significant effect on stock market returns. In

contrast, the impact of oil demand significantly influences the US stock market over the study period. Following this, Caporale et al. (2015), Degiannakis et al. (2014), and Kang et al. (2015) investigate the impact of structural oil price shocks on the European countries, United States and Chinese economy. In addition, these authors follow the method of Kilian and Park (2009) and discover that positive shocks' effect on aggregate demand and oil-market-specific demand significantly drive stock market returns in all the countries investigated. Similarly, these studies validate the conclusion of Kilian and Park (2009) that that supply shock caused by disruptions in global oil production does not affect stock returns.

In Nigeria, Effiong (2014) first examines the disaggregated oil price shocks and Nigeria's stock market nexus between 1995:1–2011:12. The study, however, examines the effects of oil price shocks on the stock market using aggregate stock returns. The use of aggregate stock returns masks the effects of oil price shocks on individual sectors. Recently, Onyeke et al. (2020) analyzed the impact of oil price shocks on sectorial stock returns but failed to consider other components of oil prices such as global oil supply and oil demand. Thus, the present study fills this obvious gap in the literature by decomposing the historical oil prices into oil supply, oil demand, and oil-specific demand. Furthermore, most of the literature reviewed on Nigeria focuses on the impact of oil price shocks on aggregate stock market return using all share index (ASI) and market capitalization as proxies. The use of aggregate returns does not give adequate information on stock market dynamics because it may not reflect the individual sector-specific stock performance which ultimately is the focus of investors when considering investing in the stock market. Besides, sectoral performance of stock returns provides crucial information to economic agents as regards the sectors to invest to reduce the degree of risk and uncertainty in their investment portfolio. Analysis of sector-specific performance is crucial because the market aggregation index may hide various sector behaviors' characteristics and salient features.

Hence, this study extends the frontier of knowledge on the oil price-stock market performance nexus in the following ways. Firstly, the study examines the impact of the oil price by disaggregating the historical oil prices into global oil supply shocks, aggregate oil demand shocks, and oil-specific demand or precautionary oil demand shock. Secondly, the study departs from existing studies that employ All Share Index (as a proxy for the aggregate stock performance) by investigating the impact of oil price components on the stock performance of five listed sectors on the Nigerian stock exchange market (Nigerian Stock Exchange, 2020). This study considers five sectoral returns, which include Banking, Consumer Goods, Insurance, Oil/Gas, and Industrial indices. This will unveil the most vulnerable sector(s) to oil price changes to formulate sector-based policies to immune these sectors from unexpected and unanticipated changes from crude oil price swing. Thirdly, the study differs in the choice of control variables to account for other macroeconomic variables that influence the performance of the stock market return in Nigeria. Thus, the study employs exchange rate, inflation rate, and interest rate as control variables based on the economic theory and transmission channels of oil-price changes. Scholarly works have found that macroeconomic variables such as inflation, interest rate, and exchange rate play major roles in the transmission of oil prices to the stock market. Hence, any attempt to ignore these macroeconomic variables in the nexus between oil price and stock market performance might underestimate or overestimate the real impact of oil price on the performance of the stock exchange market. This is the major lacuna the present study intends to address in the literature. To our knowledge, this is the first time such a detailed and comprehensive analysis of the oil price-stock market nexus is empirically investigated using Nigerian data.

Methods

This study is premised on the Arbitrage pricing theory (APT) propounded by Ross (2013) and Ross et al. (1977). The APT argues that the expected return on investment depends on some individual macroeconomic factors and risk premium connected with each macroeconomic factor**.** The APT has been identified as the most prominent theoretical model to investigate the impact of shocks and risks on stock market returns and volatility in the finance literature. The attraction of the APT among scholars lies in its efficiency in accommodating additional macroeconomic factors which

affect the investors' returns on investment. The APT model states that the expected return on investment A is given by:

$$R_A = R_F + \beta_{F1}(R_{F1} - R_F) + \beta_{F2}(R_{F2} - R_F) + \cdots + \beta_{FN}(R_{FN}R_F) \quad (1)$$

Where: R_A = return on asset, β = beta factor, a measure of the relationship between asset and the market portfolio, F_1, $F_{2...}$ F_N are individual macroeconomic factors and N is the number of identified factors.

Based on the theoretical framework discussed above, the study adopts the APT model employed by Salisu and Isah (2017) and defines the evolution of stock market returns in the following process.

$$R_i = \alpha_i + \beta_i v + \varepsilon_i \quad (2)$$

Where R_i = the return on asset (stock returns), α captures the unconditional expected return v is a vector of risk factors, β_i represents a vector capturing the impact of each risk factor on return on asset (stock), ε_i is the error term for the residual effect of the returns in question.

However, many risk factors influence the performance of a particular asset, and the study focuses on the effects of oil price and three macroeconomic variables: exchange rate, inflation, and interest rate as control variables. Incorporating these variables into equation (2), we have

$$RTN_t = \alpha + \beta_1 OLP_t + \beta_2 EXR_t + \beta_3 INF_t + \beta_4 INR_t + \varepsilon_t \quad (3)$$

RTN_t = stock returns at time t, α = constant or intercept term, OLP_t is the oil price, EXR_t represents the exchange rate, INF_t is the inflation rate, INR_t is the interest rate, and ε_t captures the error term.

Again, the study follows the existing studies such as Degiannakis et al. (2014), Effiong (2014), Hamilton (2009), Kilian & Park (2009), and Onyeke et al. (2020) and decompose the oil price variable into oil demand, oil supply, and precautionary oil demand or oil-specific demand shocks. If the three components of oil price replace OP in equation (3), the estimable model to achieve the study objective becomes

$$RTN_t = \alpha + \beta_1 OSD_t + \beta_2 OSS_t + \beta_3 ODD_t + \beta_4 EXR_t + \beta_5 INF_t + \beta_6 INR_t + \varepsilon_t \quad 4)$$

Where OSD_t is oil-specific demand, OSS_t captures the global oil supply, and ODD_t represents the precautionary oil demand.

In terms of a priori expectation, we expect a positive relationship between oil price components and stock returns in an oil-exporting economy like Nigeria, while a negative relationship is expected between the macroeconomic variables (exchange rate, inflation, and interest rate) and stock market returns.

The study employs the Autoregressive Distributed Lag (ARDL) technique to address the study's objective based on the following advantages. Firstly, the ARDL approach helps to estimate both the long-run and short-run results at the same time. Secondly, the econometric methodology helps to handle variables of mixed order of integration. Since most financial and economic variables are known to be of different orders, it is imperative to adopt a technique that handles such attributes to have reliable and unbiased results. Thirdly, the ARDL model permits the incorporation of lag values of both the explained and explanatory variables, which are crucial, especially when studying the nexus between volatile series such as stock market return and oil price.

Following Pesaran et al. (2001), the ARDL version of equation (4) is as follows:

$$\begin{aligned}\Delta RTN_t = {} & \delta_0 + \sum_{i=1}^{p} \varphi_{1i} \Delta RTN_{t-1} + \sum_{i=0}^{p} \varphi_{2i} \Delta OSD_{t-1} + \sum_{i=0}^{p} \varphi_{3i} \Delta OSS_{t-1} + \\ & \sum_{i=0}^{p} \varphi_{4i} \Delta ODD_{t-1} + \sum_{i=0}^{p} \varphi_{5i} \Delta EXR_{t-1} + \sum_{i=0}^{p} \varphi_{6i} \Delta INF_{t-1} + \sum_{i=0}^{p} \varphi_{7i} \Delta INT_{t-1} + \\ & \gamma_1 RTN_{t-1} + \gamma_2 OSD_{t-1} + \gamma_3 OSS_{t-1} + \gamma_4 ODD_{t-1} + \gamma_5 EXR_{t-1} + \gamma_6 INF_{t-1} + \\ & \gamma_7 INT_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

Equation (5) show the unrestricted version of the ARDL specification of equation (4), where $\Delta\ is$ the difference operator, δ_0 is the intercept and ε_t captures the error term. The $\gamma_{i,}$ are the long-run coefficients associated with equations (5).

The optimal lag length is selected using the Akaike Information Criteria (AIC) in testing for the null hypothesis of no cointegration as proposed by Pesaran et al. (2001). The AIC is selected because the criterion is more consistent and robust in model selection than other information criteria (Pho et al., 2019). Besides, a lower value of AIC suggests the best-fitting model among other nested models (Akaike, 1998). The null hypothesis of no long-run relationship between stock market return and oil price changes in equation (5) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$ is tested against the alternative hypothesis of the long-run relationship as $H_1: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq \gamma_7$. The null hypothesis of no cointegration is rejected if the value of the computed F statistic is greater than the upper bound value of the Pesaran et al. (2001)'s critical values.
If the cointegration is established, the long run model presented in equation (5) is estimated:

$$RTN_{t=}\pi_0 + \sum_{i=1}^{m}\pi_{1i}RTN_{t-1} + \sum_{i=0}^{n}\pi_{2i}OSD_{t-1} + \sum_{i=0}^{o}\pi_{3i}\,OSS_{t-1} + \sum_{i=0}^{p}\pi_{4i}ODD_{t-1} + \sum_{i=0}^{q}\pi_{5i}EXR_{t-1} + \sum_{i=0}^{r}\pi_{6i}INF_{t-1} + \sum_{i=0}^{s}\pi_{7i}INT_{t-1} + \mu_t \quad (6)$$

Any of the aforementioned information criteria will select the optimum lag. Specifically, we select lag 6 as the optimum lag length. Once the long-run estimates have been estimated from equations (6), error correction models are required to estimate the short-run dynamic coefficients. The corresponding error correction models are presented below:

$$\Delta RTN_{t=}\delta_0 + \sum_{i=1}^{j}\delta_{1i}\Delta RTN_{t-1} + \sum_{i=0}^{k}\delta_{2i}\Delta OSD_{t-1} + \sum_{i=0}^{l}\delta_{3i}\,\Delta OSS_{t-1} + \sum_{i=0}^{m}\delta_{4i}\Delta ODD_{t-1} + \sum_{i=0}^{n}\delta_{5i}\Delta EXR_{t-1} + \sum_{i=0}^{o}\delta_{6i}\Delta INF_{t-1} + \sum_{i=0}^{p}\delta_{7i}\,\Delta INR_{t-1} + \gamma ECT_{t-1} \quad (7)$$

Where $\delta_{i,}$ are short-run dynamic coefficients. ECT_{t-1} is the error correction term that measures the speed of adjustment after a shock while γ is the parameter of one year lag of the error correction term.

Therefore, equations (6) and (7) are estimated to obtain the long-run and short-run estimates on the effect of oil price changes on stock market performance in Nigeria.

The study employs monthly data from January 2000 to December 2019. Data for sectoral returns vis Banking index, Consumer goods index, Insurance index, Oil/Gas index, Industrial goods index, and the All-Share Index (a proxy for the aggregate stock performance) come from the Nigerian Stock Exchange. Brent crude oil price (a proxy for precautionary or oil-specific demand shock) and global oil production (a proxy for global oil supply shock) are obtained from the US Energy Information Administration (EIA). Global real economic activities, also called Kilian Index (a proxy for aggregate demand oil price shocks) are sourced from Kilian's website. Lastly, data on the exchange rate, inflation rate, and real interest rate come from the Central Bank of Nigeria (CBN) and the World Development Indicator (WDI). The consumer price index measures the inflation rate, while the monetary policy rate measures the interest rate. The study measures the exchange rate using the nominal exchange rate. The nominal exchange rate defines the value of Naira to a US dollar. However, due to data availability on sectoral market return, we use different data scopes for the sectors considered in the study. Specifically, the study employs monthly data for the All-Share Index from 2000-2019; for banking, consumer goods, insurance, and oil & gas from 2009-2019; and for the industrial sector from 2012-2019. All the variables are expressed and used in their logarithm form except the Killian index (global real economic activities), which is used as a proxy for the global oil demand.

Results and Discussion

The study employs two conventional unit root tests, the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP), with intercept and trend options, to establish the series' stationarity properties. Table 1 presents the outcomes of the two tests. The outcomes suggest that variables in the study

are of a different order of integration, but none is integrated of order 2 or higher order. This, in turn, justifies the usage of the ARDL technique as the estimation method.

Table 1. Unit root Tests results (intercept and trend)

	ADF test			PP test		
Variables	Level	1st Diff	Order	Level	1st Diff	Order
LAST	-2.144	-13.062***	1(1)	-2.21	-13.047***	1(1)
LBNK	-2.886	-11.095***	1(1)	-2.985	-11.273***	1(1)
LCNS	-2.742	-11.458***	1(1)	-2.884	-11.450***	1(1)
LIND	-1.762	-10.879***	1(1)	-1.773	-10.758***	1(1)
LINSR	-3.989**	-	1(0)	-4.225***	-	1(0)
LO_G	-3.028	-10.558***	1(1)	-3.103	-10.670***	1(1)
LOSS	-1.203	-4.236***	1(1)	-2.809	-37.863***	1(1)
ODD	-3.372*	-	1(0)	-2.708	-10.897***	1(1)
LOSD	-2.021	-12.493***	1(1)	-1.900	-12.463***	1(1)
LEXR	-1.785	-3.976**	1(1)	-6.725***	-	1(0)
LINF	-2.68	-6.202***	1(1)	-3.312*	-	1(0)
LINR	-1.336	-14.920***	1(1)	-1.524	-15.002***	1(1)

Critical Value 1%= -3.998, 5%= -3.429, 10%= -3.138
Note: ***, **, * denote 1%, 5% and 10% level respectively
Source: Authors' Compilation (2022)

Based on the unit root test results, the study employs the Bound Test approach discussed in section 3 to examine whether there is a cointegrating relationship among the variables in the study. The Bound test results support a long-run relationship for all the models estimated as confirmed by the values of the F statistic, which are greater than the upper bound critical value at various conventional levels of significance. Thus, the study rejects the null hypothesis of no cointegration and confirms that the stock market return and other explanatory variables comove in the long run. Thus, the study estimates the long-run model in equation (6) for all the sectors and the aggregate stock market return. Table 2 presents the outcomes of the Bound test.

Table 2. Bound Test Cointegration Results

Dependent Variables	Model	F-statistic	Cointegration
All Share Index (ASI)	(ASI, OSD, ODD, OSS, EXR, INF, INR)	8.093***	Yes
Banking (BNK)	(BNK, OSD, ODD, OSS, EXR, INF, INR)	3.964**	Yes
Consumer Goods (CNS)	(CNS, OSD, ODD, OSS, EXR, INF, INR)	3.724**	Yes
Industrial (IND)	(IND, OSD, ODD, OSS, EXR, INF, INR)	4.588**	Yes
Insurance (INS)	(INS, OSD, ODD, OSS, EXR, INF, INR)	4.938***	Yes
Oil & Gas (O_G)	(O_G, OSD, ODD, OSS, EXR, INF, INR)	5.679***	Yes
Critical values		Upper bound	Lower bound
1%		3.15	4.43
5%		2.45	3.65
10%		2.12	3.23

Note: ***, ** and * indicate 1%, 5% and 10% level of significance respectively
Source: Authors' Compilation (2022)

Table 3 presents the outcomes of the long-run effect of oil price changes on stock market returns. However, before discussing the main results, we automatically select the optimal lag length by the e-views using the optimum lag of 6. The results of the lag length for each model are not presented for brevity's sake. The outcomes reveal that oil supply (LOSS) has a negative impact (although not significant) on the performance of the stock market in all the models estimated except for model 6 (oil and Gas sector), where the effects of oil supply are significant. The findings support the general findings from previous studies, including Killian and Park (2009) for the US stock market, Abhyankar et al. (2013) for the Japanese stock market, and Effiong (2014) for the Nigerian stock market. All these studies confirm that oil production does not affect the stock

market performance. Meanwhile, the impact of global oil supply has an enhancing effect on the oil & gas sector returns suggesting that an increase in oil production stimulates the sector's performance in the long run. This is not unexpected, as an increase in global oil production would lead to an increase in revenue inflow to an oil-exporting country such as Nigeria. The inflow from oil is expected to improve the performance of the oil and gas sector as more funds would be available for investment in the sector.

On the other hand, oil demand and oil-specific market demand have positive and significant impacts on stock market activity for all the specifications except for the insurance sector in model 5. The outcome implies that a percentage increase in the oil-specific demand (LOSD) increases the stock market's performance by 19%. In comparison, the aggregate stock market performance rises by approximately 1% given a unit increase in the oil demand (model 1). As expected, the results imply that an increase in oil prices and global economic activity leads to an increase in wealth transfer from oil-importing economies to oil-exporting countries, including Nigeria, which consequently stimulates the performance of the Nigerian stock market in the long run. The outcomes reiterated that an increase in global economic activity would stimulate demand for oil due to its importance in the production process. As demand for crude oil increases, more revenue and foreign exchange would flow to oil-exporting countries such as Nigeria. This result is in tandem with the findings of Effiong (2014), Okere et al. (2021), and Onyeke et al. (2020) for the Nigerian stock market, and Bastianin et al. (2016) for the G7 countries and Kisswani and Elian (2017) for Kuwait. The result also validates the findings of Karim and Masih (2021) for six oil-producing countries in Africa, including Nigeria and Asafo-Adjei et al. (2021), who affirm that expansion in the global economy stimulates the performance of the stock market. However, the study contrasts with the findings of Caporale et al. (2015) for the Chinese stock market. Again, China is one of the world's major oil-importing countries, and as such increase in the oil price is expected to have a decreasing effect on the stock market of an oil-importing country due to the wealth transfer in the global market.

Table 3. Estimated Long Run coefficient

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	ASI	BNK	CNS	IND	INSR	O_G
C	10.510	7.658	7.877	-3.031	9.329	-8.344
	(0.117)	(0.311)	(0.372)	(0.301)	(0.152)	(0.371)
LOSS	-0.624	0.305	0.203	-0.375	0.467	1.421*
	(0.394)	(0.585)	(0.597)	(0.224)	(0.789)	(0.073)
ODD	0.983***	0.073***	0.286***	0.474***	0.235***	0.745***
	(0.000)	(0.000)	(0.003)	(0.035)	(0.027)	(0.005)
LOSD	19.030***	0.216***	0.656**	0.798***	0.393	0.939***
	(0.000)	(0.018)	(0.059)	(0.000)	(0.538)	(0.036)
LEXR	0.977	0.218**	-0.173	-0.175**	-0.542	-0.039**
	(0.853)	(0.012)	(0.778)	(0.029)	(0.846)	(0.025)
LINF	0.572	-0.173	-0.545***	-0.676	-0.408	0.054***
	(0.416)	(0.327)	(0.001)	(0.503)	(0.735)	(0.065)
LINR	0.720***	0.252**	0.035	0.936***	0.299	1.075
	(0.002)	(0.021)	(0.217)	(0.017)	(0.672)	(0.371)

Note: (1) ***, ** and * denotes 1%, 5% and 10% level respectively.
(2) values in the bracket represent the probability values.
Source: Authors' Compilation (2022)

The effect of the exchange rate on the sectoral stock return is mixed, as evidenced in Table 3. For instance, its effect is significantly negative on the industrial and oil & gas sector, while a positive impact of the exchange rate is observed in the banking sector. The results imply that an increase in the exchange rate (devaluation) enhances the returns of the banking sector but depresses the performance of the industrial and oil and gas sector, while the exchange rate has no impact on the All-share index, insurance, and consumer goods sectors. The result confirms the earlier finding

of Abeng (2016) that the food, beverages and tobacco, and oil and gas sectors respond negatively to exchange rate fluctuation in Nigeria. This result espouses the debilitating effect of the depreciation of the domestic currency on the returns of the industrial and oil and gas sector sectors. One major implication of this is that the industrial sector relies more on importing capital goods. Hence, the devaluation or depreciation of Naira will increase the cost of these capital goods, which in the long run might discourage potential investors in the sector (Ojeyinka & Yinusa, 2021).

In the same way, the inflation rate negatively affects the consumer goods sector (model 3) but is positively related to the performance of the oil and gas sector (model 6). However, interest rate positively affects the All-Share index and banking and industrial sectors' returns (Models 1, 2 and 4). The plausible reason for this is connected with the fact that an increase in interest rate induces potential investors to invest in the domestic economy, which will subsequently enhance the performance of the stock market.

Table 4. Short-run and Error Correction Model Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Variable	ASI	BNK	CNS	IND	INSR	O_G
D(LOSS)	-0.033	-0.041	-0.017	-0.118	-0.031	0.171***
	(0.368)	(0.584)	(0.789)	(0.181)	(0.580)	(0.027)
D(ODD)	0.457***	0.035	0.029***	0.321***	0.044	0.429***
	(0.007)	(0.742)	(0.005)	(0.025)	(0.287)	(0.001)
D(OSD)	0.846***	0.029	0.021***	0.054***	0.249***	0.247***
	(0.006)	(0.217)	(0.005)	(0.026)	(0.001)	(0.002)
D(LEXR)	-0.052*	-0.029***	-0.015*	-0.058***	-0.030***	-0.028***
	(0.074)	(0.022)	(0.074)	(0.053)	(0.037)	(0.044)
D(LINF)	-0.031**	-0.023**	-0.034***	-0.032	-0.041***	0.012
	(0.002)	(0.060)	(0.038)	(0.594)	(0.032)	(0.842)
D(LINR)	-0.319**	-0.034	-0.003	0.156***	-0.086	-0.029
	(0.002)	(0.360)	(0.563)	(0.000)	(0.419)	(0.337)
CointEq(-1)	-0.053***	-0.135***	-0.084***	-0.160***	-0.100***	-0.120***
	(0.000)	(0.015)	(0.022)	(0.000)	(0.001)	(0.003)

Note: (1) ***, ** and * represent 1%, 5% and 10% significance level respectively
(2) values in the bracket represent the probability values
Source: Authors' Compilation (2022)

Table 4 presents the outcomes from the short-run analysis. However, to ensure uniformity and comparison across the six models, we focus on the explanatory variables' contemporaneous (current) effect on the stock market performance. The output in Table 4 shows that the coefficient of the lag of the error correction term assumes the expected sign and is significant for all the models estimated. This further reiterates and confirms the evidence of the long-run relationship among the variables in the model. Following the outcomes from the long-run model (Table 3), the effect of oil supply is not significant except on the oil and gas sector where an increase in oil production significantly and positively promotes the performance of the sector. Again, the results of the short-run model mimic that of the long-run model for other components of the oil price shocks, where the oil demand exerts a positive effect on all sectors except banking and insurance returns. In the same vein, the effect of precautionary oil demand (oil-specific demand) is positive and significant on all sectors except for the banking sector's returns. Further, the exchange rate significantly and negatively affects all the sectors, including the aggregate stock performance, suggesting that the depreciation of the exchange rate discourages investors from investing in the domestic stock market. Similarly, the inflation rate exerts a significant negative effect on ASI, banking, and consumer goods. In the short run and long run, while inflation has a negative relationship with consumer goods, the interest rate is positively related to industrial returns.

It is important to note that the outcomes from the ARDL is sensitive to the optimal leg length selected. Hence, it becomes imperative to subject the lag length chosen to some diagnostic tests to ensure that the inference from the study is consistent and reliable for policy analysis and

prescription. The study conducts several post-estimation tests, as reported in Table 5, to validate the reliability of the selected lag and the estimated models. The results of the post-estimation tests suggest that all the models estimated pass all the tests. This further implies that the residual terms from all the estimated models are free from serial correlation and heteroscedasticity problems at 5% significance level. In the same way, the residual terms from all the models are normal, as confirmed by the probability value of the J-B test.

Table 5. Results of the Post Estimation Tests

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Tests	ASI	BNK	CNS	IND	INS	O_G
Serial Correlation LM	4.866	2.945	0.054	1.141	0.095	2.830
	(0.678)	(0.556)	(0.809)	(0.945)	(0.750)	(0.081)
ARCH	0.091	0.178	0.772	0.192	0.030	0.270
	(0.763)	(0.671)	(0.584)	(0.658)	(0.861)	(0.893)
Ramsey Reset	0.647	0.660	0.365	0.029	0.385	0.365
	(0.844)	(0.568)	(0.675)	(0.554)	(0.594)	(0.684)
J-B Test	186.640	89.031	40.018	22.902	52.564	54.964
	(0.087)	(0.059)	(0.074)	(0.064)	(0.066)	(0.068)

Note: Values in bracket represent the probability values
Source: Authors' Compilation (2022)

In addition, Appendix 1A to 1F reports the stability tests' results, using CUSUM and CUSUMSQ conducted on all the estimated models. It is evident from the tests that all the estimated models are stable and free from structural instability, as all the plots from the two stability tests fall within the 5% critical bound.

Conclusion

The prime objective of the study is to analyze the effects of the oil price on the sectoral returns of the Nigerian stock market. Unlike the previous study on the Nigerian stock market, the study decomposes the effects of the oil price into oil supply, oil demand, and precautionary oil (specific) demand. It examines their effects on aggregate stock returns (All Share Index) and sector-specific returns of five major sectors (banking, consumer goods, industrial, insurance, and oil & gas). The study finds convincing evidence that sectoral returns and oil price components cointegrate and comove in the long run. In more specific terms, the results from both the long run and short run overwhelmingly confirm that changes in global oil supply do not influence the aggregate stocks returns and the returns of all the sectors except the return of the Oil and Gas sector. However, the effect of oil demand and precautionary oil demand changes substantially enhance the performance of the aggregate stock returns and the sectoral returns of all the sectors except the insurance sector in the long run and the banking sector in the short run. In more general terms, empirical findings from the study reveal that sectoral returns in Nigeria respond more to changes in demand-driven factors than the supply-driven factor. Alternatively, this study identifies oil demand and oil-specific market demand as the key drivers of stock returns in Nigeria. One major implication of these findings is that changes in the components of oil price have heterogeneous effects on sectoral returns in Nigeria. Thus, it is important for policymakers and potential investors to carefully analyze the behavior of each sector of the Nigerian economy vis a vis their response to the three oil price components before any investment decision is made in any of these sectors. Besides, since Nigeria is an importer of petroleum products, an increase in oil prices might translate into a hike in the price of petroleum products, thereby putting an additional burden on the economy. Thus, for the Nigerian stock market to fully tap into the gain of increased oil prices, the government should design policies to reduce the economy's vulnerability to oil demand and oil-specific demand shocks. One major way to achieve this is by resuscitating the moribund refineries in the countries to refine crude oil into petroleum products, shying the country from an unanticipated increase in oil prices.

This study has achieved its aim by unveiling the response of sectoral returns to disaggregated oil price changes in Nigeria using monthly data. However, there is an instantaneous response of stock market participants to changes in macroeconomic fundamentals, especially the oil price. Daily data would have been more appropriate to examine the nexus between stock market behavior and oil price changes. Thus, one major limitation of this study is the nonavailability of high-frequency data, such as daily data on sectoral returns in Nigeria. As daily data become readily available, future studies might consider using daily data and re-examining the nexus between stock markets and oil price shocks in Nigeria.

Acknowledgment

Not applicable in this section

Declaration of Competing Interest

The authors declare no potential conflict of interest in the publication of this article and that the manuscript is not concurrently being considered for publication elsewhere.

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Appendix: Figure 1A-1F

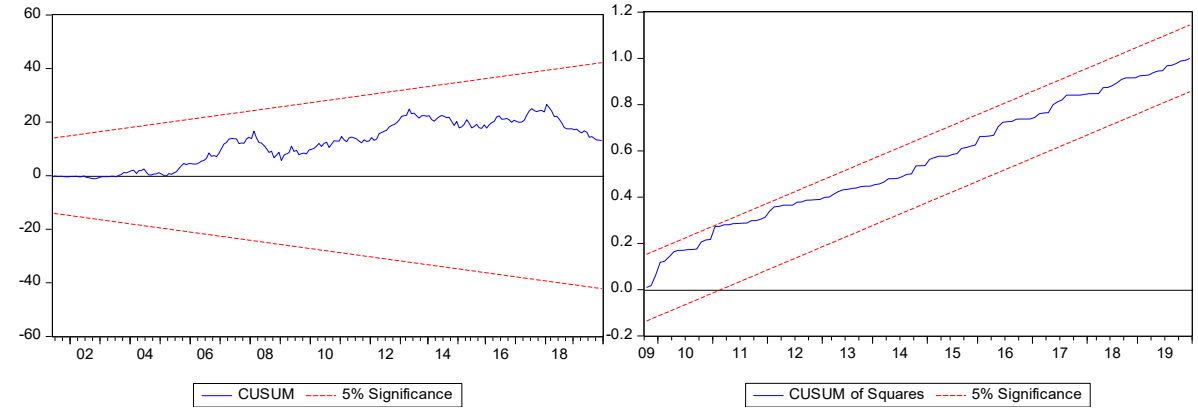

Figure 1A. CUSUM and CUM of Square Stability Test for the All-Share Index (Model 1)

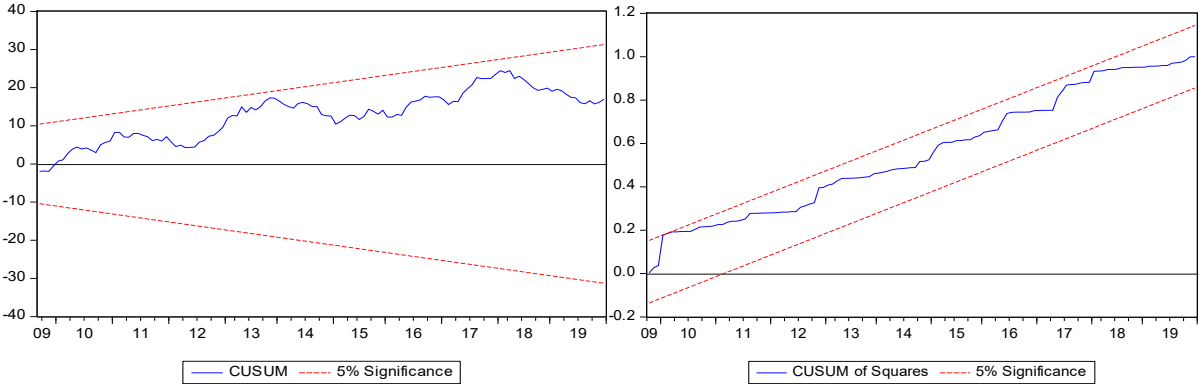

Figure 1B. CUSUM and CUM of Square Stability Test for the Bank sector (Model 2)

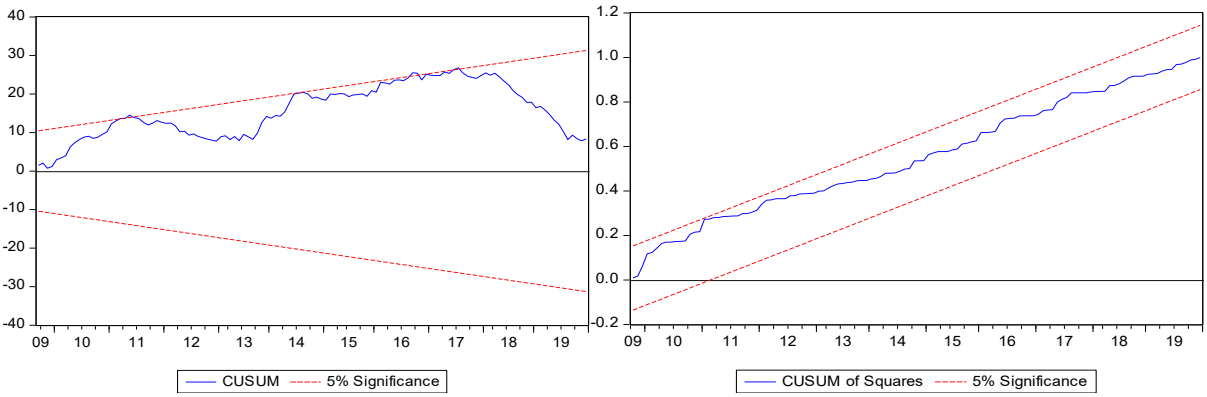

Figure 1C. CUSUM and CUM of Square Stability Test for the Consumer Goods sector (Model 3)

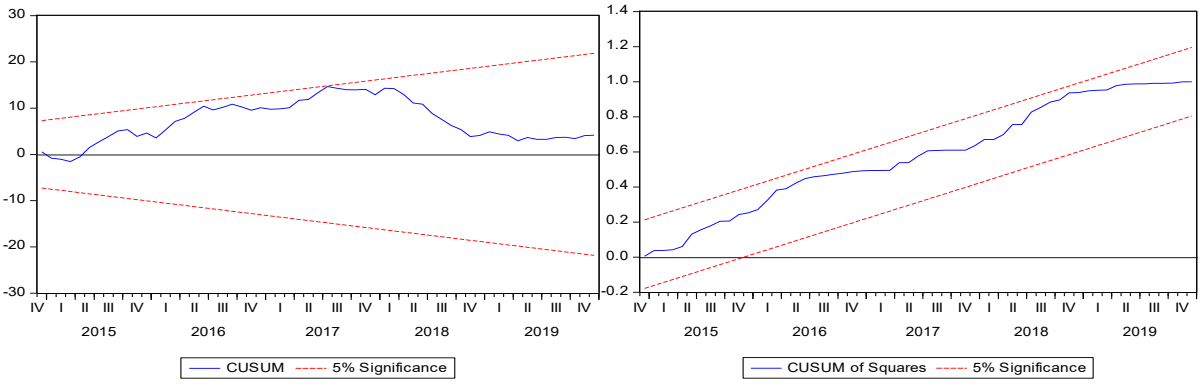

Figure 1D. CUSUM and CUM of Square Stability Test for the Industrial sector (Model 4)

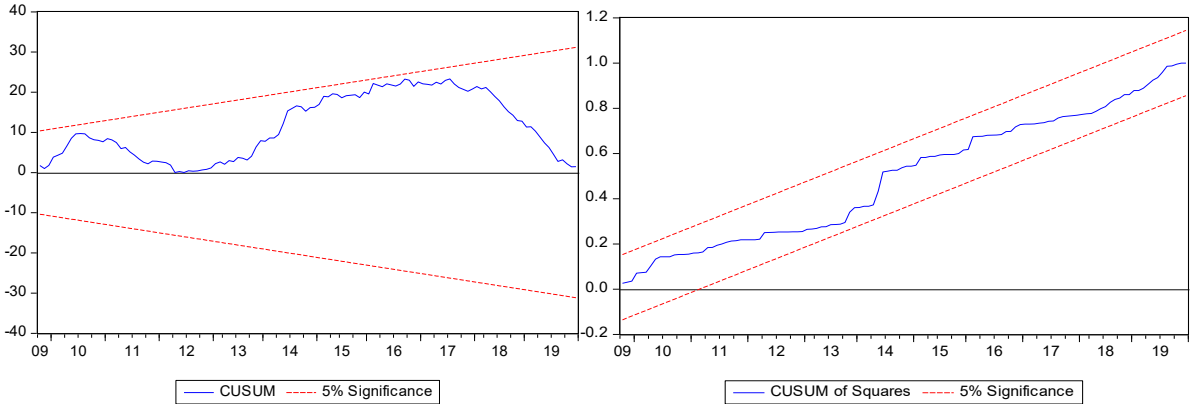

Figure 1E. CUSUM and CUM of Square Stability Test for the Insurance sector (Model 5)

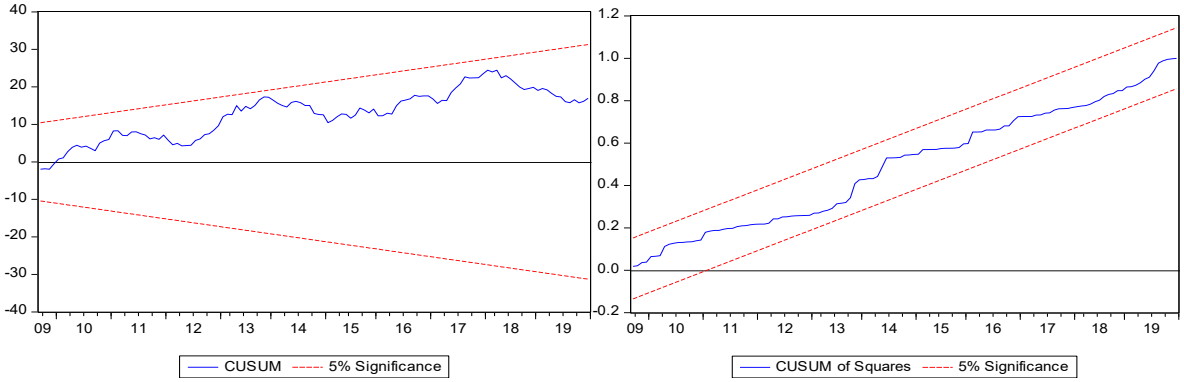

Figure 1F. CUSUM and CUM of Square Stability Test for the Oil & Gas sector (Model 6)

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Intensity of the creative economy agency and partnership in empowering micro and small enterprises

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Abstract

Purpose — This paper analyzes the determinants of micro and small enterprise company performance and its employees in Indonesia using a data set covering 2010 – 2019.

Method — This study uses the robust estimation of the panel data regression method to estimate an alternative least squares regression that does not require strict assumptions and is not sensitive to outliers.

Findings — The study's findings are as follows: 1) Improving resources, markets, entrepreneurs, and institutions has different impacts on business performance and workers' compensation due to the complexity and size of businesses, 2) The formal education of micro and small business entrepreneurship and institutionalization of partnerships have improved workers' compensation but not business performance, 3) Improving resource access, market orientation, and policies indirectly implemented by the Creative Economy Agency have improved business performance but not workers' compensation. Therefore, programs aimed at enhancing productivity of entrepreneurs and workers through partnerships are a key factor in improving the competitiveness of micro and small enterprises.

Originality — Four determinants of the business environment of micro and small enterprises were analyzed to determine their impact on entrepreneur and worker performance, in order to identify the key factors contributing to the successful empowerment of these businesses.

Keywords — Micro and small enterprises (MSEs), Partnership, Institution

Introduction

Micro and small enterprise plays a major role in the industry in Indonesia as it represents almost all the business population and account for the bulk of employment. In the 2016 Economic Census (Statistics Indonesia, 2016), micro and small enterprises in all sectors reach 26.07 million business units and as many as 4.35 million (16.68%) manufacturing businesses. These micro and small enterprises account for 96.68% of the number of all companies and 75.33% of total employment and generate 32.58% of the value of labor services and 26.82% of sales of all business units. This condition shows that micro and small enterprises in Indonesia are very small business units with an average of under 5 workers, except for micro and small enterprises in DKI Jakarta, which has an average of 6 workers per business unit. In addition to being small, micro and small enterprises in Indonesia also contribute a very small production value of IDR 52.52 million compared to IDR 10.72 billion per business unit by large companies.

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A year before the economic census, in 2015, the government established the Creative Economy Agency to manage the creative economy. As a non-departmental agency, it had more agile activities outside the bureaucratic order and fiscal budgeting cycle, leaving little room for movement and improvement (Kristiansen et al., 2009). However, in 2019, the Creative Economy Agency was merged into the tourism ministry. This study does not focus on the impact of merging the Creative Economy Agency into the ministry. Instead, it focuses on the indirect impact and influence of the Creative Economy Agency on the micro and small enterprise manufacturing sector. Within the micro and small enterprise manufacturing sector are six related creative economy businesses: craft, culinary, fashion, music, film, animation, video, and publishing (Statistics Indonesia, 2016).

The micro and small enterprise sector itself has a proven level of resilience. In the 1997/98 crisis, small and medium enterprises replaced imported raw materials with local ones. In the 2008/09 global financial crisis, small and medium enterprises managed to find new customers or markets in affected countries or explored new domestic markets. Meanwhile, in the case of the Covid-19 crisis, small and medium-sized enterprises shifted to the business of food, masks, and tools to protect people from the Covid-19 virus, as well as changing e-commerce packaging and home delivery (T. Tambunan, 2020). Similarly, Nursini (2020) showed that small and medium enterprises play an important role in poverty alleviation, reducing the percentage of poor people and the Poverty Severity and Gap Index.

Resilience and flexibility do not come naturally. It requires attention and increased empowerment of small and medium-sized enterprises to ensure the sustainability of the production cycle. To empower small and medium enterprises, the OECD offers a framework for strengthening small and medium enterprises (OECD, 2017). The framework for strengthening small and medium-sized enterprises that are partly used in this study includes: first, access to economic resources, which includes access to capital, human resources, skills, knowledge, technology, and innovation, as well as energy. Second is access to domestic and international markets, including physical infrastructure improvements, government procurement of goods and services, trade and investment policies, and domestic market conditions. Third, entrepreneurial factors include opportunities, capabilities, and attitudes. Fourth includes regulatory and institutional frameworks, such as regulatory burden, court effectiveness, and legal, governance, and partnership frameworks.

In terms of resource access, a key constraint for micro and small enterprises is the capital needed to increase production through investment in new technologies (Burger et al., 2015), to improve business profitability and growth (Ogoi, 2017), and increase export capacity (McLean & Charles, 2020). To narrow the capital gap, OECD countries have developed external financing techniques for small and medium-sized enterprises, including direct debt based on asset-based financing, alternative debt, hybrid instruments, and equity instruments (Cusmano & Koreen, 2015). Entrepreneurs in developing countries obtain capital from their own capital or borrow capital from family/relatives, partnerships, and external financing. External financing, which relies on asset-based bank loans, still creates a capital gap. Access constraints to external financing in Indonesia stem from the fact that many micro and small enterprises have not been able to access financial services, do not have or lack the necessary collateral, and operate in remote areas that are difficult to reach by banks and other services (Burger et al., 2015; ILO, 2019). Meanwhile, financial institutions and banks have yet to be able to offer customized micro and small business loans because they need the necessary systems, data, infrastructure, and personnel staff to expand micro and small business lending (ILO, 2019). Access to finance gaps and barriers to alternative external financing are also experienced by other developing countries, such as Vietnam (Le, 2012), Bangladesh (Hossain et al., 2018), the Caribbean (McLean & Charles, 2020), and in other developing countries (Ramalho et al., 2018).

Technological upgrading through capital investment can also come from human capital and skills. Positive contributions from human capital and skills (education, knowledge, experience, and skills) increase the productivity of micro and small enterprises in Makassar, Indonesia (Hernita et al., 2021), improve business performance in India (Dar & Mishra, 2021), increase exports through global value chains in Indonesia (Hing et al., 2020), increase growth, innovation, and competitiveness in Italy (Drábek et al., 2017). Formal education and vocational training are

important elements in enhancing and strengthening human capital capacity to improve the productivity and profitability of micro and small enterprises.

Small and medium-sized enterprises have the potential to enter international markets but are constrained by trade costs, overseas distribution networks, and trade policies. Based on a survey of small and medium enterprises conducted by the World Bank Enterprise Survey (2021), export products of small and medium enterprises account for only 10% of total sales of small and medium enterprises compared to 27% for large enterprises in the Asia-Pacific region. In addition to the internal productivity of small and medium enterprises, successful market entry depends on information on foreign distribution networks, which include border regulations and standards, tariff and non-tariff policies, fixed and variable costs of shipping goods, and product certification. E-commerce and participation in GVC adoption are alternative pathways that small and medium-sized enterprises can utilize to help overcome barriers and increase global trade (Tambunan, 2021).

The E-commerce adoption by Thailand's small and medium enterprise exporters has no significant positive impact on export intensity (Ueasangkomsate, 2015), but business-to-business (B2B) e-commerce can increase Thailand's small and medium enterprise exports, while older small and medium enterprise entrepreneurs tend to ignore e-commerce (Amornkitvikai et al., 2022). Meanwhile, Hasan et al. (2021) found a low level of e-commerce adoption, where most businesses use conventional patterns to sell goods and services to small and medium enterprises in Indonesia. The adoption of the Internet and e-commerce by handicraft small and medium enterprise exporters in Ghana is constrained by a lack of funding, qualified staff support to develop and maintain e-commerce websites, and limited Internet service providers (Taylor & Owusu, 2012).

In developing countries, micro and small enterprises struggle to find educated, skilled entrepreneurs and labor. Such shortages have influenced micro and small enterprises to be less likely to engage in all types of innovation in 13 Caribbean countries (Khadan, 2018), to be in informal enterprises (Berniell, 2021), and not to be engaged and connected to global value chains (Hing et al., 2020). In the case of the Indonesian Institute of Sciences' "Technology for Regions Program" empowerment program in Indonesia, small and medium enterprises receiving the program in East Java had the highest success rate, while West Java had the highest percentage of failure (Maksum et al., 2020). This is due to differences in entrepreneurial skills and attitudes and the age of their businesses being less than 2 years old. The formal tertiary education completed by entrepreneurs has not contributed to the growth of micro and small enterprises because entrepreneurship education in tertiary institutions has not been effective as an entrepreneurship education program. This is also indicated by the cultural belief, especially among students in rural areas, that being a civil servant or company employee is a more stable and promising career than being an entrepreneur (Amalia & von Korflesch, 2021). However, to improve human resources and skills, training improves the performance of small and medium-sized enterprises in the UK (Idris et al., 2023).

Improving the performance of small and medium-sized enterprises requires partnerships with large employers (Ahman, 2017). The United Nations Industrial Development Organization (UNIDO) divides three partnership institutionalization categories: engagement with small and medium enterprises through the supply chain, engagement with small and medium enterprises for distribution, and general support to small and medium enterprises for strategic reasons. In today's globalized economy, there are many opportunities for large corporations and international companies to increase local sources of supply by engaging smaller local suppliers. Micro and small enterprises receive technological support to improve product quality and gain market certainty. A triple helix collaboration (government, university research institutes, private companies) developed local pyrethrum extracts through a public-private partnership (PPP) between SC Johnson and the Pyrethrum Board of Kenya (PBK), which is a cooperative organization for approximately 200,000 small-scale farms producing pyrethrum. Unilever Vietnam responded by offering financial support, equipment, training, and direct technology transfer with local business partners. Collaboration with local small and medium enterprises provides Unilever with additional cost-effective production capacity to produce, supply and distribute quality local raw materials. Vietnamese small and medium enterprises gain new technology transfer and production stability. A large company,

Bogasari Flour Mills, has distribution partnerships with 285 small noodle makers, an important part of the flour-based industry in Indonesia (Deloitte Touche Tohmatsu, 2004).

The partnership is an alternative way to implement programs provided by the government and organizations more cost-effectively. These costs are transaction costs classified as transactions among and within organizations, i.e. (a) supporting coordination between buyers and sellers, i.e., market transactions, and (b) supporting coordination within the firm. Williamson (1981) suggests that the selection of a transaction depends on several factors, namely the specificity of the asset, the interests of the parties to the transaction, and ambiguity and uncertainty. Jobin (2008) suggests evaluating partnerships using the transaction cost economics (TCE) approach. The main hypothesis of TCE is that partners choose a governance structure that minimizes transaction costs (TC) through contracts. If the governance structure of the partnership contract is misaligned or costly, it will reduce partnership performance. The issue of trust in terms of collaboration (through contracts) between the public and private sectors is important because it affects transaction costs and improves alliance performance in Turkey (Demirbag et al., 2010) and public-private partnership performance in Germany (Schomaker & Bauer, 2022).

The Creative Economy Agency also developed a triple helix model approach. The triple helix model is that institutionalizing knowledge transfer is a continuous, unfinished, and precarious process that requires "attention" from policymakers (Pinto, 2017). Innovation systems and collaborations (domestic, foreign, and global) are further enhancing knowledge, innovation, and technology in an integrated manner at various levels in South Korea and West Africa (Mêgnigbêto, 2015). Universities are key actors in the production of knowledge and technology. At the same time, public policy emphasizes knowledge transfer through a series of support mechanisms to foster innovation by establishing innovation intermediaries. Meanwhile, the triple helix model (government, university, business) used by Creative Economy Agency shows the development of entrepreneurial skills of creative industry businesses. However, some programs are unsustainable (Purbasari et al., 2020).

This study aims to observe the role of creative economy agencies and partnerships in empowering micro and small industries in Indonesia. How does a creative economy agency (indirectly) increase the performance and labor compensation of micro and small industries? Does the long-established partnership pattern still play an important role in empowering micro and small enterprises? These two research objectives contribute empirical evidence on the role of agencies in implementing the OECD conceptual framework in Indonesia. This OECD conceptual framework has been used for small and medium enterprise empowerment in OECD countries. The framework provides a wide selection of business environment indicators and patterns of relationships between the performance and business environment of small and medium-sized enterprises. It relies on empirical evidence, academic literature reviews, policy reports, and surveys of small and medium-sized enterprises (OECD, 2017). Therefore, this conceptual framework can assist policymakers in formulating micro and small enterprise institutional empowerment policies and programs appropriate to the Indonesian economy's structural conditions.

Methods

A linear panel data regression model is considered.

$$y_{it} = x_{it}\beta' + \alpha_i + \varepsilon_{it} \quad (1)$$

where y_{it}: dependent variable of i-th observation of the t-th time periods; x_{it} is independent variable at the i-th observation of the t-th time periods; $\beta' = (\beta_1, \beta_2, \dots, \beta_j)$: j-th regression parameters; and $\varepsilon_{it}s$ are independent and identically distributed (iid) error terms.
The transformed version of the random effects model is as follows,

$$y_{it} = x_{it}\beta' + v_{it} \quad (2)$$

where $v_{it} = \alpha_i + \varepsilon_{it}$ denotes a compound error term with $\sigma_v^2 = \sigma_\alpha^2 + \sigma_\varepsilon^2$ and $cov(v_{it}, v_{is}) = \sigma_\alpha^2$, for $t \neq s. \alpha_i s$ is assumed to be uncorrelated with ε_{it} and x_{it}.

It is known that the output and labor compensation of micro and small industries have outlier data caused by the differences in product values within or between different industries. For example, the value of handicraft products differs from that of fashion and culinary products. Handicraft products have different product values depending on the type of handicraft. This outlier data entails that the estimated residuals are not equal to zero.

Since the panel data in this study has outlier data, robust regression methods can be considered (Hamiye Beyaztas & Bandyopadhyay, 2020). A commonly used method is M-estimation robust regression, a generalization of maximum likelihood estimation (Yu & Yao, 2017). An unbiased and minimum variance estimator of β_j is obtained by minimizing the residual weighted function $\rho(v_{it})$:

$$min \sum_{i=1}^{n} \sum_{t=1}^{k} \rho(v_{it}) = min \sum_{i=1}^{n} \rho(y_{it} - \sum_{t=1}^{k} x_{it}\beta_j) \quad (3)$$

where the function ρ gives the contribution of each residual to the objective function. Suppose ψ is the derivative of ϱ, then $\psi = \rho'$.
To minimize, the first partial derivative of ρ with respect to the same β_j must be equal to zero.

$$\sum_{i=1}^{n} x_{it}\psi(y_{it} - \sum_{t=1}^{k} x_{it}\beta_j) = 0 \quad (4)$$

When the weight function is $w(v_{it}) = \frac{\psi(v_{it})}{v_{it}}$, and let $w(v_{it}) = w_{it}$. The estimation equation can be written as

$$\sum_{i=1}^{n} x_{it}w_{it}(y_{it} - \sum_{j=1}^{k} x_{ij}\beta_j) = 0 \quad (5)$$

In the matrix form, the equation becomes:

$$X^T W_j X b_j = X^T W_j Y \quad (6)$$

where W is $nk\ x\ nk$ diagonal matrix of weight, X is the independent variable matrix size $(n\ x\ k)$, b is the estimator of outlier value, and Y is a dependent matrix $(n\ x\ 1)$.
The robust regression estimator with M-estimator for b is:

$$b_{j+1} = \left(X^T W_j X\right)^{-1}\left(X^T W_j Y\right) \quad (7)$$

where $b = \left(\beta_0, \beta_1, \beta_2 \ldots, \beta_j\right)$, with j = number of variables, i = number of observations (in this context 23 micro and small business sectors, and t = number of time periods (for 10 years, 2010 - 2019).

Based on the OECD conceptual framework (OECD, 2017), the performance of micro and small enterprises is indicated by firm value-added and compensation per worker. Four aspects influence the performance of micro and small enterprises. The first aspect is that micro and small enterprise performance is influenced by their access to economic resources, which include capital, loans, skilled labor, and raw materials. The second factor is market access, where the difficulty in finding buyers and the market size determine the performance of micro and small enterprises. Whether the product is sold within the district, domestic market or foreign market largely depends on whether micro and small enterprise entrepreneurs sell through traders who may be special orders or sell to companies who may subcontract production or be part of a global value chain. The third aspect is the entrepreneur's ability, which is assumed to be determined by the formal higher education completed and the age of the entrepreneur. Indeed, young entrepreneurs are relatively more energetic and have higher levels of education than older generations. The fourth aspect is institutionalization. This institutionalization serves to smoothen transactions or lower transaction costs. In this study, there are two institutional factors observed, namely (1) institutional partnerships, where micro and small enterprises can collaborate to improve performance with large entrepreneurs that are mutually beneficial, and (2) creative economy institutions which are indirect policies, because the 6 creative economy subsectors are directly related to micro and small enterprises so that improving the performance of the 6 creative economy subsectors also has the potential to boost performance related to micro and small enterprises, especially culinary, fashion and crafts. Table 1 presents the variables used in this study.

This study utilizes secondary data from the 2010 - 2019 micro and small industry survey conducted by the Central Bureau of Statistics (CBS). The CBS defines small and medium enterprises based on the unit's number of workers. Micro-business units are businesses that employ 1-4 people, small business units that employ 5-19 people, medium business units 20-99 people, and large businesses above 100 people. Based on the 2015 Indonesian Standard Industrial Classification, there are 11 micro-small enterprise sectors related to 6 creative economy subsectors (Statistics Indonesia, 2016).

Table 1. Description of the Variables

Variables	Explanation
VAF_{MSE}	The added value of micro and small-scale manufacturing industry in a year (Billion Rupiahs)
$(COMP_{MSE}/Labor)$	The compensation per total employees of micro and small scale manufacturing industry in a year (Million Rupiahs). The total of employees is the sum of paid employees and unpaid employees.
$DIFF_{CAPITAL}$	The number of establishments in the micro and small-scale manufacturing industry having capital difficulties.
$DIFF_{LOAN}$	The number of establishments in the micro and small-scale manufacturing industry having bank loans difficulties
$DIFF_{SKILL}$	The number of establishments in the micro and small-scale manufacturing industry having difficulty recruiting skilled workers.
$DIFF_{RAW}$	The number of establishments in the micro and small-scale manufacturing industry having difficulty getting raw materials.
$DIFF_{MARKET}$	The number of establishments in the micro and small-scale manufacturing industry having difficulty in marketing products (looking for buyers)
$CONSU_{LOC}$	Number of establishments of micro and small scale manufacturing industry whose main consumers of products are local markets
$CONSU_{DOM}$	The number of establishments in the micro and small-scale manufacturing industry whose main consumers of products are domestic markets
$CONSU_{FOR}$	The number of establishments in the micro and small-scale manufacturing industry whose main consumers of products are foreign markets
$CONSU_{TRADER}$	The number of establishments in the micro and small-scale manufacturing industry whose main consumers of products are traders
CON_{FIRM}	The number of establishments in the micro and small-scale manufacturing industry whose main consumers of products are firms
EDU_{UNIV}	Entrepreneur receiving a university graduation
AGE_{25TO44}	Age of entrepreneur between 25 to 44 years
$PARTN$	The number of establishments in the micro and small-scale manufacturing industry having good cooperation in the supply chain, distribution, or general
D_{CEA}	The manufacturing sector has correlated creative industries after the 2015 year are 1, while others are zero

Results and Discussion

In the descriptive analysis, the condition of micro and small enterprises already shows an imbalance in compensation between non-labor and labor resources. The average value added generated by micro and small enterprises was IDR 8.403 billion during the 2010-2019 period with 23 business subsectors, while the average compensation per total worker (the sum of paid and unpaid workers) was IDR 10.01 million. Since micro and small enterprise entrepreneurs have to pay a high price for capital, loans, raw materials, and scarce technology investments, they minimize the payment of workers' wages.

In terms of access to resources, the biggest access difficulty for micro and small enterprises is loan difficulty (1.45 million micro and small enterprises), followed by capital difficulty (694 thousand) and raw material difficulty (384 thousand). Apart from capital and raw materials, human resources are also a major problem for micro and small enterprises. This problem is related to the relatively low compensation of workers, which makes micro and small businesses less attractive to

university graduates. The average number of university graduate entrepreneurs per subsector is 3,487 per industry subsector or 2.17% of micro and small entrepreneurs are university graduates.

Table 2. Descriptive Data of Micro and Small Enterprises in Indonesia 2010 – 2019

Description	Mean	Median	Min	Max	Std.Dev.	Sum
VAF_mse	8,403	2,183	16	82,558	14,051	1,932,709
COMP_mse	2,412	557	8	19,648	3,600	554,766
COMP_mse/Labor	10.01	8.23	0.08	55.47	8.28	2371.20
Entre_mse	160,777	32,254	108	1,741,779	305,834	36,978,611
Labor	398,369	86,021	669	3,938,839	708,224	91,624,869
Diff_Loan	57,159	8,602	-	1,450,680	152,742	13,146,641
Diff_Capital	40,298	7,625	1	694,282	79,770	9,268,472
Diff_Skill	7,036	1,097	-	90,295	13,805	1,540,881
Diff_Raw	29,297	5,214	-	384,250	65,161	6,738,367
Diff_Market	36,774	6,986	2	437,024	68,630	8,457,999
Consu_Loc	150,611	29,766	41	1,706,790	300,903	24,248,350
Consu_Dom	180,556	37,919	199	1,888,825	339,739	28,888,966
Consu_For	560	33	-	15,514	1,524	90,197
Consu_Firm	18,913	5,808	18	148,718	26,570	3,045,048
Consu_Trader	85,773	16,643	30	1,142,688	191,287	13,809,408
Edu_Univ	3,487	1,029	-	40,960	6,595	795,134
Age_25To44	68,977	18,072	44	703,054	121,046	15,864,755
Partn	20,186	4,825	-	238,797	35,868	4,642,721
D_CEA	0	-	-	1	0	44

Sources: Survey of micro and small enterprises by BPS, 2020.

Therefore, technological advancement and innovation cannot rely solely on micro and small entrepreneurs. A possible shortcut is for micro and small enterprises to adopt, adapt and improve the technology by partnering with large companies. In this context, partnerships and exports are still rare, with an average of 20,186 micro and small enterprises per subsector partnering (Table 2), and an average of 560 micro and small enterprises having customers abroad.

Tables 2 and 3 present The estimation results, using the robust regression method, of the effect of the business environment on micro and small enterprises' value-added performance and labor compensation. In Table 2, the selected independent variables can explain more than 57% of the change in micro and small enterprises' value-added performance. They can explain more than 58% of the change in labor value-added performance. In addition, reduced difficulties in accessing resources (capital, labor skills, raw materials) have increased the value-added generated by micro and small enterprises. Meanwhile, firms that have customers in both local and domestic markets are relatively higher in contributing to the increase in value-added of micro and small enterprises. This finding is in line with Burger et al. (2015), who stated that increasing production through investment in new technology requires capital, and Ogoi (2017), who explained that increased profitability and business growth require capital. Institutional partnerships contribute negatively to the value-added of micro and small enterprises, while indirect institutional policies (Creative Economy Agency) contribute positively. This finding may be due to the misaligned governance structure of partnership contracts in Indonesia, thus lowering partnership performance, as good collaboration (with contracts) between the public and private sectors will improve alliance performance (Demirbag et al., 2010), and public-private partnership performance (Schomaker & Bauer, 2022).

When comparing the results from Table 3 and Table 4, the value-added performance of micro and small enterprises is not in line with the compensation provided to workers. Increased difficulty in accessing resources (capital, skills, and raw materials) increases the value-added performance of micro and small enterprises and the compensation per employee of micro and small enterprises. Firms with primary customers in local and domestic markets and work with traders have relatively higher value-added contributions for micro and small enterprises and lower compensation per micro and small enterprise employee. Entrepreneurs' education level and institutional partnerships contribute positively to compensation per employee of micro and small enterprises, while indirect institutional policies (Creative Economy Agency) contribute to lower

worker compensation. These findings corroborate the results of Mertzanis and Said (2019), which prove that skilled labor and firm performance in developing countries are positively correlated because skilled labor remains strong in controlling various firm-specific characteristics. However, the workforce of micro and small enterprises in Indonesia is still filled with less skilled labor and also does not match the skills possessed (Allen, 2016).

Table 3. Estimation of Creative Economy Agency and Partnership on Value Added Performance of Micro and Small Enterprises

Method: Robust Least Squares					
Variable	Dependent Variable: LOG(VAF_MSE)				
	(1)	(2)	(3)	(4)	(5)
Constant	8.149***	8.078***	8.442 ***	8.437***	8.488 ***
	-0.160	-0.163	-0.153	-0.172	-0.215
DIFF_LOAN	-0.001	0.000	-0.001	-0.001	0.000
	0.000	0.000	-0.001	0.000	-0.001
DIFF_CAPITAL	-0.001 **	-0.001**	-0.002 ***	-0.002***	-0.003 ***
	0.000	0.000	-0.001	-0.001	-0.001
DIFF_SKILL	-0.001***	-0.001**	-0.001 **	-0.001***	-0.001 ***
	0.000	0.000	0.000	0.000	-0.001
DIFF_RAW	-0.003***	-0.002***	-0.003 ***	-0.001***	-0.002 ***
	-0.001	-0.001	-0.001	0.000	-0.001
DIFF_MARKET	0.000	0.000	0.001	0.000	-0.001
	-0.001	-0.001	-0.001	-0.001	-0.001
CONSU_LOC	0.005***				
	0.000				
CONSU_DOM		0.004***			
		0.000			
CONSU_FOR			0.0005 *		
			-0.0003		
CONSU_FIRM				-0.001***	
				0.000	
CONSU_TRADER					0.002 ***
					-0.001
EDU_UNIV	-0.001**	-0.001**	-0.001 ***	-0.001**	-0.001 *
	0.000	0.000	0.000	0.000	-0.001
AGE_25TO44	-0.001	-0.001**	0.007 ***	0.007***	0.002 **
	-0.001	-0.001	-0.001	-0.001	-0.001
PARTN	-0.001 **	-0.001**	-0.001 *	-0.001	-0.002 ***
	0.000	0.000	-0.001	0.000	-0.001
D_CEA	0.519**	0.459**	0.439 **	0.485**	0.949 ***
	-0.209	-0.211	-0.181	-0.224	-0.285
Rw-squared	0.740	0.763	0.803	0.723	0.568
N	142	141	101	141	139

Source: processed data.
Note: Standard errors in parentheses; *** = significant at 1%; ** = significant at 5%; * = significant at 10%

Access to Finance and Resources

In access to resources, the reduction in capital, skill, and raw material difficulties increases the micro and small enterprises added value. In micro and small enterprises whose main consumers are local (Model 1), domestic (Model 2), and export (Model 3) markets, raw material difficulties are more dominant than in micro and small enterprises, whose main consumers are companies (Model 4) traders (Model 5). Every 1 unit reduction in raw material difficulty will increase 0.25% - 0.26% of micro and small enterprise added value (Models 1 and 2), while models 3 and 4 show a 1% reduction in raw material difficulty will increase micro and small enterprise added value by 0.14% - 0.19%. Meanwhile, difficulties in obtaining skilled labor are more experienced by micro and small enterprises whose main customers are firms (Model 4) and traders (Model 5), and capital difficulties

are more experienced by micro and small enterprises oriented towards foreign markets and traders. This finding explains that micro and small enterprises oriented towards local, domestic, and export markets require a reduction in raw material supply difficulties.

In contrast, micro and small enterprises oriented towards traders and firms require a reduction in difficulties in obtaining skilled labor. This finding supports that reducing difficulties in accessing economic resources will increase production (Burger et al., 2015), improve business profitability and growth (Ogoi, 2017), and increase export capacity (McLean & Charles, 2020). Therefore, policymakers need to immediately formulate tailor-made loans for micro and small enterprises as suggested by the International Labour Organization (ILO, 2019) and follow the example of alternative financing in the OECD (Cusmano & Koreen, 2015). Improving the skills of workers can be done through institutionalizing partnerships. Parent companies transfer technology to partner micro and small enterprises (International Finance Corporation, 2018).

Table 4. Estimation of Creative Economy Agency and Partnership on Compensation per Employee of Micro and Small Enterprises

Method: Robust Least Squares					
Variable	Dependent Variable: LOG(COMP_MSE/LABOR)				
	(6)	(7)	(8)	(9)	(10)
Constant	-1.828 ***	-1.670 ***	-3.476 ***	-3.977 ***	-2.933 ***
	-0.385	-0.387	-0.443	-0.329	-0.453
DIFF_LOAN	0.001	0.001	-0.004 **	0.002 ***	0.000
	-0.001	-0.001	-0.002	-0.001	-0.001
DIFF_CAPITAL	0.002 **	0.002 **	0.008 ***	0.002	0.005 ***
	-0.001	-0.001	-0.002	-0.001	-0.001
DIFF_SKILL	0.003 ***	0.003 ***	0.003 ***	0.005 ***	0.004 ***
	-0.001	-0.001	-0.001	-0.001	-0.001
DIFF_RAW	0.004 ***	0.004 ***	0.011 ***	0.002 **	0.003 **
	-0.001	-0.001	-0.002	-0.001	-0.001
DIFF_MARKET	0.001	0.001	-0.009 ***	0.002 *	0.003 *
	-0.001	-0.001	-0.003	-0.001	-0.002
CONSU_LOC	-0.008 ***				
	-0.001				
CONSU_DOM		-0.008 ***			
		-0.001			
CONSU_FOR			-0.001		
			-0.001		
CONSU_FIRM				0.004 ***	
				-0.001	
CONSU_TRADER					-0.003 **
					-0.001
EDU_UNIV	0.003 ***	0.003 ***	0.005 ***	0.004 ***	0.003 ***
	-0.001	-0.001	-0.001	-0.001	-0.001
AGE_25TO44	0.000	0.001	-0.008 ***	-0.009 ***	-0.003
	-0.002	-0.001	-0.002	-0.001	-0.002
PARTN	0.003 **	0.003 **	0.008 ***	0.002 *	0.004 ***
	-0.001	-0.001	-0.002	-0.001	-0.001
D_CEA	-1.219 **	-1.125 **	-1.032 **	-0.200	-1.687 ***
	-0.504	-0.501	-0.525	-0.429	-0.600
Rw-squared	0.697	0.711	0.773	0.830	0.585
N	142	141	101	141	139

Source: processed data.

Note: Standard errors in parentheses; *** = significant at 1%; ** = significant at 5%; * = significant at 10%

Meanwhile, for compensation per worker (Table 4), for micro and small enterprises with customers in local, domestic, and foreign markets, an increase in the level of raw material difficulty will increase the compensation per worker of micro and small enterprises. Each 1-unit increase in the level of raw material difficulty will increase workers' compensation by 0.38% (Model 6), 0.36%

(Model 7), and 1.07% (model 8). This means that the scarcity of raw materials leads to an increase in workers' welfare. Workers must work extra carefully and be more productive using scarce raw materials. Raw material scarcity is relatively not experienced by micro and small enterprises that are oriented towards the market of partner companies and traders. Drábek et al. (2017) showed that micro and small enterprise partnerships in Italy increased innovation. These partnerships will be able to provide experience and technology to save raw materials. Hing et al. (2020) proved that micro and small enterprises in Indonesia increased exports through participation in GVCs.

For micro and small enterprises with market orientation to firms (model 9) and traders (model 10), the role of worker skills is dominant. For every 1-unit increase in the difficulty of finding skilled workers, micro and small enterprises will increase compensation by 0.51% (Model 9) and 0.40% (Model 10). When employers want to find workers with the required skills, they must be willing to offer higher wages to attract workers with those skills (Krugman, 2014). In other words, Krugman says that the skills gap is more due to inadequate wages for those skills. Workers will improve their skills based on the incentives they receive. However, in Indonesia, ADB research says that unqualified workers will still fill many positions, as the continuing skills shortage is compounded by most workers employed on short-term contracts (Allen, 2016). This discourages skills investment and reinforces segmentation in the labor market. Improving the quality of education and human capital is an urgent task as micro and small enterprises still experience difficulties accessing skilled labor resources. In the current context, according to Allen (2016), Indonesia's labor force is still filled with less qualified workers, and increased incentives (income) are not matched by increased productivity, reducing global competitiveness.

Market Access and Market Orientation

In market access, the market difficulty factor does not affect the value added of micro and small enterprises (Table 3), but decreased foreign market barriers can increase workers' compensation (Table 4). Every one-unit reduction in foreign market opening barriers will increase by 0.88% of workers' compensation. This condition is explainable using the assumption that market development might arise from technological improvement. Other countries have experienced this assumption, such as the development of communication technology that allows remote communities in Peru to gain access to banking; solar technology that opens up new businesses in remote communities in Tanzania; and agricultural technology that increases agribusiness opportunities for smallholder farmers in India (International Finance Corporation, 2018). Therefore, micro and small enterprise products successfully exported are technological. However, due to the limited number of actors or types of products exported, the added value of these exports is not large enough to increase the added value of micro and small enterprises as a whole.

As for market orientation, improving the value-added performance of micro and small enterprises is more effective in markets where the main consumers are local markets (district level) and domestic markets (Table 2). Each additional 1 unit of consumers will increase 0.48% (Model 1) and 0.44% (Model 2) of the value-added output of micro and small enterprises. Whereas in Table 4, the increase in workers' compensation caused by adding consumers occurs only in micro and small enterprises that cooperate with companies.

Entrepreneurship and Human Capital

The consequences of low-quality human capital reduce innovation (Khadan, 2018) and reduce participation in GVCs (Hing et al., 2020). Human capital in micro and small enterprises is still a major constraint as indicated by every 1-unit increase in micro and small enterprise entrepreneurs who graduated from college decreases 0.07% of the value added of micro and small enterprises that have local (Model 1) and domestic (Model 2) main consumers. Similarly, micro and small enterprises with foreign markets (Model 3), companies (Model 4), and traders (Model 5) also face the same problem, where the number of university graduates working in micro and small enterprises decreases the value added of micro and small enterprises. Compared to the regression results in Table 3, the number of college graduates who graduated by micro and small business entrepreneurs increases workers' compensation, especially micro and small businesses oriented

toward foreign markets. This is in line with Amalia and von Korflesch's (2021) research that formal higher education for entrepreneurs has not been effective in producing active entrepreneurs, and also Allen (2016) says that an underqualified workforce still fills many positions.

Young entrepreneurs (aged 25 to 44), the policy target of the Creative Economy Agency, show positive contributions. The increase in the number of young entrepreneurs has increased the added value of micro and small enterprises that have overseas customers (model 3), corporate customers (model 4), and merchant customers (Model 5). However, these young entrepreneurs have not contributed to the increase in workers' compensation, especially for micro and small enterprises with foreign market orientation and partnership orientation (Model 9).

Partnership and Institutional Policy

The institutional partnership is still a weak point for micro and small enterprises in improving value-added performance. Every 1 unit increase in partnership participation decreases 0.10% of value-added generated. Therefore, an evaluation of the cooperation contract needs to be carried out to make it fairer and more profitable for both parties. In contract theory, in principle, contracts are in a state of contact imperfection. The argument is that when a contract is made by prioritizing personal or group interests, the contract benefits one party. Such cooperation does not last long. In the contract theory literature, there are two actors, where the first actor (principal) is a micro and small enterprise entrepreneur, and the second actor (agent) is a large company.

The first actor makes investment cooperation, and the second actor fulfills the promise and executes the contract, then both actors will get 0.5 each. The second actor offers investment to the first actor worth 1, promising that the first actor will receive a net of 0.5. Then the first actor's choice is investment cooperation gets 0.5, while non-investment cooperation gets 0, so the first actor's decision is investment cooperation. When the law holds the second actor accountable for damages in the event of a breach of promise, the second actor will face the choice of fulfilling the promise by getting 0.5 and breaking the promise by getting -0.5. In the breach of the promise of the second actor, the second actor must pay compensation to the first actor of 1.5, which consists of 1 as a return on the first actor's investment cooperation, and pay compensation for the promise of profit of 0.5. Then the second actor gets -0.5 (from -1.5 - 1) when breaking and gets 0.5 when fulfilling the contract. The second actor would decide to fulfill the contract. Since the investment cooperation gives both actors 0.5 profit each, the contract is long-term. Furthermore, Schomaker and Bauer (2022) argue that partnerships work well when they are mutually trusting and beneficial to both parties and concur with the opinions of the Asian Development Bank (2019), Hidayat et al. (2018), and Urata and Baek (2021) that partnerships in GVC participation can improve productivity and competitiveness and Ahman (2017) also says that improving small and medium enterprise performance requires partnerships with large entrepreneurs. However, in this context, Indonesia needs to work hard to enforce business collaboration contracts as Doing Business (World Bank) reports that the assessment of enforcing contracts ranked 134th in 2020.

However, in terms of compensation per worker (Table 3), the partnership has shown a positive contribution. That is, increased partnerships have increased workers' performance rewards. The International Labor Organization (ILO) and the German Agency for International Cooperation (GIZ) issued a key finding that small is beautiful as micro and small enterprises create most of the employment in developing countries (Deijl, .de Kok, & Veldhuis-Van Essen, 2013). Every 1 unit increase in partnerships will lead to a 0.20 - 0.83% increase in labor performance rewards. Sustainable human resource management involves partnerships and external relationships in learning and development.

The Creative Economy Agency's policy has indirectly increased the overall value-added of micro and small enterprises. Cumulatively, every 1-unit increase in the role of the Creative Economy Agency indirectly increases 51.9% of the added value of micro and small enterprises whose main consumers are consumers within one district; increases 45.9% of the added value of micro and small enterprises whose main consumers are domestic consumers; and increases 44.0% of the added value of micro and small enterprises whose main consumers are foreign markets.

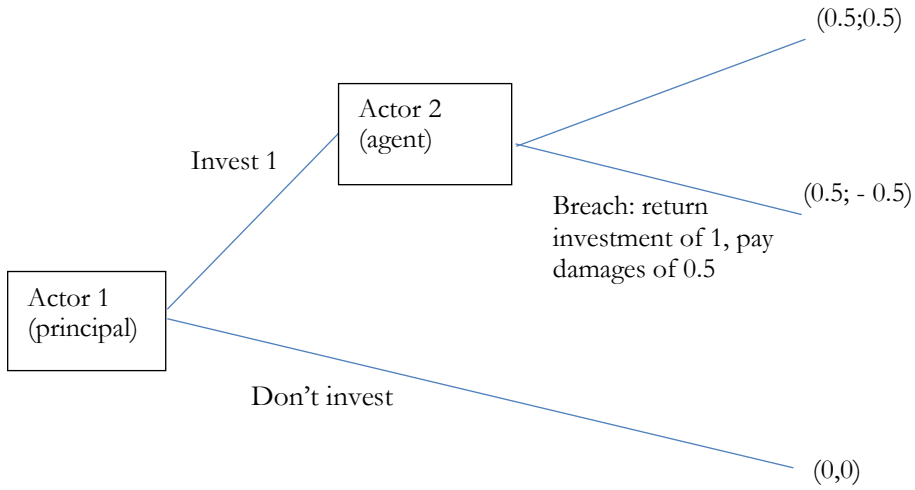

Figure 1. Agency Game with Contracts

The indirect policy of the Creative Economy Agency has increased 48.5% of the added value of micro and small enterprises whose main consumers are partnerships with companies and increased 95.0% of the added value of micro and small enterprises whose main consumers are traders (resellers). However, the Creative Economy Agency's policy still indirectly contributes to the increase in added value and has not increased the number of micro and small business actors (Dewanta & Sidiq, 2021). This condition is in line with Amalia and von Korflesch (2021) research which states that formal higher education has not been able to form active entrepreneurs. Similarly, this study found that indirect policies from Creative Economy Agency institutions have contributed greatly to increasing added value, although they have not played a role in labor compensation, especially micro and small enterprises whose main consumers are in district, domestic, and foreign markets. Based on the OECD report, Indonesia has many programs for small and medium-sized enterprises and entrepreneurs, but most are targeted at entrepreneurs, and only some address productivity growth in small and medium-sized enterprises (OECD, 2018). This is in line with this study that the compensation per employee of micro and small enterprises decreased against the indirect policies of the Creative Economy Agency.

Conclusion

Micro and small enterprises empowerment policies are complex because they result in contradictory performance between increasing the added value of micro and small enterprises, which is a proxy for firm performance, and worker compensation as a measure of reward for worker performance. Reducing resource access barriers, market orientation, and Creative Economy Agency policies indirectly improve the micro and small enterprise performance but decrease worker performance. Meanwhile, the education level of entrepreneurs and partnerships improves worker performance but reduces firm performance.

The Creative Economy Agency policy has indirectly improved the value-added performance of micro and small enterprises but not workers' compensation. This is also evidenced by statistical data showing an increase in value-added GDP contribution with the Creative Economy Agency, but the data cannot explain the recipients of value-added GDP. This finding may help explain that the increase in value-added GDP is enjoyed more by business owners than workers.

Partnerships, which are a proxy for technology adoption, are shown to provide greater compensation to workers. This is because partnerships provide more value to workers than business owners, which are opportunities for micro and small enterprises to upgrade their technology. Therefore, productivity enhancement programs - such as those aimed at improving labor and managerial skills and strengthening innovation in small and medium enterprises - need to be expanded if Indonesia wants to improve the labor productivity performance and competitiveness of small and medium enterprises.

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What drives the unemployment rate in Maldives? An Autoregressive Distributed Lag (ARDL) approach

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Abstract

Purpose – This paper examines factors that determine the unemployment rate in the Maldives.

Methods – This paper uses an Autoregressive Distributed Lag (ARDL) model in capturing long and short-run associations among the chosen variables. It uses some macroeconomic variables, namely unemployment rate, population, economic growth, foreign direct investment, external debts, inflation rate, and expatriate workers.

Findings – The empirical results suggest that except for expatriate workers, all the variables are significant determinants of unemployment rate in the long run. The study found that economic growth and inflation would negatively and significantly contribute to unemployment rate when they are combined. This explains the unemployment nexus which follows the Phillips curve and Okun's law relationship provides the presence of both these hypotheses in the Maldives in the short-run and long-run. In addition, an increase in population and external debts worsens the unemployment situation in the Maldives. Although expatriate workers are not significant in the long run, the results reveal that they have a significant positive effect on unemployment in the short run.

Implications – This result implies that the Maldivian government should encourage locals in the country to participate in the labor force and limit the participation of expatriate workers in an industry that has a shortage of skilled expertise.

Originality – This study expands our understanding of key determinants of the unemployment rate in Maldives. To the best of the authors' knowledge, this research is among the pioneer empirical study to assess the issue.

Keywords – Unemployment, long and short run, labor force, skilled workers

Introduction

For several decades, unemployment has been one of the most prominent issues faced by economies around the world (Alamro & Al-Dala'ien, 2016). The increase in the rate of unemployment can be translated as the underutilization of a nation's human capital and a waste of its indispensable resources. Unemployment is a negative global phenomenon that adversely affects economic growth and social structure. Several factors can be attributed to the incidence of unemployment. According to Gur (2015), the main factors that affect the rise in unemployment in BRIC (Brazil, Russia, India, and China) are inflation, population growth, total investment, trade volume, and

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GDP. Al-Habees and Rumman (2012) highlighted the role of economic growth as the main factor that causes fluctuation in the unemployment rate in some Arab countries.

According to the United Nations Development Program report (2014), the main reason for the increase in the unemployment rate in the Maldives is the largely increasing number of school leavers and college graduates in the population. The high unemployment rate has remained a severe social stigma and a challenge to resolve for policymakers in the Maldives (ILO, 2006). Besides, the current government promised to create 94,000 jobs in their five-year terms during the presidential debate held by Television Maldives in collaboration with Maldives National University (MNU) on 2nd but this was not realized September 2013 (Moosa, 2008). Although government officials claimed that in 2015, they have created 70,000 jobs both the private and public sectors, there is no enough evidence to support the claim (Fathih, 2015). In fact, according to the official figure in the past few years, civil services jobs remained within the range of 24,000 and only 676 civil services jobs were created between 2013 and 2014 (National Bureau of Statistics, 2015). Despite all these efforts, unemployment continues to increase and has become a growing concern amongst policy makers and politicians.

There have been several existing studies conducted in understanding the factors that determine the unemployment rate in both developed countries (Bassanini & Duval, 2006). However, studies particularly, focusing on developing countries are limited, especially in the case of the Maldives where an empirical study is yet to be conducted in understanding unemployment determinants. The Maldives must address the problem of unemployment by employing various necessary measures and agendas through a joint effort with regional development banks, international financial institutions, and other non-governmental organizations. Yet, the efforts made by the government in resolving this issue have resulted in unsatisfactory outcomes. Hence, the problem of unemployment remains a social stigma and major challenge for the nation, especially for youths.

There are several studies conducted to examine the determinants of unemployment in various countries. Some studies focused on investigating the factors that influence unemployment from a macroeconomic point of view while others were dedicated to examining the determinants of unemployment for both developed and developing nations. Tercek (2014) found that public expenditure for social welfare has an impact on unemployment, and trade-off in unemployment is true for both European and USA regions in the short-run and long run. Bassanini and Duval (2006) revealed that different policy and institutional changes accounted for 66 percent of the fluctuation in non-cyclical unemployment. Ünal (2015) finds that fluctuation in fiscal policy such as tax, government spending on the labor market, and social security tax affects GDP, consumption, and unemployment rate in the Netherlands during the study period. The same view was shared by Franks (1996). Neumark and Wascher (2004) indicated that minimum wage negatively impacted the rate of employment for teenagers and youth in these countries. Quintini and Manfredi (2009) find that one factor that contributes to youth unemployment is the skills mismatch that arises from a lack of quality education. Zyra (2013) found that higher education contributes to reducing the unemployment rate. Ryan (2001) states that the school-to-work transition process is important and varies across different countries over time. Caroleo and Pastore (2007) added that youth who have less education and skills are more vulnerable to prolonged unemployment and are more prone to unsteady and inferior jobs compared to youths with higher education. Mauro and Carmeci (2003) mentioned that youths with higher educational qualifications should also need to acquire firm-specific skills and knowledge at their schools to become successful and productive employees.

The determinants of unemployment in developing countries were studied by several studies over the years. Subramaniam and Baharumshah (2011) showed that job vacancy rate, economic growth rate, government spending, and inflation are the main factors that determined the unemployment rate in the Philippines. Chowdhury and Mavrotas (2006) reveals that inflation, exchange rate, GDP growth rate, and unemployment are significant determinants of unemployment in Bangladesh. Arslan and Zaman (2014) investigated the determinant factors of unemployment in Pakistan using annual data from 1999 to 2010. The issue of unemployment in the Maldives is primarily caused by an increase in the working age population (between 15 and 64)

due to the high mortality rate, which has become a major hindrance to building necessary human resources in the country (World Bank, 2011).

The purpose of this study is to examine the factors that determine the unemployment rate in the Maldives. Unlike other countries, there are a few studies conducted on understanding the unemployment rate in the Maldives, but most of them focus on the theoretical ground such as (Salih, 2013). A lack of study in understanding the problem and magnitude of unemployment necessitates the need to produce an empirical study that would inform the public, government, and other relevant parties of the seriousness as well as the importance of addressing this issue.

Methods

The study used some macroeconomic variables sourced from the following organization IMF, United Nations Population Unit, and International Labor Organization (ILO) to examine the determinants of unemployment in the Maldivian economy. The time range of data is from 1991 to 2019. The specific variables used for the study are shown in Table 1.

Table 1. Data and Variables

Data and Variables	Proxy	Measurement	Period
Unemployment (lnUN)	Unemployment	Number of people	1991-2019
Working-age Population (lnPOP)	Population	Units	1991-2019
Gross Domestic Product (lnGDP)	Economic growth	USD (million)	1991-2019
Net inflow of investment (lnFDI)	Foreign direct investment	USD (million)	1991-2019
Total amount of debts (lnED)	External debts	USD (million)	1991-2019
Consumer Price Index (lnINF)	Inflation	(annual percentage)	1991-2019
Inflow of migrant employed (lnEXW)	Expatriates workers	Units	1991-2019

Notes: (1) The data are from World Development Indicator, World Bank, except the Consumer Price Index (from International Monetary Fund), and Inflow of migrant employed (from International Labor Mictration)

For the purpose of exploring the properties of stationary in the data, the study used the Augmented Dickey-Fuller (ADF) as established by Dickey and Fuller (1979), and Phillips-Perrons procedures by Phillips and Perron (1988). Engle and Granger (1987) preferred the ADF test as the best procedure to examine the existence of unit roots in the variables owing to the stability of the test's critical values despite the strength of its over and above various sampling experiments. According to Davidson and MacKinnon (2004), the augmented Dicky-Fuller test has an advantage over the Phillips-Perron test procedure as it performs better with finite samples. We provide both analyses. The assumption of a unit root for ADF assumed that the null hypothesis of variable Y is non-stationary while the alternative hypothesis shows that variable Y is stationary. However, the main concern is the most suitable estimation procedure for the ADF test. The following is the equation or model that involves intercept and trend.

$$\Delta Y_t = \alpha + \theta t + \lambda Y_{t-1} + \sum_{i=1}^{k} \phi i \, \Delta Y_{t-i} + \mu_t \quad (1)$$

Y_t could be any variables chosen for the study: it could be Unemployment (InUN), Gross Domestic Product (InGDP), Inflation (InINF) and Foreign Direct Investment (InFDI). The lag number k is set by applying the Akaike Information Criterion (AIC), as suggested by Engle and Granger (1987), or Schwartz Criterion (SBC) to remove any form of serial correlation that may exist in the residuals and, at the same time, to make the error term white noise. Likewise, the μ_t is the error term with white noise which is presumed to be independently and identically distributed with zero mean. The t =1 and N refer to the trend variable.

The model used in this study was based on the co-integrating mechanism of bounds testing approach with the framework of the ARDL model proposed by Pesaran et al. (2001) to examine the determinants of unemployment in the Maldives for both the short-run and long-run. The Wald-F statistic is a unique mechanism of ARDL statistical procedure that estimates the generalized

Dicky-Fuller regression in order to examine the significance of variables under the conditional and unrestricted equilibrium correction model (ECM) which tests the presence of long-run relationship provided that upper and lower bound decision as proposed by the Pesaran et al. (2001) The ARDL procedure was chosen for this study over the other techniques and procedures such as the residual-based test for Error Correction methods developed by Engle and Granger (1987) and the Johansen maximum likelihood approach proposed by Johansen and Juselius (1990) because it has many advantages over these conventional approaches. In this regard, according to Duasa (2007), the ARDL approach allows an estimation of the co-integration relationship using the OLS technique when the lag order of ARDL is identified. The ARDL approach is much more adjustable as it does not require any unit root pre-testing for variables and is appropriate irrespective of the order of integration such as I (0) or I (1) or both at the same time (Budha, 2013). However, Narayan (2017) suggested that the technique may not produce a robust result and may even collapse if the variables happen to integrate at I(2).

The bound testing procedure under the ARDL framework involves two steps to estimate the existence of cointegration. Initially, the F-statistic was employed to test the existence of long-run cointegration amongst the selected variables for this study. The null hypothesis of no cointegration is rejected depending on the two sets of critical values as suggested by Pesaran et al. (2001) namely the upper bound I(1) and the lower bound I(0). Hence, the cointegration using the dynamics of ARDL and lower bound testing approach for both long-run and short-run were estimated following the unrestricted error correction model (UECM) as follows:

$$U\Delta LUN_t = \alpha_0 + \alpha_Z Q + \sum_{i=1}^{0} \beta_i \Delta LUN_{t-i} + \sum_{i=0}^{p} \theta_i \, \Delta LPOP_{t-i} + \sum_{i=0}^{q} \pi_i LGDP_{t-i} + \sum_{i=0}^{r} \gamma_i \Delta LFDI_{t-i} + \sum_{i=0}^{s} \partial_i \Delta LED_{t-i} + \sum_{i=0}^{m} \varphi_i \Delta LINF \sum_{i=0}^{n} \rho_i \Delta LEXW_{t-i} + \delta_1 LUN_{t-1} + \delta_2 LPOP_{t-1} + \delta_3 LGDP_{t-1} + \delta_4 LFDI_{t-1} + \delta_5 LED_{t-1} + \delta_6 LINF_{t-1} + \delta_7 LEXW_{t-1} + \mu_t \quad (2)$$

The first difference operator is denoted as Δ in the equation (2) and the maximum order of lag is given as (o, p, q, r, s, m and n) for the ARDL procedure, which is decided based on the Schwarz Bayesian criterion (SBC). According to Pesaran et al. (2001), the ARDL is more appropriate to use a maximum of two lag length if the selected criteria is Schwarz Bayesian. The short-run dynamic parameters are $\beta, \theta, \partial, \pi, \delta, \gamma, \varphi$ and ρ while all the δ's capture the long-run relationship between the variables. The F- statistics is used for joint significance of the coefficient for the lagged variables to determine the existence of long-run cointegration. The null and alternative hypothesis of no cointegration was set as follows (Shahbaz, 2009):

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_6 = 0 \quad (3)$$

Test against the alternative hypothesis of cointegration exist i.e.
H_0: At least one of the δ is not equal to zero

The existence of long-run cointegration between the variables was examined through comparison of Wald F-statistic and two critical values, namely the upper and lower bound. The first set of critical values is lower bound (LCB) and deduces the variables that consist in the ARDL are integrated at order I(0). The second set of critical values are upper bound (UCB) which considers the variables in the model as integrated at I(1). The rejection of null hypothesis for no cointegration is established for the existence of long-run cointegration between the variables if the F-statistic surpasses the set upper bound limits irrespective of the order of cointrgration. On the other hand, if the F-statistics happen to fall behind the set lower bound, the null hypothesis cannot be rejected for no cointegration and must accept that there is no existence of long-run relationship amongst the variables. If the F-statistics fall between the upper and lower bounds the relationship is inconclusive and the order of integration must be calculated to move forward with the estimation.

According to the Duasa (2007) and Budha (2013) once the presence of cointegration is established amongst the variables, the next step is to find the optimum number of lags in the model through either Akaike information criterion (AIC) or Schwartz-Bayesian criteria (SBC) prior to the estimation of the model using Ordinary Least Squares (OLS). Pesaran et al. (2001) suggested that the model with an annual data maximum of two lag is more appropriate to use if the selected

criteria are Schwarz Bayesian. On the other hand, Saboori and Soleymani (2011) claimed that the AIC selects the maximum lag length for the model while SBC selects the minimum possible lag length. Therefore for this study, Schwarz Bayesian was selected instead of the Akaike information criterion.

Following the bound testing approach, the second step of the ARDL is to identify the short-run dynamics or cointrgration by employing the error correction model (ECM) initially applied by Sargan (1974). The lagged error correction term (ECT) is included and the ARDL framework for the short-run dynamic was constructed by deriving the error correction model (ECM) expressed as follows:

$$\Delta UN_t = \alpha_0 + \sum_{j=1}^{o} \lambda_{1i} \Delta UN_{t-j} + \sum_{j=0}^{p} \lambda_{2i} \Delta POP_{t-j} + \sum_{j=0}^{q} \lambda_{3i} \Delta GDP_{t-j} + \sum_{j=0}^{r} \lambda_{4i} \Delta FDI_{t-j} + \sum_{j=0}^{s} \lambda_{5i} \Delta ED_{t-j} + \sum_{j=0}^{r} \lambda_{6i} \Delta INF_{t-j} + \sum_{j=0}^{s} \lambda_{7i} \Delta EXW_{t-j} + \eta_1 ECT_{t-1} + \vartheta_t \quad (4)$$

The term ECT_{t-1} in the equation (4) indicates the lagged error correction term and is the residual that is attained through the cointegrating equation while η_1 is the speed of adjustment parameter. ϑ_t is the error term in the model which is identically independently and normally distributed. The coefficient of lagged error correction indicates the speed of adjustment in the cointegration equation from the short run towards its long run. It also explains how the percentage of change in the dependent variable converges back to the long-run equilibrium provided that the percentage changes in the explanatory variables in the ARDL model. Hence, the coefficient of error correction ECT_{t-1} is anticipated to be statistically significant with a negative sign.

Results and Discussions

The unit root test was conducted by adopting the Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) tests. The analysis of ADF and PP tests from Table 2 depicts that all variables, except for LNGDP, are stationary at the first difference. This implies that LNGDP is in order of integration zero (0) while other variables are in order of integration one (1). Based on the result, since none of the variables of this study is in order of integration (2), therefore ARDL model is appropriate for this research.

Table 2. Unit Root Analysis

Variables	ADF Test statistic		Phillips-Perron tests statistic		Order of integration
	Level	First Difference	Level	First Difference	
LNUN	-1.267	-4.120***	-1.295	-4.120***	1
LNED	-1.199	-5.914***	-1.170	-5.925***	1
LNEXW	-1.917	-5.414***	-1.975	-5.481***	1
LNFDI	-0.437	-4.357***	-0.340	-4.379***	1
LNGDP	-2.737**	-4.905***	-5.533**	-4.905***	0
LNINF	-1.242	-3.350***	-1.179	-3.350***	1
LNPOP	-0.764	-4.226***	-0.977	-4.543***	1

Note: ***, **, * denote rejection of the null hypothesis and variables significant at 1%, 5%.

Based on the ARDL model, the foremost phase is to investigate the presence of a long run relationship between the variables for this study. Narayan's (2017) method was used at a default maximum lag of two (2) and count on Schwarz-Bayesian Criteria to pick the optimal lag selection for the ARDL model, given its explanatory power and superiority. In addition, Pesaran et al. (2001) method of calculating the Wald F-statistic was adopted and matched with the upper and lower bound critical value.

The estimated F-statistics is 13.37161, which is significant at a 1 percent level and greater than the upper bound critical value of 3.99. Therefore, the null hypothesis of no long-run relationship was failed to be accepted, and can be concluded that there is a long-run relationship

between the variable of the study. The Autoregressive Distributive Lag (ARDL) model was computed and the findings of the estimated F-statistics with LNUN as an endogenous variable and composed with the upper and lower bound are reported in Table 3.

Table 3. Bound Testing for Long-run Relationship

	Critical Values (Restricted intercept, no Trend)		
Calculated F-statistic	LCB	UCB	Sig.
F_C (LNUN, LNED, LNEXW, LNFDI, LNGDP,	2.88	**3.99**	**1%**
LNINF, LNPOP)	2.55	3.61	2.5%
13.37161	2.27	3.28	5%
	1.99	2.94	10%

Note: This table shows the results for the bound testing in capturing long-run relationships. The annual time frame date used is from 1991 to 2019. The maximum las were based on Schwarz-Bayesian Criteria

The confirmation of the long-run cointegration amongst the variables was reported in Table 3. The next step was to estimate the long-run model by normalizing the unemployment rate, which is illustrated in Table 4. The long-run analysis shows inflation, economic growth, as well as foreign direct investment, have a negative relationship with the unemployment rate, while population and expatriate workers have a positive relationship with the unemployment level. The coefficients of LINF and LGDP are negative and statistically significant at a one-percent level. Thus, using the ARDL framework, the test for the existence of the Phillips curve shows the trade-off between inflation and unemployment, and Okun's law hypothesis explains the relationship between unemployment and economic growth in the Maldives. From this conclusion, we can reject the hypothesis of Friedman (1968) and confirm the presence of Phillips curve effects on Maldives' economy in the long run. This conclusion agrees with the study by Sarwar, et al. (2020) who provided evidence of both the Phillips curve and Okun's law hypothesis.

Furthermore, the result also shows that when the inflation rate increases by one percent, unemployment reduces by 55 percent. This finding is in line with Cheema (2014) who found a strong negative relationship between inflation and unemployment in Pakistan between 1975 -2009. This also shows that when the inflation rate is higher in the Maldives, the unemployment rate decreases as business cycles expand more job opportunities due to the excess demand of labor compared to labor supply. At the same time, the wage rate is adjusted according to the labor market demand, resulting in more employment.

Similarly, the significant and negative sign of the coefficient of economic growth shows that more investment into the economy would negatively correlate with the unemployment rate in the long run, meaning that a one-percent increase in GDP or economic growth would reduce the unemployment rate to 33 percent. The findings are consistent with Noor, et al. (2007) who found the validity of Okun's law. This implies that economic growth enables an increase in the productivity of a country by reducing unemployment to relatively lower levels in the long run. Also, the ARDL long-run result shows that the relationship between economic growth and unemployment exhibits a trade-off between both variables and this ratifies the existence of Okun's law in the Maldives.

Although there is no current empirical study on the Maldives, the results of this study support the theoretical assumption made by Ghosh (1998) and some of the empirical assumptions made by Salih (2013), as they studied the determinants of intention to work in Maldivian resorts in 2012. The findings of this study also revealed that external debts are significant and have a positive long-run relationship with the unemployment rate. This implies that a one-percent increase in external debts will lead to a 1.82 percent increase in the unemployment rate. The findings of this study are validated by Sarwar et al. (2020) who found a positive but insignificant relationship between unemployment and external debts. Moreover, this indicates that loans obtained by the government of Maldives from the World Bank and other financial institutions are not appropriately utilized. The external debts of the Maldives stand at approximately USD 693.7 million in 2014, meaning that 27.7 percent of the GDP is allocated for debt servicing (World Bank, 2014). Due to

the few allocations of resources for the development projects of the country, there is an increase in the unemployment rate.

However, there is a positive but insignificant long-run relationship between expatriate workers and unemployment. This could be due to the labor market adjustment where the local labor force must enhance their education and technical skills to meet the excess demand of the labor market and private sectors are unwilling to hire foreign workers in the long-run. Hence, expatriate workers are not considered a significant factor that affects unemployment in the long run. However, they are found to be statistically significant in the short run and have a positive relationship with unemployment. This outcome is consistent with the study by Islam (2007) on the relationship between unemployment and immigration in Canada from 1961 to 2002 which found no evidence of a significant effect of expatriate workers on unemployment in the long run although it was found significant in the short-run using Vector Error Correction Method (VECM). This implies that when expatriate workers increase by one percent, unemployment in the Maldives is expected to increase by 67 percent. This confirms the earlier hypothesis and is inconsistent with the findings of Gorry, et al. (2020) and Salih (2013) as well.

The finding also shows a negative relationship between FDI and unemployment in the long-run and short run. It indicates that a 1 percent increase in FDI will lead to a 35.9 percent decrease in unemployment in the long run and a 14 percent decrease in the short run. The Maldives being a country that heavily depends on the tourism sector has a steady increase of foreign companies established in Maldives. This would enhance private investment, increase job opportunities for the locals, bring in new knowledge, incorporate technology into the labor force and have a positive impact on economic growth. This finding is consistent with Eksi and Onur Tas (2022) and Jayaraman and Singh (2007).

Lastly, the results also indicate a nexus between unemployment and population size, exhibiting a positive long-run, and this concludes our hypothesis for the Maldives. An increase in the population size of the country by one percent will increase unemployment by 24 percent in long run. This finding is in line with the results of Arslan and Zaman (2014) whom they advocate growth in the increasingly unemployed working-age population in Pakistan. Likewise, developing countries such as the Maldives, which is also among the fastest-growing population in the region, have comparatively slow economic growth, limiting labor demand and preventing youths from seeking appropriate employment. However, this could be effectively reversed through stable economic growth.

Table 4. Long-run and Error Correction Estimates, 1991-2019

Panel A: Long-run Analysis						
Dependent Variable	Independent Variables					
ΔLNUN	LNED	LNEXW	LNFDI	LNGDP	LNINF	LNPOP
	0.182***	0.0243***	-3.595**	-0.331***	-0.551***	2.241***
	(8.297)	(0.489)	(-6.968)	(-9.015)	(-30.804)	(20.894)

Note: ***, **, * denotes rejection of the null hypothesis. For robustness of the reliability of the analysis, a diagnostic test was examined by adopting a number of tests such as Ramsey's RESET test and serial correlation, heteroscedasticity, and normality test. To certify estimates of the error correction term, the residual was subjected to a serial correlation test by adopting Busch-Godfrey Serial Correlation LM Test. The alternate hypothesis of no serial correlation failed to reject since the p-value of the F-statistics (0.9719) was greater at a 5 percent level of significance and, as such, no heteroscedasticity (F-Stat = 0.4922) was found. In addition to this, the Ramsey RESET (F-Stat = 1.1237) test certified that the model for this study was correctly specified and the Jarque-Bera (JB) (0.0602) of normality indicated that the error term was normally distributed.

The results of the short-run dynamic are revealed in Table 5, which shows that in the short-run, the unemployment rate has a significantly negative relationship with the inflation rate and economic growth represented by GDP. However, the impact of inflation is much stronger than the impact of economic growth on the unemployment rate. The significance of these two variables in the short run also implies that the Phillips curve and Okun's law hypothesis are maintained in

the short run as well. The FDI also shows a negative and significant relationship with unemployment while long-run population size and external debts have maintained a positive and significant impact in the long-run and short run. There is no change in the sign of the coefficient of the variables between the long-run and short-run except expatriate workers. Although the sign of expatriate workers is positive and insignificant in the long run, the sign is negative and significant in the short run.

The error correction model, as represented by ECMt-1, measures the speed of adjustment from disequilibrium to the equilibrium level. From Table 5 coefficient of the ECMt-1 is -0.8138 which is significant at a one percent level and fulfills the condition of trending back to equilibrium since the coefficient has a negative sign. Therefore, this denotes that short-run deviance from the long-run equilibrium level of unemployment is normalized at an adjustment speed of 81.38% over the period.

Table 5. Short run Analysis and Error Correction Model, 1991-2019

Dependent Variable: ΔLNUN coefficients t-statistics		
$\Delta LNED_t$	-7.640***	(-22.671)
ΔLNEXW_t	6.770***	(10.616)
ΔLNFDI_t	-1.047***	(-13.327)
ΔLNGDP_t	-0.002***	(-25.772)
$\Delta LNINF_t$	-0.262a***	(-25.838)
$\Delta LNPOP_t$	0.000***	(14.770)
ECMt_{t-1}	-0.814***	(-12.815)
$R^2 = 0.9985$	F-stat =159.91	DW-stat = 1.827
	Prob (F-stat = 0.0007)	

Note: ***, **, * indicates significance at 1%, 5%, and 10% levels, respectively. For robustness of the reliability of the analysis, a diagnostic test was examined by adopting a number of tests such as Ramsey's RESET test and serial correlation, heteroscedasticity, and normality test. To certify estimates of the error correction term, the residual was subjected to a serial correlation test by adopting Busch-Godfrey Serial Correlation LM Test. The alternate hypothesis of no serial correlation failed to reject since the p-value of the F-statistics (0.9719) was greater at a 5 percent level of significance and, as such, no heteroscedasticity (F-Stat = 0.4922) was found. In addition to this, the Ramsey RESET (F-Stat = 1.1237) test certified that the model for this study was correctly specified and the Jarque-Bera (JB) (0.0602) of normality indicated that the error term was normally distributed.

The VAR model was estimated to compute the variance decomposition and impulse response function to examine the short-run dynamic relationship and robustness of the causal interaction between the variables in the model. The outcomes of both the variance decomposition and impulse response function are reported in Figure 1 (Appendix) clearly shows that IRF can generate the time path (i.e. the variable can rise and fall, though not in regular intervals) of dependent variables in the VAR model in response. However, based on the estimated results most of the shock from the explanatory variables tends to be zero. This confirms the stability of the vector error correction method of the system equation. Besides, Figure 1 also indicates that, in most cases, the direction of the variables' response to innovation in the system is quite reasonable. Unemployment significantly responds to the GDP, population, FDI, inflation, expatriate workers, and external debts but also reacts negatively to some of these variables, including FDI, GDP, and inflation. However, unemployment contributes to the GDP, population, Foreign direct investment, inflation, expatriate workers, and external debts.

Conclusion

This paper finds that GDP, inflation, and FDI are important determinants of unemployment. It also finds that Expatriates workers also contribute to FDI and GDP growth. This implies that the government of Maldives should increase economic growth by bringing in FDI and imposing

proper measures to keep the inflation rate at a moderate level in order to reduce unemployment. Hence, it is important for the Maldives to become a higher-income country as this will reduce the unemployment rate and create a buoyant economy for business ventures to thrive for the greater well-being of the country. The government of Maldives can take several important measures to reduce the level of unemployment such as increasing economic growth by bringing more foreign direct investment. This will improve employment and physical capital in the country. With regard to labor, it is important for the government to consider the quantity and quality of the labor force. Likewise, human capital development is imperative to improve the quality of labor force which aims to provide new technical skills to enable the for unemployed to find jobs that meets all requirements. Another important step is that the government should encourage skilled and unskilled local labor and professionals to participate in the labor force using certain working incentives such as life pension schemes. A large amount of idle labor force may create more concerns such as an increase in several expatriate workers. In order to reduce the increasing number of expatriate workers the government should limit their participation to only industries and occupations in which there is a shortage of skills. Besides, an amendment to the current recruitment policy in the tourism sector which favors expatriate workers is imperative to attract local labors to the industry (Salih, 2013). However, the government should also conduct an awareness program in collaboration with NGOs and other institutions to break the reluctant behavior among locals (such as having the illusion of a wealthy country and categorising some jobs as odd and dirty).

Besides, the government and other private companies must take proactive measures to control external debts taken from international organizations and other private sectors through some restrictive measures. Without proper controlling measures, the effort of the government to induce additional demand to reduce unemployment would be fruitless. This is largely because external debts reduce GDP due to a large amount of money flowing out of the country. In turn, this reduces the funds available to invest in enhancing public services and other development projects. External debt should be used to create more capital stock such as roads, hospitals schools and so on so as to generate more employment and future income for the economy. The increase in aggregate demand is considered as the most appropriate and effective approach of attempting to reduce the unemployment rate. Furthermore, the country is suffering from employment trap because private establishment are no longer employing. Therefore, government create enabling environment through tax incentives and long term relieves to boost private investments in order to spur growth and employment.

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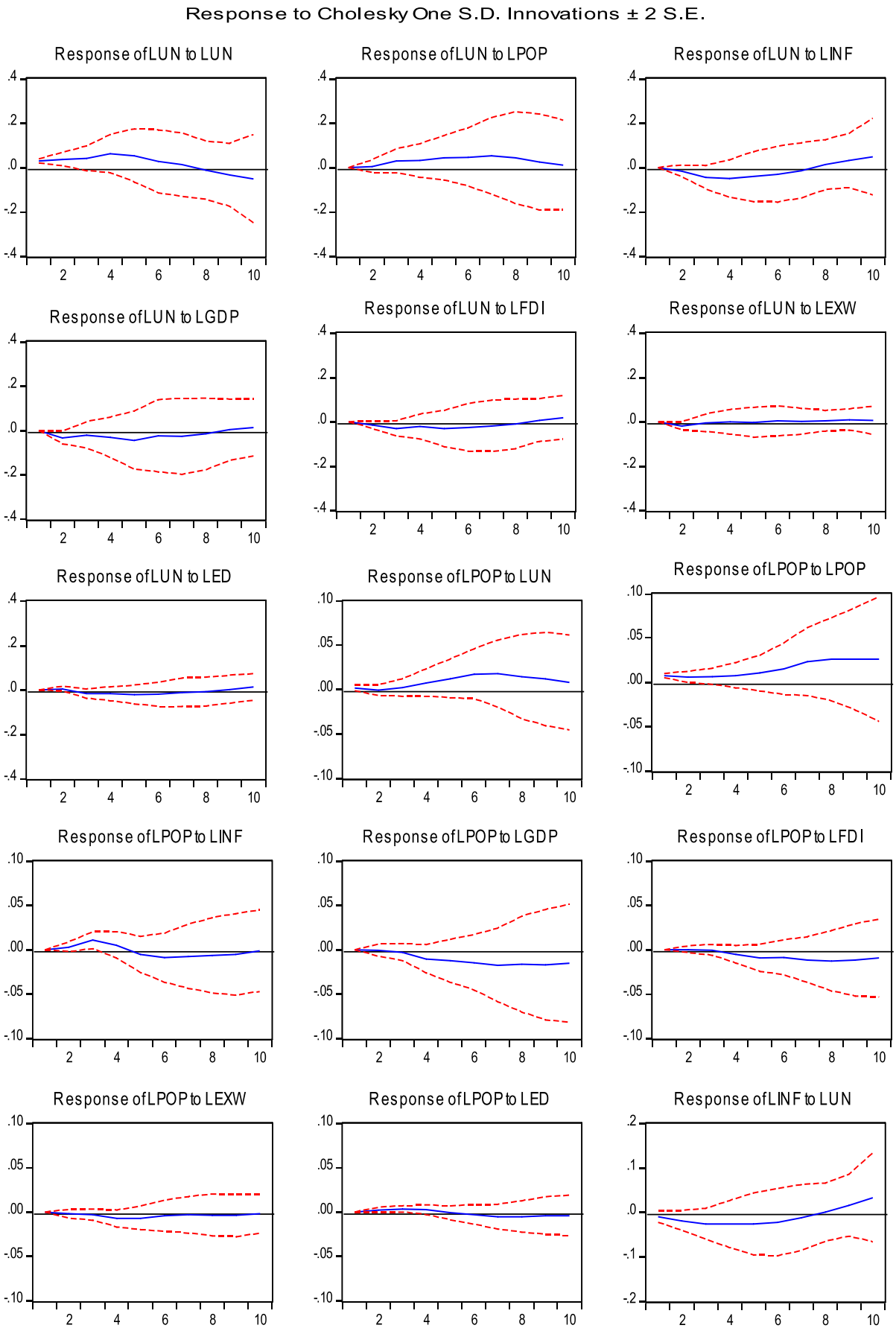
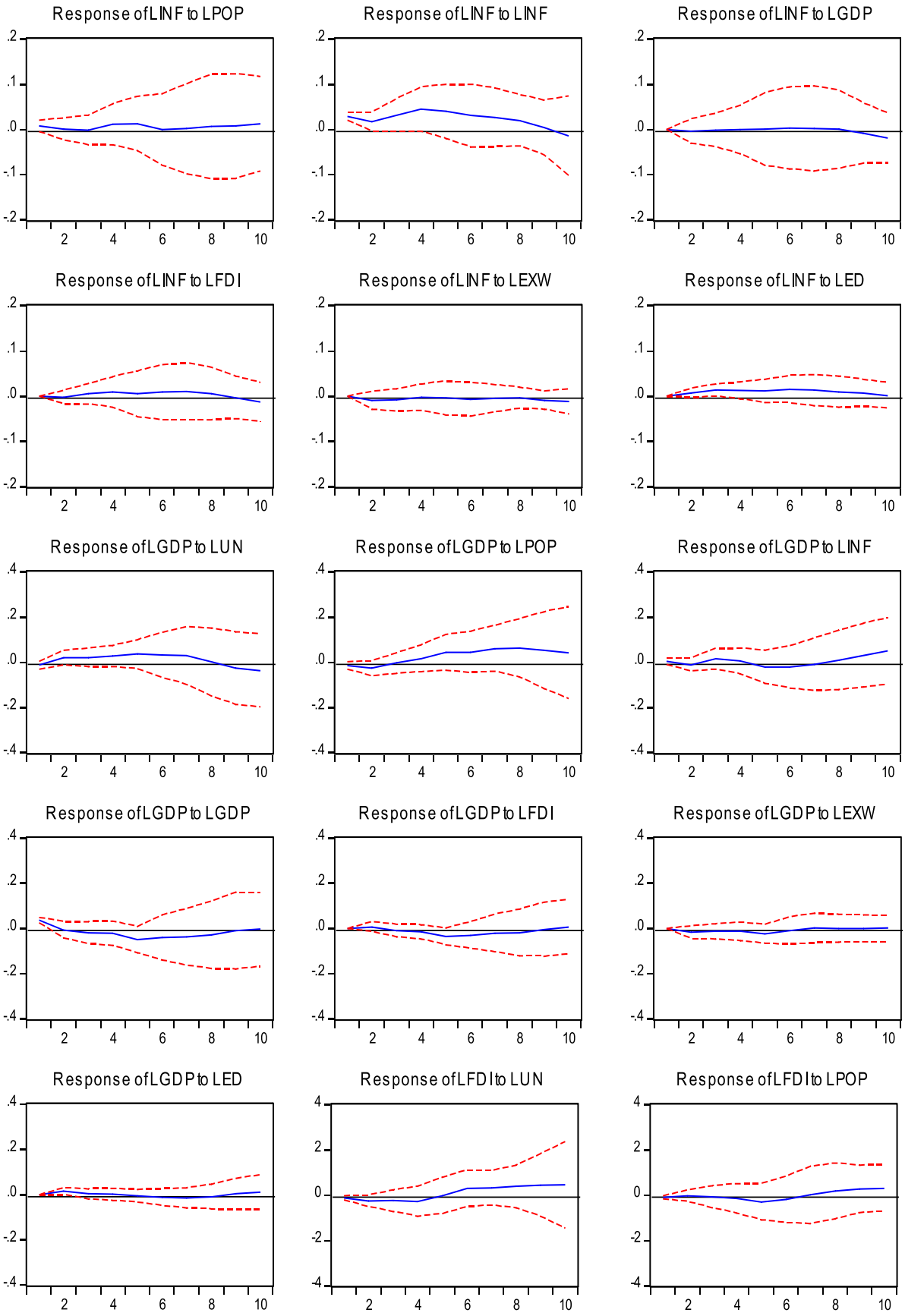
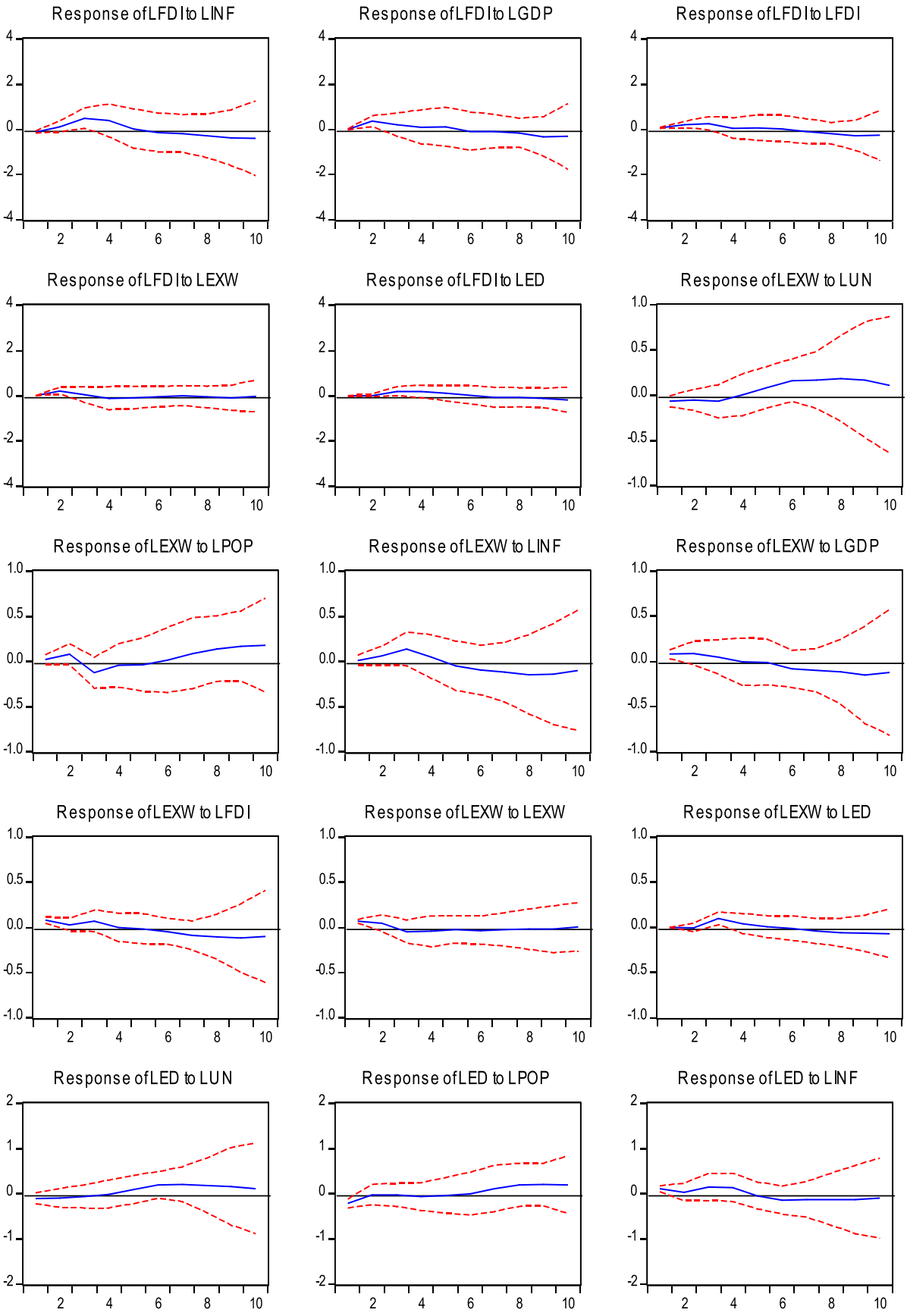
Appendix

Figure 1. Impulse Response Function




Response of LINF to LPOP
Response of LINF to LINF
Response of LINF to LGDP
Response of LINF to LFDI
Response of LINF to LEXW
Response of LINF to LED
Response of LGDP to LUN
Response of LGDP to LPOP
Response of LGDP to LINF
Response of LGDP to LGDP
Response of LGDP to LFDI
Response of LGDP to LEXW
Response of LGDP to LED
Response of LFDI to LUN
Response of LFDI to LPOP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Response of LFDI to LGDP
Response of LFDI to LFDI
Response of LFDI to LEXW
Response of LFDI to LED
Response of LEXW to LUN
Response of LEXW to LPOP
Response of LEXW to LINF
Response of LEXW to LGDP
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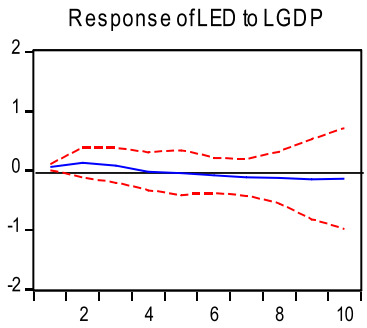
Response of LEXW to LEXW
Response of LEXW to LED
Response of LED to LUN
Response of LED to LPOP
Response of LED to LINF


Response of LED to LGDP
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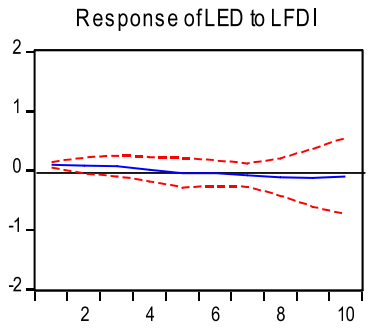
-1
-2
2
4
6
8
10


Response of LED to LFDI
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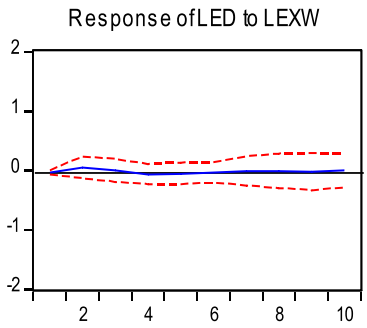
0
-1
-2
2
4
6
8
10


Response of LED to LEXW
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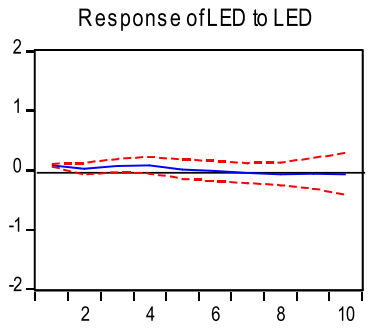
-1
-2
2
4
6
8
10


Response of LED to LED
2
1
0
-1
-2
2
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Are the global economic policy uncertainties blocking the export flows of emerging markets? A heterogeneous panel SVAR analysis

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Abstract

Purpose – This paper examines the effect of global economic policy uncertainty (EPU) on emerging markets (EMs) export flows.

Methods – This paper uses a structural panel vector autoregression modeling approach to capture country interdependencies and the likelihood that EMs' responses are heterogeneous and dynamic. An unbalanced monthly panel data from 2003:01 to 2019:12 is used to estimate impulse responses and variance decompositions not only for the entire panel data but also for each EM.

Findings – The results show that global EPU has a persistent and negative effect on exports, while foreign income and the exchange rate increase export volumes in EMs. Given the different responses of EMs to uncertainty shocks, the second-stage regression estimates suggest that greater sectoral export diversification in an EM can potentially reduce the unfavorable impact of global EPU on their export flows. Meanwhile, the higher technology content of exports leads to a multiplication of global EPU transmissions.

Implication – These findings advance the literature by highlighting the importance of accounting for the transmission effect of global EPU in EMs by considering country heterogeneity.

Originality – This is the sole paper examining the factors that mitigate or amplify GEPU impacts on export flows by estimating second-step ordinary least square equations.

Keywords – Export, emerging markets, global economic policy uncertainty, structural panel VAR.

Introduction

While the United States (US), European Union (EU), and Japan were severely affected by the crisis in 2008 and 2009, emerging economies rarely slowed, and their robust growth (particularly China and India) contributed to the global economy's recovery (Hanson, 2012). Emerging markets (EMs) are characterized as diverse in their revenue, exports of products and services, and engagement with the global economy. According to the data of 28 EMs and China, the percentage of global exports by emerging economies rose dramatically from 28% to 35% from 2006 to 2019. Also, their global gross domestic product (GDP) shares increased from 21.5% to 33.9% by 2019 compared to 2006. When the undeniable contribution of the Chinese economy is ignored, the shares of EMs in the world foreign trade and the world income have followed a stable but slow upward trend in

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the 2000s. Therefore, engaging with the global economy makes EMs open to uncertainties arising from economic policy changes created by developed countries or their global trade partners.

The world trade data of the World Bank suggests a negative association between the growth rate of exports of goods and services and the global economic policy uncertainty index of Baker et al. (2016) in the period of 1997 and 2021[1]. Lower export growth rates since 2011 have also been associated with high levels of economic policy uncertainty, particularly in 2016 and 2018-2020. Economic policy uncertainty (EPU) may reduce the level of international trade volume by shrinking economic activities. Consumers may cut back on spending, investors may opt for a wait-and-see approach, and traders may postpone or terminate trading agreements during higher EPU periods. High global uncertainty may also influence firms' investment decisions in international markets.

A growing body of work investigates the influence of EPU on international trade. The study by Baker et al. (2016), which measures the EPU of the US economy, has boosted the quantity of empirical research. Today, the EPU indices for 28 countries have been produced. The impacts of EPU on export flows can be classified into the studies of a group of countries (e.g., Aslan & Acikgoz, 2021; Borojo, Yushi et al., 2023; Gül & Gupta, 2021; Jia et al., 2020; Khalfaoui et al., 2022; Zhao, 2022) and the studies of individual countries (e.g., Hailemariam & Ivanovski, 2021; He et al., 2021; Hu & Liu, 2021; Liu, Zhang, & Li, 2020). Both time series and panel data estimation methods have been employed, mostly covering the period after 2000. Among these studies, Carballo et al., (2022) and Handley and Limão (2017) explain the effect of EPU on export and trade within the framework of structural modeling that uses calibration methods based on general equilibrium models. One of the general conclusions of these studies is that EPU or global EPU has a detrimental influence on the export flows of countries, regardless of whether they are exporters or importers. Specifically, Khalfaoui et al. (2022) showed that the COVID-19 pandemic has a profound immediate effect on the EPU of the US, Japanese, South Korean, Indian, and Canadian economies. Most of studies also focused on the economies of the United States and China as the key actors in trade conflicts that have the potential to cause EPU on a global scale.

The recent literature on EPU/global EPU and export relationship pays less attention to EMs. As a result, this research aims to investigate the implications of global EPU shocks on EMs export flows, with a particular emphasis on whether these effects differ systematically between EMs. Handling EMs as panel data necessitates dealing with heterogeneity and cross-sectional dependence in estimations. Pedroni (2013) proposed an approach for cross-country panel data sets that simultaneously allow for full panel heterogeneity and dependence. This method is defined as "a new approach to VAR analysis in panels based on a structural decomposition of shocks into common type shocks vs. idiosyncratic type shocks, as well as component shocks within each of these types" (Pedroni, 2013).

With the advantages of the panel SVAR method of Pedroni (2013), this paper contributes to the related literature twofold. First, it integrates data from 28 EMs to assess the effects of global EPU (GEPU) on export for each EM. In other words, the response of exports to GEPU and to the other target variables, which are the exchange rate and foreign income, is estimated separately for each EM using full information of EMs. Second, by investigating the cross-sectional association between various country characteristics such as economic growth, sectoral variety of exports, and technological intensity of exports, this paper looks into the determinants of variation in the impulse responses for each EM. This part of the study relies on ordinary least square regressions where the impulse response functions are taken as a dependent variable, allowing us to discover the transmission of GEPU impacts on export flows in EMs.

Additionally, this paper differs from similar ones (such as Aslan & Acikgoz, 2021) because it not only shows the negative effect of GEPU on the export of EMs but also highlights the dilutions of export responsiveness to the exchange rate advantages because of heightened uncertainties. The structure of the paper is as follows. The next section details the method used in the estimations. Estimation results are reported in the third section. The paper ends with conclusion.

[1] https://data.worldbank.org/topic/21

Methods

An unbalanced panel data set covering 28 EMs over the period 2003:01-2019:12 is used in the estimations. Details regarding the data set can be found in Appendix Table A1. It should be noted that the data set does not cover the COVID-19 pandemic period because it is still on the agenda of most countries, which is not the focus of this paper (please see Hu & Liu, 2021).

Data sources are the Organization for Economic Co-operation and Development (OECD), the World Trade Organization (WTO), the Trade Map, the Bureau of Industry and Security (BIS), and the databases of the International Monetary Fund (IMF). The real export values are obtained by dividing the nominal export values by the US consumer price index (CPI). The industrial production index (IPI) is a proxy for external income. The real effective exchange rates are calculated using the US economy's CPI and the CPIs of each EM, which are directly taken from the BIS database. According to the calculation method, increases in exchange rates refer to the appreciation of the local currencies.

Baker et al. (2016) measured the US economy's EPU level based on searches of prominent newspapers for combinations of keywords that capture economics, policy, and uncertainty. The index began in 1985 and is updated monthly. This method of measurement has been expanded to 24 developed and developing countries. We derived a GEPU index for each EM in this paper by applying the partial least squares (PLS) factor model to the EPU indexes of those 24 economies. In this way, we distributed the uncertainty generated by the 24 countries among EMs because such an EPU index is unavailable for most of them. The PLS method gives this advantage as it uses the export flows of the EMs in the decomposition process. Detailed information about the PLS method can be found in Bianchi et al. (2019) and Cepni et al. (2020).

The structural panel vector autoregressions (SVAR panel) method of Pedroni (2013) is employed in this paper. He showed that the properties of the sample distributions of these structural dynamics are well, even when the panel's time series dimensions are relatively short.
In this method, the unobserved structural shocks are the composite shocks, which are distributed independently over time but maybe cross-sectionally dependent. The heterogeneous SVAR panel model is expressed by Equation (1).

$$B_i z_{it} = A_i(L) z_{it} + \varepsilon_{it} \text{ where } i = 1, \dots, N \text{ and } t = 1, \dots, T \quad (1)$$

In Equation (1), B_i is the matrix of structural parameters, z_{it} is the matrix of endogenous variables. A well-established export model used in the related literature (e.g. Bahmani-Oskooee, 1986) contains the real export (RE_t), the real external income (EI_t), the real exchange rate (ER_t), and global EPU ($GEPU_t$) which are endogenous variables contained in z_{it}. $A_i(L)$ represents a matrix of lag operators where optimal lag lengths are determined by general to specific (GTOS) criteria in this paper.

In Equation (1), ε_{it} is the structural white noise shocks and they are also called as composite structural shocks and the method allows to divide them into common and idiosyncratic shocks.

To decompose composite structural shocks, ε_{it}, into $M \times 1$ the vector of common, $\bar{\varepsilon}_t$, and idiosyncratic shocks, $\tilde{\varepsilon}_{it}$, the processes followed is as below.

$$\varepsilon_{it} = \wedge_i \bar{\varepsilon}_t + \tilde{\varepsilon}_{it}; E(\xi_{it}, \xi'_{it}) = \begin{bmatrix} \Omega_{i,\bar{\varepsilon}} & 0 \\ 0 & \Omega_{i,\tilde{\varepsilon}} \end{bmatrix} \forall i, t; E(\xi_{it}) = 0 \; \forall i, t; E(\xi_{it}, \xi'_{is}) = 0 \; \forall i, s \neq t \text{ and}$$
$$E(\tilde{\varepsilon}_{it}\, \tilde{\varepsilon}'_{it}) = 0 \; \forall t, i \neq j \quad (2)$$

In Equation (2), $\wedge_i$ is the $M \times M$ diagonal matrix containing loading coefficients in its' diagonal items. It should be noted that composite error shocks, ε_{it}, of the covariance matrix, $E(\xi_{it}, \xi'_{it})$, also has a diagonal matrix with arbitrarily normalizable variances exposed to extra constraints referred to by Equation (2). This guarantees that the restrictions implemented for the entire panel become consistent with similar restrictions made upon panel members by treating them as if they are individual time series.

The estimation operations are applied firstly to obtain composite shocks, ε_{it}, and associated impulse response and variance decomposition results. For this aim, we estimate $M + 1$ (28 + 1 = 29 VAR models in our case) reduced form of VAR models for each country in the panel data and cross-sectional averages.[2]

$$\begin{aligned} z_{1,t} &= C_1(L)z_{1,t} + e_{1,t} \\ z_{i,t} &= C_i(L)z_{i,t} + e_{i,t} \\ z_{m,t} &= C_m(L)z_{m,t} + e_{m,t} \\ \bar{z}_t &= \bar{C}(L)\bar{z}_t + \bar{e}_t \end{aligned} \quad (3)$$

In Equation (3), $C_i(L) = B_i^{-1}A_i(L)$; $e_{i,t} = B_i^{-1}\varepsilon_{it}$, $\bar{C}(L) = \bar{B}^{-1}\bar{A}(L)$ and $\bar{e}_t = \bar{B}^{-1}\bar{\varepsilon}_t$ indicate composite ε_{it} and common shocks $\bar{\varepsilon}_t$ of residuals.

In the second stage, idiosyncratic shocks, $\tilde{\varepsilon}_{it}$ and the loading matrix Λ_i are estimated using the orthogonality properties of the shocks. Estimated loading matrix $\hat{\Lambda}_i$ contains $M \times M$ sample estimates of $E[\epsilon_{it,m}\epsilon_{t,m}]/E[\epsilon_{t,m}^2]$ for $m = 1, 2, \ldots, M$. Diagonal elements of $\hat{\Lambda}_i$ matrix is the loading coefficient of common structural shocks. These loading coefficients are used to decompose the composite structural shocks into common and idiosyncratic shocks that are equal to simple correlation coefficients between ε_{it} and $\bar{\varepsilon}_t$ shocks (Góes, 2016).

The panel SVAR system for the model given in Equation (1) can be formulated as in Equation (4). Structural shocks of these variables can be ordered from exogenous to endogenous as shown in Equation (5).

$$Z_{it} = (GEPU_{it}, EI_{it}, ER_{it}, RE_{it}) \quad (4)$$

$$\varepsilon_{it}^{z} = (\varepsilon_{it}^{GEPU}, \varepsilon_{it}^{EI}, \varepsilon_{it}^{ER}, \varepsilon_{it}^{RE}) \quad (5)$$

Results and Discussion

Implementing a structurally identified VAR to estimate the VAR coefficients for a wide set of countries, as stated by Mishra et al. (2014;) and Pedroni (2013), faces two empirical issues. For example, some or many of the countries in the sample may have relatively limited data spans available, and data from some or many of the countries may be noisy. A typical time series-based study for any single country may be unreliable under these conditions. To strengthen the reliability of the inferences, we used a panel data set of EMs. This section of the paper reports both the estimated impulse responses with variance decompositions estimated by panel SVAR and the second-stage OLS regressions estimates.

Impulse Responses

The composite, common, and idiosyncratic impulse response functions obtained with the panel SVAR model are reported in Figure 1, Figure 2, and Figure 3, which depict the composite, common, and idiosyncratic median responses, respectively. While solid lines show the median responses, dashed lines represent the associated 25% and 75% quantiles in these figures. The distance between the median responses and the 25% and 75% quantiles shows the degree of heterogeneity. The closer median values to the upper or lower limits imply the more heterogeneous responses of the variables. As seen in Figures 1-3, the reactions of the real export to GEPU shocks are heterogeneous. Mainly, heterogeneity is obviously observed in common impulse response functions of exchange rate shocks. According to the outcomes, GEPU significantly and negatively affects the real export of emerging markets that seems stable and permanent. This finding is compatible with the results of the related literature (Constantinescu, Mattoo, & Ruta, 2020; Krol, 2018; Liu et al., 2020). Shocks of increasing external income cause a remarkable increase in exports. This is an expected result and is consistent with the findings of Aslan and Acikgoz (2021) and Gül (2018).

[2] Equation (3) is the vector moving average (VMA) representation of the main model given in Equation (1).

Figure 1. Composite Impulse Responses

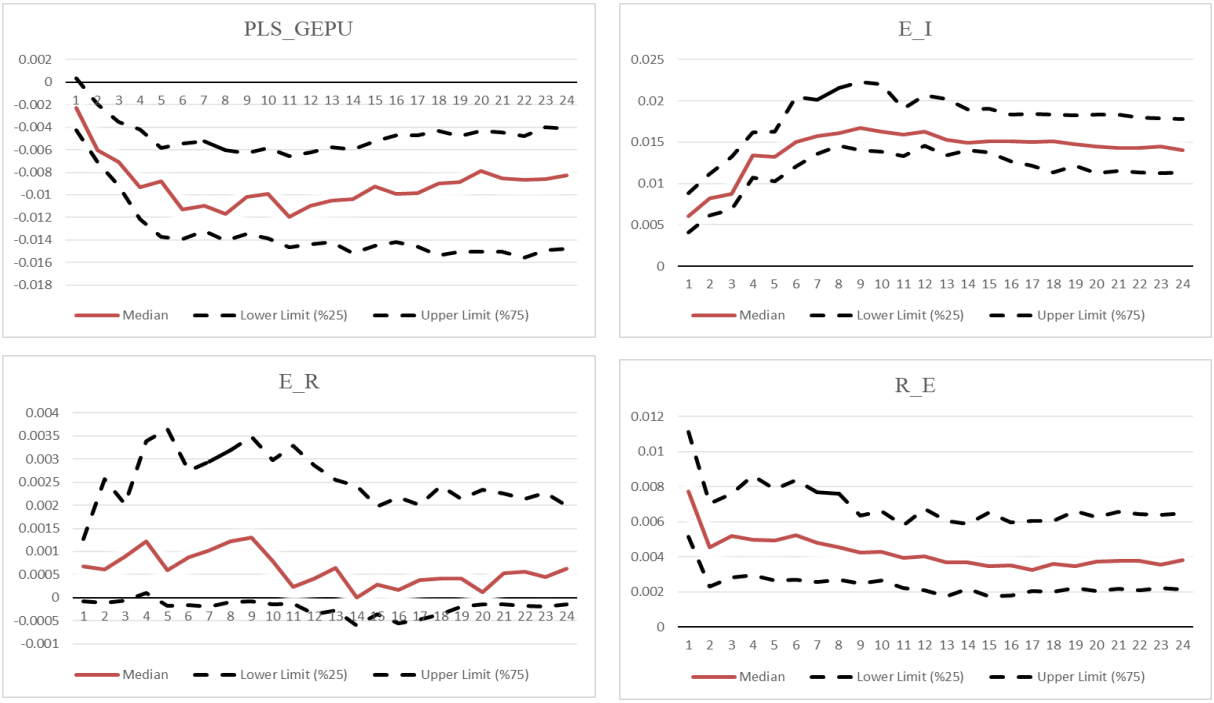

Figure 2. Common Impulse Responses

Composite and idiosyncratic responses of export flows of EMs to the real effective exchange change are significantly positive in the first ten and twelve periods. For the rest of the time interval of composite and idiosyncratic and entire periods of common responses, export responses to exchange rate shocks are found to be positive but insignificant. This result contradicts our expectations implying that local currency appreciations precipitate the reduction in export volumes by making export products more expensive. Although this result contradicts expectations, an extensive literature study argues that the link between exchange rate and export has weakened. Ahmed et al. (2015) and Amiti et al. (2014) raised the fact that exporter countries are also in importers' position. In this scenario, exchange rate advantages for export flows become disadvantages for import flows. Therefore, for EMs recognized as needing a high level of

intermediate imported inputs to go on production and export actions exchange rate advantages would even turn into disadvantages on the contrary. Hlatshwayo and Saxegaard (2016) argued that increasing EPU hinders the expected positive effects of exchange rate advantages on exports. To sum up, this finding is logical as particularly considering that we studied with EMs.[3]

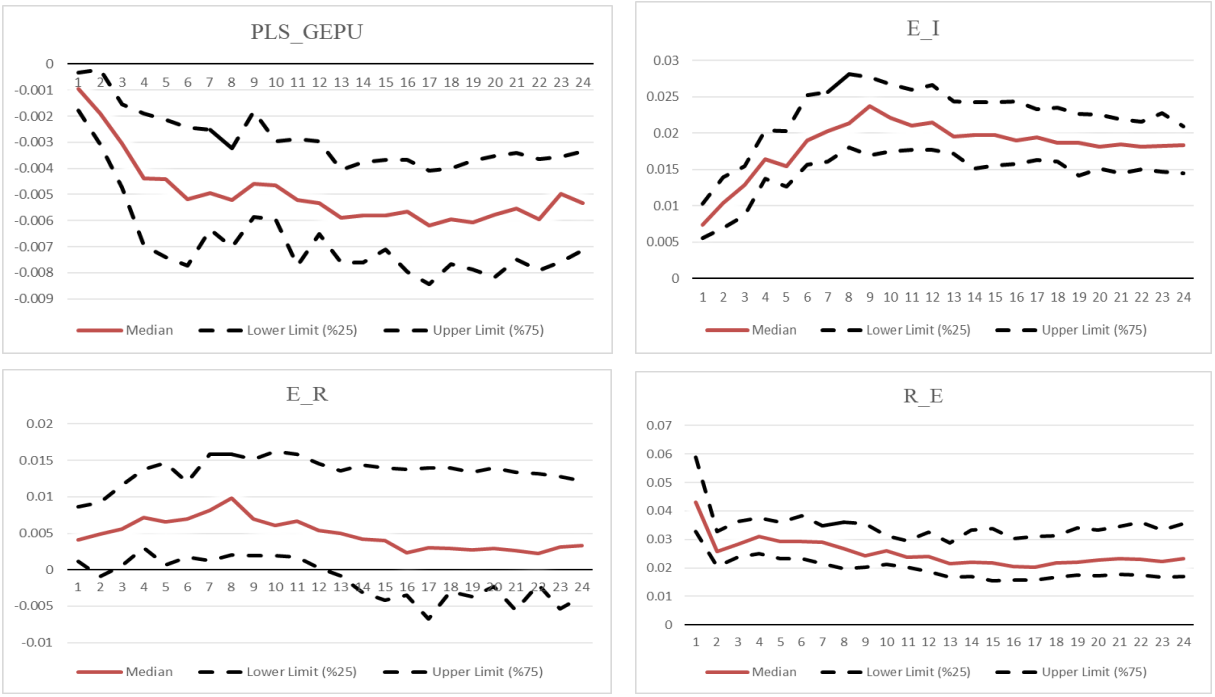

Figure 3. Idiosyncratic Impulse Responses

Variance Decompositions

Variance decomposition results of composite, common, and idiosyncratic shocks are summarized in Table 1. Unlike impulse responses, the results differ depending on the types of shocks. The real export contributes to the composite total variance by 82% on average in the first six periods. Although this contribution decreases in the coming periods, it is about 50%. According to common variance decompositions, this share is 55% and immediately drops in the coming periods. Idiosyncratic variance decompositions show country-specific variance decompositions. Again, the real export explains 80% and 96% of the total idiosyncratic variance in the first periods. The real external income explains 25%-34% of the common total variance of the real export, especially after the first nine months. A similar contribution is also observed for the idiosyncratic variance decompositions. However, the real external income outshines when it comes to common shocks, and its contribution increases in the next periods. Although the explanation percentages of the GEPU shocks are quite limited for composite and idiosyncratic variance decomposition, 4 % on average, its contribution to the common variance decompositions is considerable, with 24% on average. These results imply that export flows of emerging markets have their own patterns, and global EPU has a meaningful total effect on export flows of emerging markets when these countries meet the uncertainty shocks together. The explanation power of exchange rate shocks in export flows of EMs is very small for all types of variance decompositions. The findings of export reactions to the GEPU shocks for composite and idiosyncratic variance decomposition are consistent with the variance decomposition outputs of Aslan and Acikgoz (2021). Moreover, this paper's common variance decomposition results confirm Wei's (2019) variance decomposition results.

[3] We also estimated the model by changing GEPU indices to check the robustness of the main findings. We estimated the second GEPU series with factor-based Principal Component Analysis (PCA) and took the third GEPU series reported by Baker et al. (2016) according to the Gross Domestic Product (GDP) calculation. The estimated impulse responses of the second and third models confirm our baseline findings. To save space we did not report these results; however, they are available upon request.

Table 1. Variance Decompositions

	Composite Variance Decompositions				Common Variance Decompositions				Idiosyncratic Variance Decompositions			
Period	PLS_GEPU	E_I	E_R	R_E	PLS_GEPU	E_I	E_R	R_E	PLS_GEPU	E_I	E_R	R_E
1	0.00	0.05	0.01	0.94	0.07	0.37	0.01	0.55	0.00	0.03	0.01	0.96
2	0.02	0.09	0.02	0.88	0.16	0.48	0.01	0.35	0.01	0.06	0.02	0.92
3	0.02	0.11	0.03	0.84	0.26	0.48	0.01	0.24	0.01	0.07	0.03	0.89
4	0.04	0.14	0.03	0.79	0.25	0.53	0.01	0.21	0.01	0.09	0.03	0.86
5	0.04	0.16	0.04	0.76	0.24	0.55	0.01	0.20	0.01	0.11	0.04	0.84
6	0.05	0.20	0.04	0.71	0.24	0.56	0.01	0.18	0.01	0.14	0.04	0.80
7	0.05	0.23	0.04	0.67	0.24	0.60	0.01	0.16	0.02	0.17	0.05	0.77
8	0.06	0.25	0.04	0.65	0.24	0.62	0.01	0.13	0.02	0.20	0.05	0.74
9	0.06	0.29	0.04	0.61	0.23	0.64	0.01	0.11	0.02	0.22	0.05	0.71
10	0.06	0.30	0.05	0.59	0.23	0.65	0.01	0.10	0.02	0.22	0.05	0.70
11	0.06	0.32	0.05	0.57	0.24	0.65	0.01	0.10	0.02	0.23	0.06	0.69
12	0.06	0.33	0.05	0.55	0.24	0.65	0.01	0.09	0.02	0.24	0.06	0.68
13	0.07	0.34	0.05	0.54	0.25	0.65	0.01	0.09	0.02	0.25	0.06	0.67
14	0.07	0.34	0.05	0.54	0.25	0.65	0.01	0.09	0.02	0.26	0.06	0.66
15	0.07	0.34	0.05	0.54	0.25	0.65	0.01	0.09	0.02	0.27	0.06	0.65
16	0.07	0.34	0.05	0.54	0.25	0.65	0.01	0.08	0.02	0.28	0.06	0.64
17	0.07	0.35	0.05	0.54	0.26	0.65	0.01	0.08	0.03	0.28	0.06	0.64
18	0.07	0.35	0.05	0.54	0.26	0.66	0.01	0.07	0.03	0.28	0.05	0.64
19	0.07	0.35	0.05	0.53	0.26	0.66	0.01	0.07	0.03	0.28	0.05	0.64
20	0.07	0.35	0.05	0.53	0.26	0.66	0.01	0.07	0.03	0.28	0.05	0.64

Second Stage Regression Estimation Results

To further explore the determinants of the variation in impulse responses, we next examined the cross-section association between specific country characteristics, explained below, and the strength of the impulse responses. For this reason, several OLS regressions were estimated. Our aim is here to determine the factors that mitigate the negative effect of global EPU on EMs' export flows. To the best of our knowledge, this is the first study that combines impulse responses with other factors that influence country export flows.

One of the goals of growing and developing economies is to diversify their exports. A more diverse export basket, for example, is associated with lower production volatility or stronger long-term output growth (Haddad et al., 2013; Hnatkovska & Loayza, 2003; Ramey & Ramey, 1995). Most developing countries' export baskets are concentrated on a few raw commodities with fluctuating international pricing (Salinas, 2021). This also exposes them to the shocks of global EPU growth. As a result, we evaluated whether high sectoral diversity in EM exports makes export flows more resilient to external shocks in this research. Because of the high sectoral diversity in production and export, domestic exporters may have more options by establishing a resistance mechanism against uncertainty shocks. This will also assist EMs boost future economic growth.

Only innovative and advanced technology opportunities allow for producing and exporting high-tech goods and services. Given that high-tech goods include aviation and space, computers, pharmaceuticals, scientific instruments, and electrical machinery, firms would face significant fixed costs in addition to R&D expenses. They, too, would occasionally have to hire qualified and technical personnel at high wages. As a result, increasing export technology density is predicted to amplify unfavorable GEPU effects on export flows. To estimate the effects of export diversification (diversification) and the density of the high-tech export level (technology), we also controlled comparative growth (cgrowth). Export concentration index (cindex), and trade-in value added (tiva) are used as alternative proxies for diversity and density of the high-tech export level, respectively, for robustness check. Comparative growth shows each country's relative per capita GDP and is calculated as the per capita GDP of each country divided by the US per capita GDP. The high-tech export data has calculated the basis of the ISIC Rev. 3 classification.[4] The added

[4] Detailed calculations are available upon request.

value in trade[5] is exchanged with the technology variable in the OLS estimations. The sectoral concentration index of export (cindex) is used to indicate sectoral export diversification. Descriptive statistics for EMs in terms of these variables are reported in Table 2. Logarithmic values are used except for economic growth.[6]

The average comparative economic growth of EMs is about −3.7%, and growth rates vary between −1% and −7% in the sample period. The average diversification measure of EMs is −0.34), meaning the sample countries do not have a much-diversified export basket. The standard deviation of this variable is also the smallest one among the others, implying that it does not vary between EMs. Descriptive statistics show a similar pattern for the export concentration index with a slightly higher standard deviation. However, their high-tech export density is higher on average, showing their potential. Their trade in value-added changes between 2.2 and 4.1 with a 3.2 average and 0.50 variation. These descriptive statistics show that the density of the high-tech export level and economic growth are varied across EMs.

Table 2. Descriptive Statistics Variables Used for Second-Stage Regressions

Statistic	diversification	technology	cgrowth	cindex	tiva
Mean	-0.350	2.387	-3.689	-1.784	3.158
Median	-0.276	2.316	-3.735	-1.879	3.134
Maximum	-0.142	3.976	-1.024	-0.932	4.125
Minimum	-1.229	-0.693	-7.067	-2.614	2.227
Std. Dev.	0.234	1.142	1.466	0.484	0.500
Observations	28	28	28	28	28

Authors' calculation from the related data sources.

Table 3. Coefficient Estimates

Impulse responses of log real export to GEPU Shocks	1st Month	4th Month	8th Month	12th Month
constant	-0.0046***	-0.0096***	-0.0113***	-0.0089***
	(0.0016)	(0.0019)	(0.0027)	(0.0020)
cgrowth	0.0009*	0.0009*	0.0013*	0.0008
	(0.0004)	(0.0005)	(0.0007)	(0.0005)
technology	0.0012***	0.0015***	0.0017**	0.0011**
	(0.0004)	(0.0005)	(0.0007)	(0.0005)
diversification	-0.0110***	-0.0115***	-0.0188***	-0.0089***
	(0.0025)	(0.0003)	(0.0042)	(0.0031)
Observations	28	28	28	28
R^2	0.5605	0.5004	0.5495	0.3499
Adjusted R^2	0.5056	0.4379	0.4931	0.2686
F-Stat.	10.2026***	8.0120***	9.7565***	4.3050**
	[0.0002]	[0.0007]	[0.0016]	[0.0016]
LM(1) p-value	0.0788	0.3759	0.0124	0.6312
	[0.7571]	[0.5022]	[0.9023]	[0.3871]
LM(4) p- value	0.0823	0.2588	0.0549	0.4234
	[0.9779]	[0.8480]	[0.9896]	[0.7016]
White p- value	8.0692	0.9766	0.7897	0.5158
	[0.1145]	[0.5631]	[0.0967]	[0.3999]

Notes: (.) denotes standard errors. [.] denotes p-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The ordinary least squares (OLS) estimates are presented in Table 3. According to the results, even though estimates of the coefficient of technology are too small, a 1% increase in high

[5] More details about trade-in-value added (TIVA) data can be found at https://www.oecd.org/sti/ind/tiva/TiVA2018_Indicators_Guide.pdf (Accsess Date 14.07.2021)

[6] Data sources for the variables used in the OLS regressions are from UNCTAD and OECD databases.

technology intensity of an EM leads to a significant 0.0012-point increase in responses of the real export to global EPU on average in the first month, and that will be followed by in the next months. This result supports the hypothesis that the high technology density of export assists in the transmission of impacts of global EPU on export flows. Estimates of the coefficient of diversification are negatively significant in all periods and show that sectoral diversification has higher impact, in absolute values, on responses than technology. A more diversified emerging economy means global economic uncertainties have less effect on the export of emerging markets. High technology density, sectoral diversity, and comparative economic growth explain variations in impulse response across emerging markets by about 50% in the first eight months. However, the coefficient of adjusted determination decreases to 27% at the end of the first year.

To check whether the estimates are robust, we use two alternative proxies for both high technology intensity and sectoral diversification: the added value in trade (tiva) and the sectoral concentration index of export (cindex). Increases in tiva mean higher value added in foreign trade and are expected to respond similarly to the technology density variable. On the other hand, cindex implies the opposite side with diversification and implies sectoral contraction in export. Hence, cindex is expected to expand negative GEPU effects on export flows.

These OLS estimates are given in Table 4 and Table 5, respectively. The coefficient of tiva is estimated positively and significantly in the first eight months, confirming that the transmission of negative global EPU effects on export volume is likely to amplify with increasing tiva levels. Table 7 shows that the concentration index positively affects responses to global EPU shocks of export. Since diversification and cindex represent opposite sides, a positive coefficient implies that more concentrated emerging markets will be more affected by global EPU shocks. Our findings are robust to alternative variables regarding the density of technology export and sectoral export diversification. After that, we performed diagnostic checking. Both autocorrelation and heteroscedasticity (which might arise from the noise in the impulse-responses) issues are tested using the Breush-Pagan LM test and the White test, respectively. For all models, the autocorrelation problem does not exist. Constant variance assumption is also satisfied for all models except for the 8th-month prediction model of the third model.

Table 4. Coefficient Estimates with tiva

Impulse responses of log real export to GEPU Shocks	1st Month	4th Month	8th Month	12th Month
constant	-0.0083**	-0.0143***	-0.0192***	-0.0101**
	(0.0032)	(0.0042)	(0.0045)	(0.0042)
cgrowth	0.0011**	0.0015**	0.0019**	0.0009
	(0.0005)	(0.0007)	(0.0007)	(0.0007)
tiva	0.0021*	0.0030*	0.0039**	0.0011
	(0.0011)	(0.0015)	(0.0015)	(0.0011)
diversification	-0.0141***	-0.0136***	-0.0258***	-0.0116***
	(0.0029)	(0.0038)	(0.0041)	(0.0038)
F-Stat.	9.8363***	5.3652***	16.9638***	3.5967**
	[0.0003]	[0.0063]	[0.0000]	[0.0297]
R^2	0.5729	0.4225	0.6982	0.3291
Adjusted R^2	0.5146	0.3438	0.6570	0.2376
Observations	28	28	28	28
LM(1) p-value	0.0831	1.6378	0.0353	2.5220
	[0.7488]	[0.1702]	[0.8346]	[0.1272]
LM(4) p- value	0.0968	0.4480	0.0115	0.8525
	[0.9687]	[0.6709]	[0.9995]	[0.3873]
White p- value	0.4291	0.6796	0.3928	0.7172
	[0.6502]	[0.7664]	[0.6458]	[0.5878]

Notes: (.) denotes standard errors. [.] denotes p-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Coefficient Estimates with cindex

Impulse responses of log real export to GEPU Shocks	1st Period	4th Period	8th Period	12th Period
constant	-0.0012	-0.0039	0.0017	-0.0015
	(0.0032)	(0.0035)	(0.0046)	(0.0031)
cgrowth	-0.0004	-0.0003	-0.0006	-0.0001
	(0.0004)	(0.0004)	(0.0006)	(0.0003)
technology	0.0012**	0.0015**	0.0018**	0.0012**
	(0.0005)	(0.0006)	(0.0007)	(0.0005)
cindex	0.0022*	0.0034**	0.0074***	0.0041***
	(0.0013)	(0.0015)	(0.0018)	(0.0012)
F-Stat.	3.0813**	4.3962**	8.2159***	5.2467***,
	[0.0465]	[0.0134]	[0.0006]	[0.0063]
R^2	0.2781	0.3546	0.5067	0.3961
Adjusted R^2	0.1878	0.2740	0.4450	0.3206
Observations	28	28	28	28
LM(1) p-value	0.0770	0.2786	0.1481	0.6587
	[0.7599]	[0.5627]	[0.6722]	[0.1699]
LM(4) p- value	0.1868	0.9110	0.4198	0.4793
	[0.9085]	[0.3650]	[0.7047]	[0.1717]
White p- value	5.4283	0.4021	10.4165	1.4122
	[0.0153]	[0.8607]	[0.0052]	[0.2542]

Notes:(.) denotes standard errors. [.] denotes p-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The result of this paper highlighted that increasing global EPU hinders the EMs' export level. This finding is confirmed by estimating the model with two alternative different GEPU variables and it accords well with existing literature such as Jia et al. (2020) and Krol (2018). The main reason behind this negative impact is that sunk and irreversible cost concerns delay investments in high uncertainty periods (Bernanke, 1983; Dixit, 1989; Krol, 2018). EPU harms trade flows via global supply chains since it is globally based. This can be another explanation for negative GEPU influences on trade flows. As a control variable, external income assists in expanding the export volume of EMs as consistent with expectations. Besides, this is the most dominant variable explaining the export level. Contrary to expectations, it is interesting that the exchange rate positively affects exports. This unexpected result can be explained as (i) a high level of global EPU prevents taking the exchange rate advantages for enhancing the export level depending on postponing investments, and (ii) although the exchange rate depreciation provides opportunities to increase the export level, it creates unfavorable conditions for the import level at the same time. EMs described as having high import needs to export would have faced a lack of intermediate goods supply. In this case, due to the depending on import demand, exchange rate advantages are reversed for export flows.

Conclusion

This paper examines the effects of global EPU on the export flows of 28 emerging markets. Data is an unbalanced monthly panel data from 2003 to 2019. The structural panel VAR model proposed by Pedroni (2013) is used in the estimations. This method allows full heterogeneity among panels and estimates the individual response behavior of all EMs in the sample. To the best of our knowledge, this is the sole paper examining the factors that mitigate or amplify GEPU impacts on export flows by estimating second-step ordinary least square equations. For this aim, sectoral diversification and technology intensity of export are analyzed. Sectoral diversification prevents unfavorable GEPU impacts while the technology intensity of export multiplies them.

Our paper has remarkable policy implications. As the most used economic policy application, the exchange rate would become useless in amplifying export flows. In highly import-

dependent economies, exchange rate appreciations would hamper export volume instead of assisting. Additionally, it should be noted that local macroeconomic policies would be insufficient in many cases hence, policymakers should assess the global economic conditions when they take acquired precautions. The subject of economic policy uncertainty and its unwanted impacts on economic activities such as export should be taken seriously. Such large-scale economic trade agreements could be applied to control the negative effects of global economic policy uncertainties.

Moreover, sectoral diversification is another way to hamper GEPU influences. Governments should encourage new sectors to increase the sectoral spread of production and export. Since export sectors manufacturing high-tech products are more sensitive to GEPU movements, policymakers should follow these sectors more closely, especially in high uncertainty times. Even some regulated support incentives can be provided to prevent decreased production levels if necessary.

This paper stresses the nexus between GEPU and the export flows of 28 emerging markets. Empirical analyses are performed with total export values. However, a deeper analysis could be implemented with less aggregated export data. For example, empirical analyses with firm basis sectoral export data would offer more detailed and interesting information. Furthermore, a different, maybe wider country group could be preferred. In summary, there are still avenues waiting to be explored in this subject.

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APPENDIX

Table A1. List of Emerging Economies

No	Country Name	Data Period
1	Brazil	2003:01-2019:12
2	Bulgaria	2004:01-2019:12
3	Chile	2003:01-2019:12
4	Colombia	2003:01-2019:12
5	Costa Rica	2003:01-2019:12
6	Croatia	2004:01-2019:12
7	Czechia	2003:01-2019:12
8	Greece	2003:01-2019:12
9	Hungary	2003:01-2019:12
10	India	2003:01-2019:12
11	Indonesia	2003:01-2019:12
12	Latvia	2004:01-2019:12
13	Lithuania	2004:01-2019:12
14	Macedonia	2006:01-2019:12
15	Malaysia	2004:01-2019:12
16	Malta	2004:01-2019:12
17	Mexico	2003:01-2019:12
18	Peru	2006:01-2019:12
19	Philippines	2006:01-2019:12
20	Poland	2003:01-2019:12
21	Romania	2004:01-2019:12
22	Russian Federation	2003:01-2019:12
23	Singapore	2006:01-2019:12
24	South Africa	2003:01-2019:12
25	Republic of Korea	2003:01-2019:12
26	Tunisia	2003:01-2019:12
27	Turkey	2003:01-2019:12
28	Uruguay	2003:01-2019:12

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An empirical investigation of the relationship between government revenue, expenditure, and economic growth in selected EMEs

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Abstract

Purpose — This article explores the relationship between government revenue, government expenditure, and economic growth for nine emerging market economies using annual data from 1991-92 to 2019-20.

Method — This paper distinguishes itself from the existing literature through the application of co-integration tests, vector error correction, DOLS and FMOLS for an empirical investigation of a unique panel data set of select emerging economies across Asia, Africa, Europe and Latin America. A bi-directional causal long-run relationship between economic growth and government expenditure, as well as between government expenditure and government revenue, was found using standard panel co-integration tests.

Findings — The long-run elasticities computed using VECM were confirmed from DOLS as well as FMOLS estimates. A one per cent increase in expenditure and revenue, in the long run, would result in an increase in GDP by 0.94 and 0.90 per cent, respectively. Similarly, an increase in GDP by one per cent would lead to an increase in government expenditure by 1.1 per cent. On the other hand, an increase in government revenue by one per cent would cause a corresponding increase in government expenditure by nearly one per cent. The findings of this research point to a positive association between government revenue, expenditure, and economic growth, which will be valuable to policymakers.

Contribution — Our combination of country selection covering economies from different continents is a first of its kind to the best of our knowledge. Another contribution is the application of panel cointegration and panel error correction techniques to fully use the panel data set, while most previous studies utilised the typical time series modelling with individual time series data.

Keywords — Government revenue, government expenditure, economic growth, panel co-integration, panel vector error correction.

Introduction

Fiscal policy, a government's primary policy tool, aims to maximise economic growth by preserving macroeconomic stability, boosting work and investment incentives, fostering human capital accumulation, and improving total factor productivity (IMF, 2015). To achieve this, the government must take an active role in attaining economic growth, particularly for emerging and developing economies (Edame & Okoi, 2014). The two main fiscal policy instruments, government's revenue and expenditure, are critical for accomplishing this fundamental goal.

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Hence, it is important to assess the effect of government revenue and expenditure on an economy's growth (Roşoiu, 2015). An extensive amount of theoretical and empirical investigation had been conducted that examined the role of government revenue and expenditure in supporting economic growth (Gurdal et al., 2021). This, in fact, has turned out to be a widely debated issue resulting in a large body of literature on the subject. Researchers have long debated whether the changes in federal budget size are caused by expenditure modification followed by revenue adjustments or *vice versa* or both (Akpan, 2005; Baghestani & McNown, 1994).

The association between government's revenue collection and economic growth have been debated within research and academic parlance. Revenue collection by the government influences growth in the short-term, according to the neo-classical growth models but it affects economic growth in the long-term as per arguments put forth by the endogenous growth models (Karagianni et al., 2012). According to the neo-classical proponents, the government's revenue earnings have a temporary influence on growth, assisting economy in reaching full employment equilibrium. On the other hand, endogenous growth proponents argue that the government's revenue has a long-term effect on achieving the steady-state economic growth path since it impacts key growth indicators like income, output and employment. In their growth paradigm, Keynesian economists have included a role for revenue collection, notably taxation, with lower taxation leading to higher disposable income in the hands of the public, thereby encouraging consumption and, ultimately, growth of the economy.

The other important research subject that has perplexed researchers is the nature of the link between government spending and economic growth. In fact, the debate over the relationship between government spending and economic growth has a long history, and the impact of government spending on economic growth has turned out to be an issue of topical interest. Government expenditure can impact an economy's output either positively or negatively (Karagianni et al., 2019). In this context, it is also important to highlight the views of the two celebrated schools of economic thought – Keynesians and Classical stances on public expenditure. Government expenditure, according to the Keynesians, has a positive role (through the multiplier and accelerator channels) in boosting economic growth, whereas the classicals economists emphasised the market mechanism for fostering efficient resource allocation and economic growth.

Another area discussed in literature has been the relationship between government's revenue and expenditure. This link is critical for an effective fiscal consolidation process, which is even more important in case of emerging and developing economies with structural fiscal deficit, raising concerns about sustainability of their economic growth. Since the commencement of the COVID-19 pandemic, the issue of high level of debt and deficit has resurfaced as countries all over the world have experienced an unprecedented contraction in revenue and unforeseen spike in expenditure as a result of actions taken to protect lives and livelihoods. Arguments and counter-arguments about the virtues and drawbacks of having fiscal deficit have long been debated in theoretical literature. Several scholars have argued that fiscal deficit could catalyse the growth process whereas it has been countered by other academicians with the argument that higher deficit would make the growth process unsustainable (Amoah & Loloh, 2008). A balance policy towards revenue and expenditure could lead to an optimal level of deficit/surplus for maximisation of a country's economic growth. Against this backdrop, it is safe to assume that a proper understanding of the nexus between government revenue and expenditure becomes essential for framing fiscal policies that would promote long-term economic growth process.

Regarding the existing empirical literature, a recent analysis covering the period from 1980 to 2016 for G7 economies, using time-domain and frequency-domain panel causality tests revealed a unidirectional causation between government revenue and expenditure, as determined via the time-domain panel causality test (Gurdal et al., 2021). Using bootstrap analysis in a panel framework for European Union economies, it was discovered that countries like Greece, France, Italy, Portugal, and Spain had unidirectional causality running from government expenditure to revenue. In contrast, the United Kingdom, Belgium, Finland, Austria, Germany, and several other European Union economies had a causality running from government revenue to expenditure (Afonso & Rault, 2009). When it comes to Asian economies, examining the revenue-expenditure

nexus for ASEAN economies revealed mixed results with the causation running from revenue to expenditure predominating in most of them (Magazzino, 2014). Using co-integration and the ECM framework, unidirectional causality from government revenue to expenditure was found in case of Gulf countries. In contrast, bi-directional causality was identified in few Gulf economies (Fasano & Wang, 2002). For petroleum exporting countries, empirical evidence supporting the revenue-spend hypothesis was discovered using the vector autoregression (VAR) paradigm (Petanlar & Sadeghi, 2012). An examination of select Asian economies (nine countries) from 1960 to 2000 yielded mixed granger causality results, with only three nations revealing a long-run co-integrating relationship (Narayan, 2005).

On the other hand, empirical results of the effects of taxation on economic growth, is inconsistent, with several studies suggesting a positive association amongst taxes and economic growth (Jalata, 2014; Ugwunta & Ugwuanyi, 2015) while others report a negative or no significant relationship (Bonu & Pedro, 2009; Saibu, 2015). Lastly, the extant empirical works analysing the association between government's spending and economic growth could be categorised into four major ones as per empirical research findings. Firstly, several works had inferred the presence of a direct association amongst government spending and economy's growth (Aschauer, 1990; Kelly, 1997). Secondly, studies have found an inverse association between government spending and economy's growth (Abrams, 1999; Bergh & Henrekson, 2011; Engen & Skinner, 1992). Thirdly, studies have also discovered a U-shaped relationship between government spending and economy's growth (Carboni & Medda, 2010; Rahn & Fox, 1996; Scully, 2003). Lastly, there are also studies which point toward the inability to infer the exact association between these two macro parameters (Gemmell & Au, 2013).

It appears that several schools of thought have advanced various arguments regarding the relationship between government revenue, expenditure, and economic growth, but the debate remains unresolved. In this context, we attempt to decipher the long run association between government's revenue, expenditure, and economic growth at the general government level through an empirical investigation for select peer emerging economies. The existing literature on this topic has revealed that the empirical testing of the long run association between government revenue, expenditure, and economic growth in emerging market economies has been quite limited. Since India is an emerging market with great growth potential, we are conducting this study along with few select peer emerging economies (eight economies) from Asia, Europe, Latin America and Africa in a panel framework. From the existing empirical literature, we could only locate studies which focussed exclusively on Euro zone economies, Asian economies or those in the Latin American/African sub-continent. Thus, our combination of country selection covering economies from different continents is a first of its kind to the best of our knowledge. In fact, such a study is quite creative and interesting since despite their geographical difference, EMEs across continents share similar economic characteristics. For this study, we use data at the general government level since it provides an accurate representation of the impact of fiscal instruments such as government expenditure and revenue on economic growth and *vice versa*. Another major contribution is the application of panel cointegration and panel error correction techniques to fully use the panel data set. Even though we came across multiple cross-country studies in the literature, the majority of them utilised the typical time series modelling with individual time series data. In our panel co-integration framework, we also adopt more explicit modelling approaches such as Dynamic OLS (DOLS) and Fully modified OLS (FMOLS) for robustness check.

The reminder of the study comprises of three more sections. Section II contains the information on data used for the empirical exercise as well as specifics on the econometric methodology of our empirical exercise. The outcomes and interpretation from our empirical exercise are lucidly explained in Section III. The study's concluding observations are put forth in Section IV.

Methods

The empirical exercises undertaken in this paper are based on annual data from 1991-92 to 2019-20 sourced from the International Monetary Fund's (IMF) World Economic Outlook. Nine emerging market economies - South Africa, Russia, Malaysia, Poland, Chile, Hungary, Thailand,

Philippines and India – are chosen for their economic commonalities[1]. The data on general government revenue, general government expenditure and gross domestic product (GDP) are in real terms[2] and are used in natural logarithm form.

Unit Root Test

Using panel causality tests, panel cointegration tests and a panel error correction model, this paper investigates the relationship between governments' revenue, expenditure and GDP[3]. The long-run elasticities are also estimated using fully modified ordinary least square (FMOLS) and dynamic ordinary least square (OLS). Since the variables are at log level, they are expected to have unit root properties. Panel unit root tests are undertaken using methods proposed by Im, Pesaran, and Shin (2003) and Levin, Lin, and Chu (2002) and Fishers' ADF and PP test. The results of the unit root tests are reported in the following section.

Cointegration Test

After identifying the properties of variables, long-run relationships are examined using Pedroni Residual Cointegration Test (2004) and Kao Residual Cointegration Test (1999). Engle-Granger's (1987) two-step (residual-based) cointegration tests constitute the foundation for these cointegration tests.

Pedroni cointegration tests

This test extends the Engle-Granger (1987) cointegration test, which looks at the regression residual with I(1) variables to see if it has unit root features. If the residual obtained from the regression is I(0), the variables are cointegrated. In step 1, the following regression estimation is involved, and the residual is obtained. The test extended by Pedroni (2004) involves a panel framework. He has proposed many tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross-sections.

$$y_{it} = \sigma_i + \delta_i t + \beta_i x_{i,t} + \epsilon_{i,t} \quad (1)$$

where t = 1, …, T; and i = 1, …, N.

Here y and x are assumed to be I(1) and σ_i and δ_i are individual and trend effects that may be set to zero if desired. Under this framework, the null states that the residual is I(1). In the second step, the residual is tested for unit root, and if we reject the null, the variables are cointegrated. Eleven statistics with varying degrees of properties (size and power for different N and T) are generated.

Kao cointegration tests

The Kao test is also an extension of the Engle-Granger (1987) cointegration test. This test and Pedroni's test are similar, except the former specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. Like Pedroni, in step 1, the following regression is estimated with an intercept to be heterogeneous and slope to be homogeneous across cross-sections and setting all trend coefficients to be zero, and then the residual is obtained.

$$y_{it} = \sigma_i + \beta_i x_{i,t} + \epsilon_{i,t} \quad (2)$$

where t = 1, ..., T; and i = 1, ..., N.

Here y and x are assumed to be I(1). Under this framework, the null hypothesis is that the residual is I(1). In the second step, the residual is tested for unit root, and if we reject the null, the variables are cointegrated.

---

[1] For undertaking the empirical investigation, our annual data range was kept limited to the year 2019 to keep at bay the structural disruptions brought by the COVID-19 pandemic. A table depicting the key fiscal indicators of the nine emerging market economies are provided in Annex I.

[2] Nominal variables are converted into real variables using GDP deflators obtained from IMF's World Economic Outlook.

[3] Since there were data gaps in the case of a few countries under our consideration attributable to their non-availability, the empirical exercise was undertaken on an unbalanced data set.

Causality and Long-Run Elasticity

The vector error correction model (VECM), panel dynamic ordinary least square (DOLS), and fully modified OLS (FMOLS) are used to evaluate causality and long-run elasticities in this paper.

Vector error correction model

Vector error correction model facilitates estimation of short-run and long-run relationships along with the error correction process.

$$\Delta y = \alpha_i + \lambda_i ecm_{i,t-1} + \sum_{k=1}^{h} \beta_{1,i,k} \Delta y_{i,t-k} + \sum_{k=1}^{h} \beta_{2,i,k} \Delta x_{1,i,t-k} + \cdots + \sum_{k=1}^{h} \beta_{n+1,i,k} \Delta x_{n,i,t-k} + \varepsilon_{i,t} \quad (3)$$

where t = 1, 2, …, T, i = 1,2, …, N.

Here y and x are dependent and independent variables. β is the coefficients to be estimated, T is the period, N is the number of cross-section. The error correction term, *ecm*, specifies how much time it takes to adjust if a divergence from the long-run course happens.

Panel Dynamic Ordinary Least Square (DOLS) and Fully Modified OLS (FMOLS)

Long-run elasticities were evaluated using the DOLS and FMOLS methods after the direction of long-run causality was established. In comparison with the single equation methods, these robust estimators directly examine the condition on the cointegrating vector, which is essential for the existence of a strong relationship. In the panel cointegration framework, the use of FMOLS has been recommended by Pedroni (1996). Pedroni's FMOLS addresses the issue of heterogeneity. This is attained by including country-specific regression intercepts and allowing variation in serial correlation properties of the error processes across the countries in the panel data set.

On the other hand, Kao and Chiang (2001) extended the DOLS estimator to panel analysis. According to their pioneer work, the DOLS estimator is far more powerful in terms of unbiased estimation in the case of finite samples than both the OLS and FMOLS estimators. In addition, the DOLS estimator helps in controlling the model's endogeneity.

Results and Discussion

First, we'll look at a descriptive statistic for the three economic parameters that are being considered for the nine emerging market economies (Table 1).

Table 1. Descriptive Statistics

	ln(GDP)	ln(Expenditure)	ln(Revenue)
Mean	9.338	8.059	7.973
Median	9.277	7.644	7.660
Maximum	11.949	10.616	10.510
Minimum	5.771	4.476	4.533
Std. Dev.	1.731	1.752	1.744
Skewness	-0.256	-0.191	-0.162
Kurtosis	1.850	1.760	1.753
Jarque-Bera	15.376	16.341	16.120
Probability	0.001	0.0002	0.0003
Sum	2175.86	1877.91	1857.78
Sum Sq. Dev.	695.279	712.313	706.125
Observations	233	233	233
Cross Sections	9	9	9

Source: Authors' estimates.

Note: Expenditure and Revenue are pertaining to general government; and ln is natural log.

The stationarity properties of the concerned variables are tested using four methods: Im et al. (2003); Levin et al. (2002); Fishers' ADF; and PP test (Choi, 2001; Maddala & Wu, 1999). According to all tests, the variables are non-stationary in level but stationary at the first difference, indicating that the series has I(1) features (Table 2).

Table 2. Panel Unit Root Test Results

Method	ln(GDP)	ln(Expenditure)	ln(Revenue)
LLC-t*			
Level	0.97265	0.57145	0.27815
First Difference	-8.39625***	-6.83460***	-10.0416***
IPS W-stat			
Level	2.78260	3.91875	2.50170
First Difference	-8.41743***	-6.98578***	-9.02299***
ADF-Fischer Chi-Square			
Level	25.0174	5.78578	15.0690
First Difference	99.4933***	89.5866***	106.516***
PP-Fischer Chi-Square			
Level	30.5815	4.84413	15.7166
First Difference	75.5651***	190.173***	110.433***

Source: Authors' estimates.

Note: 1. Expenditure and Revenue are pertaining to general government; and ln is natural log.
2. LLC, IPC, ADF-Fischer and PP-Fisher examine the null hypothesis of non-stationarity. Probabilities for Fischer tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.
3. *** implies that the coefficient is significant at one per cent level.

Table 3. Pedroni's Panel Cointegration Test Results

Dependent Variable: GDP		Independent Variable: Expenditure
	Statistic	Weighted Statistic
Panel v-Statistic	0.447	0.447
Panel rho-Statistic	-2.021**	-2.021**
Panel PP-Statistic	-2.124**	-2.124**
Panel ADF-Statistic	-1.839**	-1.839**
Group rho-Statistic	-0.369	
Group PP-Statistic	-1.414*	
Group ADF-Statistic	-1.076	
Dependent Variable: GDP		Independent Variable: Revenue
	Statistic	Weighted Statistic
Panel v-Statistic	-1.650	-1.650
Panel rho-Statistic	-0.043	-0.043
Panel PP-Statistic	-1.912**	-1.912**
Panel ADF-Statistic	-6.741***	-6.741***
Group rho-Statistic	1.474	
Group PP-Statistic	-1.16	
Group ADF-Statistic	-6.894***	
Dependent Variable: Expenditure		Independent Variable: GDP
	Statistic	Weighted Statistic
Panel v-Statistic	1.945**	1.945**
Panel rho-Statistic	-1.695**	-1.695**
Panel PP-Statistic	-2.219**	-2.219**
Panel ADF-Statistic	-2.226**	-2.22**
Group rho-Statistic	-0.064	
Group PP-Statistic	-1.527*	
Group ADF-Statistic	-1.534*	
Dependent Variable: Revenue		Independent Variable: GDP
	Statistic	Weighted Statistic
Panel v-Statistic	4.309***	4.309***
Panel rho-Statistic	0.284	0.284
Panel PP-Statistic	-2.536***	-2.536***
Panel ADF-Statistic	-7.120***	-7.120***
Group rho-Statistic	1.780	
Group PP-Statistic	-1.903**	
Group ADF-Statistic	-7.344***	

Source: Authors' estimates.

Note: *, ** and *** implies that the coefficient is significant at 10 per cent, 5 per cent and 1 per cent level, correspondingly.

Given that the variables are integrated of order 1, Pedroni's panel cointegration test and Kao's residual cointegration test are used to examine the cointegration between general governments' revenue, expenditure, and GDP. Pedroni's panel cointegration test shows that GDP and government spending, and GDP and government revenue, are cointegrated. The relationship between GDP and government spending, and government spending and government revenue, was discovered to be bidirectional. Cointegration between GDP and government revenue, on the other hand, arises only when revenue is used as the dependent variable (Table 3).

Countries consider their revenue collection while framing their spending. Similarly, expenditure has an impact on economic growth, which helps to increase revenue collection. Surprisingly, the findings back this up: government spending and revenue are cointegrated regardless of which one is regarded as the dependent variable (Table 4).

Table 4. Pedroni's Panel Cointegration Test Results

Dependent Variable: Expenditure		Independent Variable: Revenue
	Statistic	Weighted Statistic
Panel v-Statistic	-1.314	-1.314
Panel rho-Statistic	-1.697**	-1.697**
Panel PP-Statistic	-2.009**	-2.009**
Panel ADF-Statistic	-6.644***	-6.644***
Group rho-Statistic	-0.067	
Group PP-Statistic	-1.277	
Group ADF-Statistic	-6.779***	
Dependent Variable: Revenue		Independent Variable: Expenditure
	Statistic	Weighted Statistic
Panel v-Statistic	4.669***	4.669***
Panel rho-Statistic	-1.735**	-1.735**
Panel PP-Statistic	-1.968**	-1.968**
Panel ADF-Statistic	-6.516***	-6.516***
Group rho-Statistic	-0.102	
Group PP-Statistic	-1.228	
Group ADF-Statistic	-6.627***	

Source: Authors' estimates.

Note: *, ** and *** implies that the coefficient is significant at 10 per cent, 5 per cent and 1 per cent level, correspondingly.

Table 5. Kao's Residual Cointegration Test

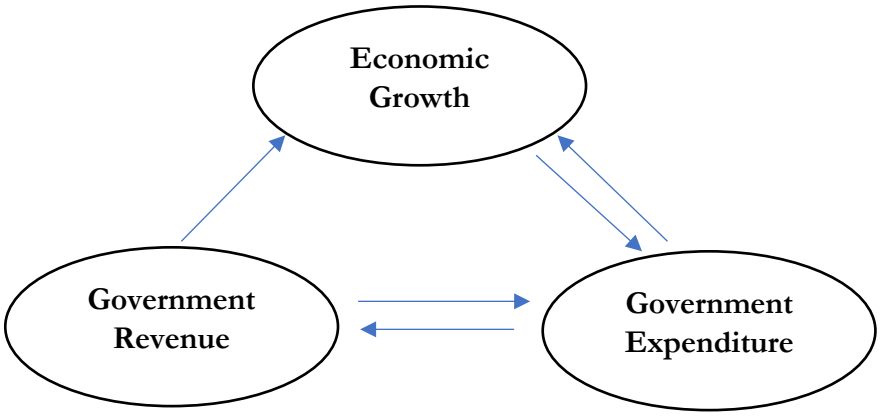
Variables		**t-Statistic**
Dependent Variable: GDP Independent Variable: Expenditure	ADF	-7.767***
Dependent Variable: GDP Independent Variable: Revenue	ADF	-1.387*
Dependent Variable: Expenditure Independent Variable: GDP	ADF	-8.607***
Dependent Variable: Revenue Independent Variable: GDP	ADF	-2.284**
Dependent Variable: Expenditure Independent Variable: Revenue	ADF	-11.224***
Dependent Variable: Revenue Independent Variable: Expenditure	ADF	-9.439***

Source: Authors' estimates.

Note: *, ** and *** implies that the coefficient is significant at 10 per cent, 5 per cent and 1 per cent level, correspondingly.

Kao's residual cointegration test is also used to confirm the long-run association between these three variables for robustness checking. Certainly, the conclusions drawn from Kao's panel cointegration test findings are the same as those in Pedroni's test results (Table 5).

The cointegrating relationship (*i.e.,* long-run association) was confirmed through the two panel cointegration tests (*viz.,* Pedroni's panel cointegration test and Kao's residual cointegration test) among the three economic variables (*viz.,* economic growth, government revenue and government expenditure) and could be summed up in Figure 1.



Note: The arrow indicates the direction of cointegration (long run association) between the variables.

Figure 1. Growth-Expenditure-Revenue Nexus for Nine Select Emerging Economies

Table 6. Panel Vector Error Correction Model (VECM) Estimation Results

Independent Variable/Equation	Dependent Variable					
	GDP	GDP	Expenditure	Expenditure	Revenue	Revenue
Long-run						
GDP	-	-	1.05**	-	1.1***	-
Expenditure	0.94**	-	-	-	-	0.99**
Revenue	-	0.90***	-	1.0**	-	-
Short-run						
Constant	0.05***	0.06***	0.07***	0.07***	0.06***	0.06***
Δ (GDP (-1))	0.01	0.38	-0.13	-	-0.08	-
Δ (GDP (-2))	-0.12	0.04	-0.02	-	-0.02	-
Δ (Expenditure (-1))	-0.11	-	0.06	0.37	-	-0.13
Δ (Expenditure (-2))	-0.13	-	-0.4	-0.34	-	-0.23
Δ (Revenue (-1))	-	-0.57	-	-0.6	-0.04	-0.02
Δ (Revenue (-2))	-	-0.23	-	-0.04	-0.21	-0.004
Error-Correction Term						
ECR	-0.37*	-0.86*	-0.07*	-0.57*	0.08*	0.03*
Diagnostic Tests						
Adjusted R-square	0.15	0.30	0.17	0.33	0.05	0.11
F-statistic	9.12	21.28	10.5	24.47	3.49	6.7
Akaike AIC	-2.78	-2.98	-2.68	-2.9	-3.02	-3.09
Schwarz SC	-2.7	-2.9	-2.6	-2.81	-2.94	-3

Source: Authors' estimates.

Note: *, ** and *** implies that the coefficient is significant at 10 per cent, 5 per cent and 1 per cent level, correspondingly.

A bi-variate panel vector error correction model (PVECM) is then used to estimate elasticities of GDP in relation to general government revenue and expenditure, as well as revenue and expenditure elasticities in relation to GDP. The derived coefficients can directly be read as elasticities because the variables are in a natural logarithm. According to the findings, a 1 per cent increase in expenditure and revenue would result in an increase in GDP by 0.94 and 0.90 per cent, respectively, in the long run. Similarly, an increase in GDP of 1 per cent would lead to increase in

government expenditure by around 1.1 per cent. On the other hand, an increase in government revenue by one per cent would cause a correspondent increase in government expenditure by nearly one per cent. The elasticities of revenue with respect to GDP and expenditure are found to be statistically significant; however, the error correction terms, which explain possible corrections of deviations from the long run path, are found to be insignificant. Therefore, we are ignoring the results of these elasticities (Table 6).

Following the panel VECM approach for predicting long-run elasticities, our work used both the FMOLS and DOLS methodologies for calculating long-run elasticities for robustness checks. Estimating using FMOLS and DOLS has several advantages, as discussed in the methodology section. All the coefficients of the dependent variables evaluated within the bivariate framework turn out to be significant in the case of both the FMOLS and DOLS approaches, which is consistent with the estimation of long run elasticities using the VECM approach (Table 7). With marginal deviations, the elasticities are also of equal magnitude. Higher GDP leads to higher government spending. Spending has an impact on GDP as well as on revenue collected by the government. Because capital spending has a greater multiplier, effective capital project investment would result in a rise in the future income, which would help the government to repay its existing debt and incur additional capex. The results are reflected in both DOLS and FMOLS.

Table 7. Panel Fully Modified Ordinary Least Square (FMOLS) and Panel Dynamic Ordinary Least Square (DOLS) Results

FMOLS	
Variables	**Coefficient**
Dependent Variable: GDP Independent Variable: Expenditure	0.85***
Dependent Variable: Expenditure Independent Variable: GDP	1.16***
Dependent Variable: Revenue Independent Variable: GDP	1.14***
Dependent Variable: Expenditure Independent Variable: Revenue	1.02***
Dependent Variable: Revenue Independent Variable: Expenditure	0.98***
DOLS	
Dependent Variable: GDP Independent Variable: Expenditure	0.86***
Dependent Variable: Expenditure Independent Variable: GDP	1.13***
Dependent Variable: Revenue Independent Variable: GDP	1.11***
Dependent Variable: Expenditure Independent Variable: Revenue	1.01***
Dependent Variable: Revenue Independent Variable: Expenditure	0.97***

Source: Authors' estimates.
Note: *, ** and *** implies that the coefficient is significant at 10 per cent, 5 per cent and 1 per cent level, correspondingly.

To sum up, the empirical investigation was undertaken for determining the long-term relationship between government revenue, expenditure and economic growth. The confirmation of the long-run economic relationship between these variables could help policy makers enhance their foresight. Interestingly, our empirical investigation confirms the existence of such a relationship between these variables in the nine emerging market economies under consideration. From the empirical exercise, a bi-directional causal long-run association between economic growth and government expenditure, as well as between government expenditure and government revenue, was found using the standard panel cointegration tests. However, in the case of

government revenue and economic growth, we could only find a one-way causality (*i.e.,* a long-run association running from government revenue to economic growth and not otherwise). Our findings are consistent with numerous other studies on the subject. We also estimated the long-run elasticities using three distinct methods after demonstrating the existence and direction of causality in the long-run, for a better understanding of the impact of each of these economic variables on one another These estimates also pointed towards a strong nexus between government revenue, government expenditure and economic growth.

From the point of macroeconomic stability, the government's revenue, which is the key source of funding for its expenditure, is critical. On the other hand, large government spending would have a multiplier effect on the economy, resulting in higher revenue collections for the government. In this context, it is recommended that the government's plans for increasing tax collection needs to be consistent with its spending objectives. This would ensure that the purchasing power of the public remains unaffected. Adequate capital spending, and targeted, high quality revenue spending by the government would benefit the economy by increasing demand and ultimately resulting in higher economic growth. Higher economic growth would set a virtuous cycle of increased government spending and revenue collection. As a result, emerging and developing economies must devote sufficient attention to spending, particularly capital spending, which has a considerable impact on economic growth. Nonetheless, as a word of caution, countries must exercise prudence while incurring expenditure financed through borrowing, as excessive borrowing could lead to a vicious cycle of unsustainable debt and, eventually, decrease economic growth.

Conclusion

The main goal of this study was to determine the long-term relationship between government spending, revenue, and economic growth at the general government level in nine emerging economies (South Africa, Russia, Malaysia, Poland, Chile, Hungary, Thailand, Philippines, and India) from 1991 to 2019. The findings of our paper point toward a strong relationship between government revenue, government expenditure and economic growth in the nine select emerging economies. The key take away from our analysis for policy makers is that adequate attention needs to be paid to fiscal policy decisions such as revenue collections and expenditure incurrence by the authorities, apart from channelising the benefits accrued from economic growth. This would lead to unleashing the virtuous cycle between higher economic growth, government expenditure and revenue collections.

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Annex I: Key Fiscal Variables of the Nine EMEs

	1991	2000	2005	2010	2015	2019
General Government Revenue (per cent of GDP)						
Chile	22.2	21.5	24.2	22.7	22.9	23.7
Hungary	-	44.1	41.6	44.5	48.4	43.6
India	19.0	17.4	19.1	18.8	19.9	19.9
Malaysia	29.0	19.6	21.7	22.3	22.2	21.6
Philippines	17.8	17.5	17.1	16.1	18.5	20.0
Poland	-	39.0	40.3	38.4	39.1	41.0
Russia	-	33.8	37.1	32.3	31.9	35.7
South Africa	-	21.3	25.0	23.8	25.8	26.8
Thailand	-	17.6	21.8	20.9	22.3	21.0
General Government Expenditure (per cent of GDP)						
Chile	20.7	22.2	19.7	23.1	25.0	26.5
Hungary	-	47.2	49.4	48.9	50.4	45.7
India	26.8	25.6	26.4	27.4	27.1	27.4
Malaysia	27.4	25.6	24.5	26.6	24.7	23.6
Philippines	18.0	20.8	18.7	18.3	17.9	21.7
Poland	-	43.0	44.2	45.8	41.7	41.8
Russia	-	30.7	29.5	35.5	35.3	33.8
South Africa	-	22.6	25.1	28.3	30.2	31.5
Thailand	-	19.3	19.6	22.0	22.2	21.8
General Government Fiscal Balance (per cent of GDP)						
Chile	1.5	-0.7	4.5	-0.4	-2.1	-2.7
Hungary	-	-3.0	-7.8	-4.4	-2.0	-2.1
India	-7.8	-8.3	-7.4	-8.6	-7.2	-7.5
Malaysia	1.6	-6.1	-2.8	-4.3	-2.5	-2.0
Philippines	-0.3	-3.3	-1.6	-2.3	0.6	-1.7
Poland	-	-4.0	-3.9	-7.4	-2.6	-0.7
Russia	-	3.1	7.6	-3.2	-3.4	1.9
South Africa	-	-1.4	-0.1	-4.5	-4.4	-4.7
Thailand	-	-1.8	2.2	-1.1	0.1	-0.8

Source: World Economic Outlook, IMF.
Note: '-' implies Not Available.

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