“Macroeconomic determinants of Jordan’s external debt in the period 1980–2022 using ARDL”

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MACROECONOMIC DETERMINANTS OF JORDAN'S EXTERNAL DEBT IN THE PERIOD 1980–2022 USING ARDL

Abstract

This paper addresses the macroeconomic determinants of Jordan's external debt. The study aims at exploring the impact of foreign direct investment inflows on external debt service, gross domestic product (GDP), inflation, government spending, and real exchange rate, on the external debt of Jordan from 1980 to 2022. The study utilizes the autoregressive distributed lag (ARDL) bound cointegration econometric model to establish long-run relationships between variables. The model also investigates short-run dynamics via an error correction model to give insight into how quickly the system returns to equilibrium following a shock. Statistical results demonstrate an inverse link between foreign direct investment and debt, where a 1% increase in investment reduces debt by 0.15311%. Similar patterns are seen with GDP and external debt, where a 1% GDP rise reduces debt by 0.4743%. Government spending shows a direct relationship, with a 1% increase causing a 1.02049% debt rise. Real exchange rate and inflation impact debt, with a 1% rise causing debt to increase by 0.067 and decrease by 0.00771 dollars, respectively, though these effects are relatively small. In the short run, the system adjusts to shocks with an error correction coefficient indicating a 24% correction to equilibrium each period.

Keywords external debt service, foreign direct investment inflows, gross domestic product

JEL Classification F20, F21, F23, F34, F35

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INTRODUCTION

Foreign direct investment (FDI) serves as a catalyst for the economic growth of any nation, facilitating the influx of capital, technology, and knowledge. The significance of FDI is especially magnified in developing countries, where it fills the void left by inadequate fixed capital formation, limited access to advanced technology, and insufficient domestic savings. In such economies, FDI acts as a critical enabler of development, compensating for the insufficiency of domestic savings to fuel growth, and assisting in managing continual budget and trade deficits. Jordan, faces recurring crises and challenges at the economic, social, and political levels, has been making persistent efforts to attract FDI to bolster its economic trajectory.

One sector where the impact of FDI is less understood, yet critically important, is its influence on external debt, both are significant sources of funding where a country often resort to in the absence of sufficient domestic resources. Although Jordan relies heavily on such external financing, the relationship between FDI and external debt in the Jordanian context remains underexplored in the current literature. Addressing this gap, this study seeks to analyze the impact of FDI flows on Jordan's external debt, thus contributing to the ongoing debate on the association between FDI and external debt.

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Over the past few years, several researchers have delved into the dynamics of FDI and its impact on economies. Bekhet and Al-Smadi (2017) studied the effect of FDI on the economic growth in Jordan and found that FDI inflows had a positive effect on the country's economic growth. However, they did not explore the specific impact of FDI on external debt. A similar investigation conducted by Al Kasasbeh (2021) identified a long-run equilibrium relationship between FDI and economic growth in Jordan, yet the interplay with external debt remained unaddressed. Oudat et al. (2019) focused on the effects of FDI on employment generation in Jordan, leaving a gap in understanding the relationship between FDI and external debt. Additionally, Al-Qudah et al. (2021) also highlight the critical role of a strong financial market, which can intensify the impact of foreign direct investment on economic growth by providing sufficient liquidity and facilitating domestic and foreign investment linkages.

The aim of this study is to provide empirical evidence on the macroeconomic determinants of external debt in the context of Jordan. In doing so, it seeks to investigate effects of FDI inflows, external debt service, GDP, government expenditures, inflation rate and foreign exchange rate on Jordan's external debt.

To accomplish the stated aim, this study sets out three objectives. First, it will employ the autoregressive distributed lag (ARDL) approach to investigate the effect of FDI on Jordan's external debt using time series data from 1980 to 2020. Second, it will test the hypothesized relationships between external debt and its potential macroeconomic determinants. Lastly, it will draw conclusions and policy implications based on the empirical results of the study. These findings will not only enrich the existing literature on the subject but will also provide valuable insights for policymakers in Jordan, helping them better manage the nation's external debt.

1. LITERATURE REVIEW

The relationship between external debt and FDI has received considerable attention in economic research. Different econometric models and techniques were used to test the significance of the relationship between external debt and FDI. This relationship was examined in the context of panel data from country groups or at the individual country level. This section reviews the literature starting with group studies and then looking at country-level studies.

In an early study, Elbadawi et al. (1997) investigated the effect of debt service on investment in Sub-Saharan African countries, using a panel regression model, and found a negative and significant effect of debt service on investment. They concluded that debt service is an important determinant of investment in the region. For Jordan, Ajmi (2002) analyzed economic variables affecting foreign investment in Jordan. He argued that GDP and the flow of Arab and foreign finance over the period 1985–1999 had the main impact on investment and economic growth supported by stable political and economic conditions. But the relationship between external debt an FDI was not explored. Azam and Khan (2011) examined how public debt influences FDI in Pakistan by analyzing time series data from 1981 to 2007. Their findings indicated that public debt has a negative impact on the inflow of FDI into Pakistan. As a result, they suggested that the appropriate management of public debt is crucial to fully reap the benefits of FDI in the country. At the country level, Lokesha and Leelavathy (2012) surveyed the determinants of FDI in India. They found that the debt-to-GDP ratio is negatively related to FDI inflows, which implied that the increased debt-to-GDP ratio resulted in India's economic instability and made the country less attractive to foreign investors. Although evidence from Kenya is inconclusive, Mugambi (2014) found that external debt service, the openness of the economy, market size, return on investment, and real interest rate had insignificant negative impacts on FDI. However, by utilizing a more advanced econometric approach and incorporating gross fixed capital formation, inflation rate, exchange rate, and real GDP as control variables, Mugambi discovered that external debt service had a significant negative impact on FDI. His study suggests that the government should decrease its reliance on external borrowing to finance economic growth and instead cut its programs to

prevent a higher budget deficit. Ostadi and Ashja (2014) investigated the relationship between external debt and FDI using panel data from eight developing countries (Bangladesh, Egypt, Nigeria, Indonesia, Iran, Malaysia, Pakistan, and Turkey) over the period 1995–2011, and they found that external debt had a significant negative effect on FDI. Increasing foreign debt had created a negative expectation for investors and reduced investment. Moreover, the study found that the government size had a negative effect on attracting foreign investment and crowded out private investment. Jilenga and Gondje-Dacka (2016) investigated the impact of external debt and FDI on economic growth in Tanzania, using time series data for the period from 1971 to 2011. They indicated that in the long run, external debt had a positive impact on economic growth, but FDI had a negative impact on economic growth. Therefore, they called for proper management of external debt since debt servicing could be a serious impediment to economic growth and development. Al-Fawwaz (2016) examined the determinants of external debt in Jordan between 1990 and 2014 by employing the ARDL model. His findings showed a significant positive impact of a trade variable on external debt in the long run, while GDP per capita exhibited a statistically significant negative impact on external debt. On the contrary, Oche et al. (2016), employing more sophisticated econometric techniques, found a positive and significant relationship between public debt and FDI in South Africa during the period 1983–2013. Wabwalaba (2017) examined the impact of public debt on the inflow of foreign direct investment (FDI) in Kenya. The findings indicated a positive correlation between FDI inflows and public debt. However, the study also observed that the increase in public debt had only resulted in insignificant improvements in FDI inflows within the country. Tanna et al. (2018) explored how external debt affects the potential economic growth benefits resulting from foreign direct investment (FDI). Utilizing both annual and 5-year averaged data for 39 developing countries between 1984 and 2010, they provided empirical evidence supporting the idea that the growth stimulated by FDI is reliant on external debt restrictions. Specifically, their findings indicated that heavily indebted economies are limited in their ability to reap growth benefits from FDI, as they prioritize reducing their debt levels beyond a certain threshold. Omar and Ibrahim (2021) studied the determinants of external debt in Somalia from 1980 to 2018 using joint integration to establish short and long-term relationships and using Distributed Autoregressive Model (ARDL). They showed that the exchange rate and domestic investment had a significant and positive impact on external debt in the long run, while per capita GDP and government spending had significant and negative effects on external debt. Dawooda et al. (2021) studied the external debt of some developing Asian countries during the period from 1995 to 2019 and used the generalized method of moments (GMM) that solved the problems of potential homogeneity between countries in estimating the study results and outcomes. They showed that economic growth and investment reduced external debt, while exchange rate, trade, and government spending increased external debt in the short and long terms.

It is clear from the previous literature that FDI and external debt were important sources of financing economic growth and development in Jordan and other developing countries. The evidence drawn from the literature was mixed. In some cases, there had been a negative relationship between FDI and external debt. The negative relationship could be explained as follows: The higher government budget deficit led to fiscal and financial imbalances. This would force the government to tighten fiscal policy through lowering spending or higher taxes. As a result, aggregate expenditures would fall, and economic growth would be hindered. This negative relationship was reinforced by the fall in FDI, which was affected negatively by the rise in the risk of default, and hence lower expected rates of returns on investment opportunities in the domestic economy. These adverse conditions fed into creating an inappropriate business environment and generated a wave of pessimistic expectations, which would lead to a reduction in both domestic and foreign direct and indirect investment (Krugman, 1988; Clements & Nguyen, 2003; Mugambi, 2014).

On the other hand, the positive relationship between FDI and external debt could be explained by the hypothesis that both assumed a positive role on financing economic growth and development. They served complementary roles. Both FDI and external debt augmented domestic saving role and contributed to economic growth and development.

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The primary objective of this study was to investigate and analyze the impact of foreign direct investment (FDI), along with other key macroeconomic variables, on Jordan's external debt over the time period spanning from 1980 to 2022. This investigation was carried out utilizing the autoregressive distributed lag (ARDL) model.

2. ECONOMIC MODEL

The economic model employed by this study relies on the traditional investment model developed by Udo and Obiora (2006); and is accustomed to capture to the effect of foreign direct investment inflows and other macroeconomic variables on external debt in Jordan.

For the purpose of the study, it is hypothesized that the dependent variable external debt (EXD) is determined by a set of independent variables, namely, the external debt service (EXDS), foreign direct investment inflows (FDII), government spending (GS), gross domestic product (GDP), real exchange rate of the dinar (REXCH), and inflation rate (INF). The model is specified in a semi-logarithmic form given in equation (1):

$$LEXD = \beta_0 + \beta_1 LEXDS + \beta_2 LFDII + \\ + \beta_3 LGDP + \beta_4 LGS + \beta_5 REXCH + \\ + \beta_6 INF + \mu \ , \quad (1)$$

where *LEXD* is the log of external debt; *LEXDS* is the log of external debt service; *LFDII* is the log of direct foreign investment inflows, *LGDP* is the log of *GDP*; *LGS* and *LGS* is the log of government spending. *REXCH* and *INF* are real exchange rate and inflation rate, as specified in the previous paragraph, and μ is the error term. Table 1 summarizes expected signs of model independent variable effects on the dependent variable (*LEXD*).

Table 1. Summary variables and expected signal

Variables	Expected Signal
LEXDS	–
LFDII	–
LGDP	–
LGS	+
REXCH	+
INF	–

Data are sourced from the World Bank, UNCTAD, International Monetary Fund (IMF), and Jordan's Central Bank. All data are reported in million US dollars and are annual data for the model variables during the study period (1980–2022) for Jordan.

The choice of the study period is due to two main reasons, the first of which is the availability of data for all the variables of the study, and the second factor is the quality of the time series and their suitability for measurement and satisfying requirements of models applied.

To estimate various models, the study utilizes the statistical software EViews 12, known for its wide range of econometric and statistical modelling tools. The study primarily employs a general Autoregressive Distributed Lag (ARDL) model to analyze the short and long-run relationships between variables of interest. To examine variable stationarity, the study uses the Phillips-Perron (PP) unit root test. And to select the optimal lag length for models, Vector Autoregression (VAR) lag order selection criteria were used, which provided more insights into the stationarity of model variables. Next, to examine the long-term equilibrium relationship between FDI and Jordan's external debt, a bounds test was conducted, which is a common approach to check for cointegration in time series data. The results from the ARDL model were then used to estimate the long-run coefficients of model variables, providing further insights into the long-term impacts of FDI on Jordan's external debt. Upon finding evidence of a long-run relationship, an error correction model (ECM) was estimated. The ECM allow understanding how FDI and external debt adjust in the short run when they deviate from their long-term equilibrium relationship. Lastly, to ensure that the model was stable over the entire period under study, the Cumulative Sum (CUSUM) stability test was used. The results from this test helped validate model's robustness and strengthen the reliability of empirical findings.

And for the purpose of this study, the model takes the difference form:

$$\begin{aligned}\Delta LEXD_t &= \beta_0 + \beta_1 LEXD_{t-1} + \\ &+\beta_2 LEXDS_{t-1} + \beta_3 LFDII_{t-1} + \\ &+\beta_4 LGDP_{t-1} + \beta_5 LGS_{t-1} + \\ &+\beta_6 REXCH_{t-1} + \beta_7 INF_{t-1} + \\ &+\sum_{i=0}^{p}\beta_{5i}\Delta LEXD_{t-i} + \sum_{i=1}^{q1}\beta_{6i}\Delta LEXDS_{t-i} + \\ &+\sum_{i=2}^{q1}\beta_{7i}\Delta LFDII_{t-i} + \sum_{i=3}^{p}\beta_{8i}\Delta LGDP_{t-i} + \\ &+\sum_{i=4}^{q1}\beta_{9i}\Delta LGS_{t-i} + \sum_{i=5}^{q2}\beta_{10i}\Delta REXCH_{t-i} + \\ &+\sum_{i=6}^{q2}\beta_{11i}\Delta INF_{t-i} + \varepsilon_{1t},\end{aligned} \quad (2)$$

and estimates the long-run relationships between the variables using the following equations:

$$\begin{aligned}\Delta LEXD_t &= \beta_0 + \sum_{i=0}^{p}\beta_{1i}\Delta LEXD_{t-i} + \\ &+\sum_{i=1}^{q1}\beta_{2i}\Delta LEXDS_{t-i} + \sum_{i=2}^{q1}\beta_{3i}\Delta LFDII_{t-i} + \\ &+\sum_{i=3}^{p}\beta_{4i}\Delta LGDP_{t-i} + \sum_{i=4}^{q1}\beta_{5i}\Delta LGS_{t-i} + \\ &+\sum_{i=5}^{q2}\beta_{6i}\Delta REXCH_{t-i} + \sum_{i=6}^{q2}\beta_{7i}\Delta INF_{t-i} + \varepsilon_{1t},\end{aligned} \quad (3)$$

and estimates the error correction model (ECM) relationships between the variables derived from the ARDL bounds test through a simple linear transformation. Using the following equations:

$$\begin{aligned}\Delta LEXD_t &= \beta_0 + \sum_{i=0}^{p}\beta_{1i}\Delta LEXD_{t-i} + \\ &+\sum_{i=1}^{q1}\beta_{2i}\Delta LEXDS_{t-i} + \sum_{i=2}^{q1}\beta_{3i}\Delta LFDII_{t-i} + \\ &+\sum_{i=3}^{p}\beta_{4i}\Delta LGDP_{t-i} + \sum_{i=4}^{q1}\beta_{5i}\Delta LGS_{t-i} + \\ &+\sum_{i=5}^{q2}\beta_{6i}\Delta REXCH_{t-i} + \sum_{i=6}^{q2}\beta_{7i}\Delta INF_{t-i} + \\ &+\lambda ECM_{t-1} + \varepsilon_{1t}.\end{aligned} \quad (4)$$

While the existence of cointegration established in models (3) and (4) may not necessarily suggest the stability of the estimated coefficients, Pesaran and Pesaran (1997) and Pesaran et al. (2001) recommended the evaluation of parameter stability in estimated models using Brown et al.'s (1975) tests, which are referred to as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) tests (Dritsakis & Stamatiou, 2014).

3. RESULTS

Below data on foreign investment and external debt will be discussed, then empirical results are reported and analyzed.

3.1. Data analysis

During the early 1980s, FDI sees a steady climb from USD 941.44 million in 1980 to USD 1,696.51 million in 1988. This suggests the economy was in a favorable state for foreign investments, policies were enacted to encourage it. However, there was a slight decline in 1989 to USD 1499.80 million, which suggests a fluctuation in the economic conditions or investor sentiment during that time. The FDI in the 1990s generally shows a stabilizing trend, hovering around USD 1,300 to USD 1,400 million with slight fluctuations. However, there is a notable rise towards the end of the decade with FDI reaching USD 2,065.41 million in 1998 and USD 2,221.81 million in 1999. The steady trend suggests the economic conditions and policies were favorable but not significantly innovative to spur massive growth. The period from 2000 to 2007 sees a significant boost in FDI, indicating a very positive market scenario and perhaps, economic reforms that attracted foreign investments. From USD 3,135.12 million in 2000 to a whopping USD 19,012.76 million in 2007, the jump is quite pronounced. The 2008 global financial crisis seems to have not drastically impacted FDI, as growth is still evident, albeit at a slower rate. This suggests that the economy managed to hold on to its foreign investors during the crisis. Post the financial crisis, there was a steady climb from USD 21,867.74 million in 2010 to USD 36,555.62 million in 2020. This period likely indicates the recovery and strength of the economy, attracting steady and increased foreign investment. Despite the global impact of the COVID-19 pandemic that started in 2019–2020, the data shows that FDI continued to

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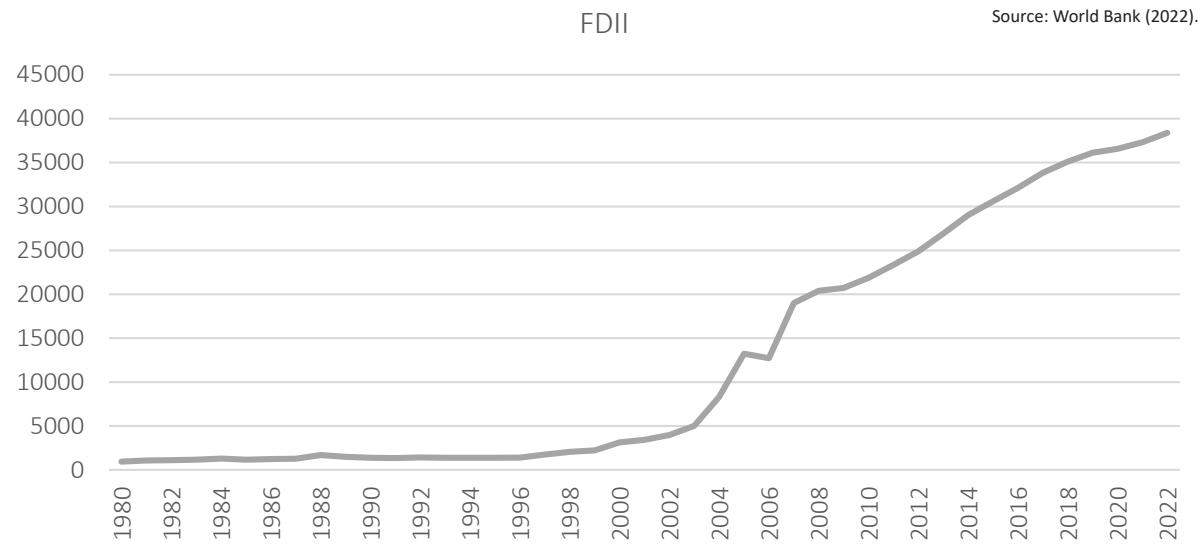

Figure 1. Foreign direct investment inflows to Jordan, 1980–2022

rise from USD 36,555.62 million in 2020 to USD 38,379.84 million in 2022. This could indicate resilience in the economy and continued investor confidence, despite the global health crisis. This in-depth look paints a picture of an economy that has generally been successful in attracting and retaining foreign investment over time, with periods of significant growth in the early to mid-2000s and consistent growth after recovering from the 2008 financial crisis. It is worth noting that many factors can influence FDI, including political stability, infrastructure, access to markets, skilled labor, tax policies, and more (World Bank, 2022).

Another source of financing investment and accumulating capital, to promote economic growth and development, is borrowing from external resources, especially when domestic savings are insufficient to finance the process of growth and development, and to cope with continuing government budget deficit, or to finance the chronic trade deficit as in the Jordanian case.

Figure 2 shows the growth of Jordan's external debt throughout the study. During the early years of the 80s, external debt was less than two billion dollars, and started to increase gradually in the second half of the decade. Following the drastic fall of the exchange rate of the dinar, external debt increased dramatically in 1990 to reach an unprecedented high of USD 9,700.26 million. This was a reason for Jordan to start financial adjustment reforms and external debt began to decline until 1998, then external debt fluctuated up and down around an average of USD 2 billion in the next decade, then rose to about USD 23,003.17 million in 2013. External debt continued to rise in the following years until it reached more than USD 38 billion in 2020. Moreover, experts predict that external debt will continue to rise further in 2021 and 2022 because of the breakout of COVID-19 and the associated economic hardships (Macrotrends LLC, Jordan Report, 2022).

The rise in external debt had resulted in higher debt service ratios. For example, the debt service to export ratio rose in the year 2019 to more than 19%. What makes the problem of external debt more serious, as some researchers claimed, the fact that foreign loans were not utilized appropriately, or directed to productive sectors to increase production and exports, and hence an increase in national income and national savings to reflect positively on the balance of payments (Abdelhadi, 2012).

The Jordanian government's capital spending faces a shortage of funding, as it usually resorts to increasing current expenses more than capital expenses due to the economy's increasing need for funding current expenses. However, capital spending contributes more to stimulating the national economy than current spending.

Figure 3 shows the development of government spending in Jordan in the period 1980-2022, indicating that government spending gradually in-

Source: World Bank (2022).

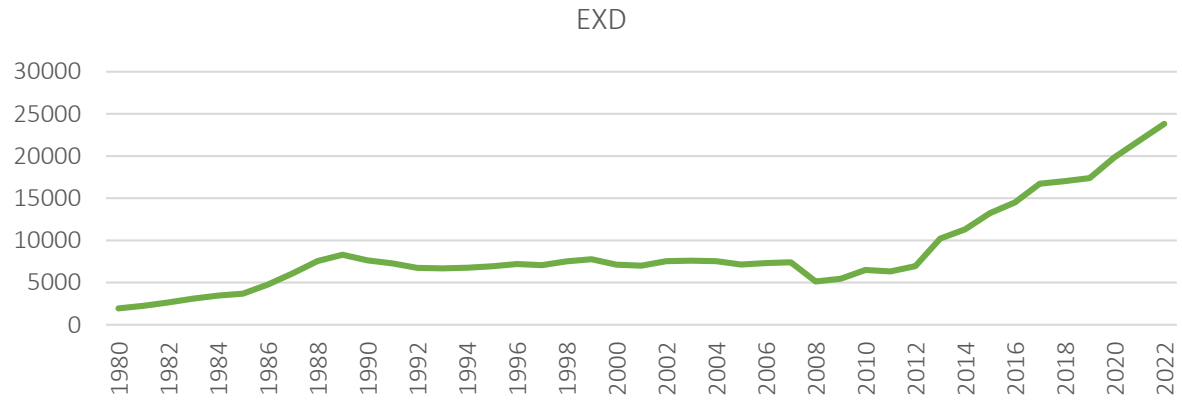

Figure 2. External debt 1980–2022

creased irregularly and with clear fluctuations during the study period. In 1980, government spending amounted to USD 1,810.5 million and then began to gradually increase in the following years. Between 1988 and 1989, Jordan experienced a significant depreciation of the dinar against the US dollar which resulted in a decrease in government spending from USD 2,838.2 to USD 1727.5 in 1989. From 1990 to 1998, there was a slight continuous increase, and then the value of government spending decreased in 1999 to USD 2,759.2 and increased to USD 2,861.4 million in 2008. In the following years, the values continued to increase gradually until reaching USD 4,134 million in 2004, due to an increase in current spending that year. In the next few years, the values continued to increase gradually until 2009, when they significantly increased to USD 8,493.7 million due to an increase in both current and capital spending. The following year 2010, it decreased to USD 8,039.4 million due to a decrease in capital spending, and then it increased again in 2011 to reach USD 9,572.7 million. The volume of government spending continued to increase until 2014 due to an increase in the number of Syrian refugees, which led to an increased need for necessities and infrastructure, which were funded directly from capital government spending, reaching USD 11,057.9 million. Then it decreased in 2015 to USD 10,877 million due to a decrease in both current and capital expenditures. In the following years, it began to gradually increase until it reached USD 12,973.7 million by the end of the period in 2020. This is attributed to many reasons, including the emergence of the COVID-19 virus, which greatly increased expenditures on the healthcare sector. Given the context of Jordan, the increase in government expenditure might be attributed to Jordan having been dealing with an influx of refugees from neighboring countries for several years. The country may have increased spending on social programs, healthcare, education, and housing to accommodate this population (The Central Bank of Jordan, 2022).

Source: The Central Bank of Jordan (2022).

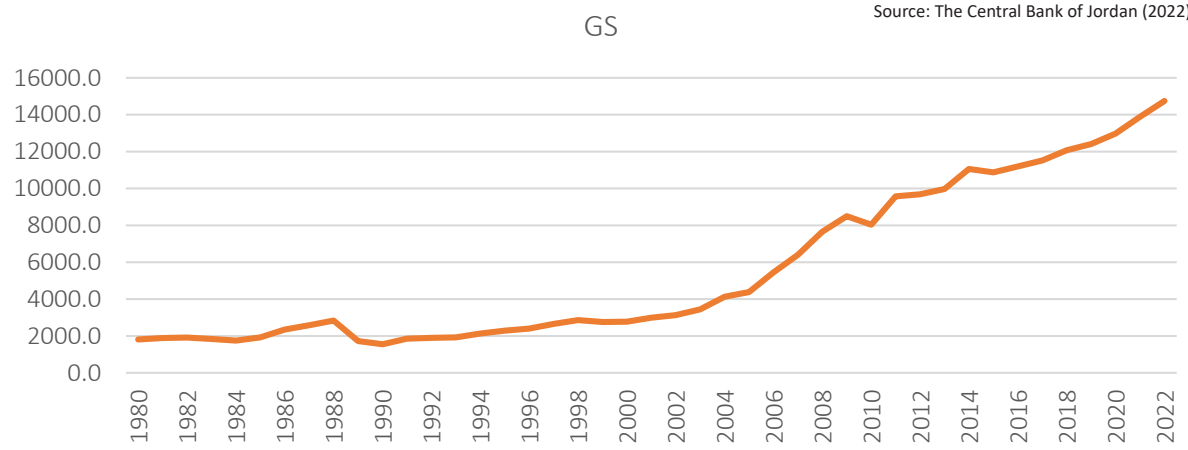

Figure 3. Government spending 1980–2022

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In summary, from the 1980s to 2022, Jordan's economy experienced a rise in Foreign Direct Investment (FDI), suggesting favorable economic conditions and resilience amidst global crises like the 2008 financial crisis and COVID-19. However, Jordan also saw a considerable increase in external debt due to economic hardships and potential mismanagement of foreign loans, worsened by a high debt-service ratio. Despite escalating government spending, driven by factors like refugee influx and the COVID-19 pandemic, capital expenditure that effectively stimulates the economy remains underfunded.

3.2. Empirical results

To interpret the results of the autoregressive distributed lag (ARDL) test, at first the values and statistical significance of the estimated coefficients need to be considered. The estimated coefficients in the ARDL model indicate the short-run and long-run effects of the independent variables on the dependent variable. The statistically significant coefficients, as denoted by p-values less than the chosen significance level (often 0.05 or 0.01), highlight the variables that significantly impact the dependent variable. Particularly, the error correction model (ECM), derived from the long-run ARDL model, is of high importance. A statistically significant and negative ECM signifies that any deviation from the long-run equilibrium is corrected. The speed of adjustment towards equilibrium is determined by the magnitude of the ECM. Any insignificant or wrongly signed ECM would indicate a misspecification of the model. Lastly, the diagnostic tests (LM-Test, ARCH test, and The Jarque-Bera normal distribution test), including serial correlation, heteroskedasticity, and stability checks, would help assess the model's reliability.

Table 2 gives summary statistics for data used in the study.

Phillips-Perron (PP) unit root test provides evidence on whether the variables are stationary or not under the null hypothesis that it suffers from a unit root (non-stationary). The test results for variables are shown in Table 3.

Table 2. Summary statistics, 1980–2022

Source: Created by the authors.

	EXD	EXDS	FDII	GDP	GS	REXCH	INF
Mean	8612.458	1214.221	12654.56	17608.31	5577.63	2.203767	4.738669
Median	7204.528	858.1078	3428.293	8975.69	2995.1	1.656619	3.161597
Maximum	23818.3	3948.167	38379.84	46945.77	14741.82	5.375343	23.62468
Minimum	1940.086	241.6716	941.4384	3910.037	1555.8	1.30114	-0.41387
Std. Dev.	5132.197	863.22	13706.61	15057.96	4253.557	1.295326	4.716302
Skewness	1.418957	1.466962	0.688252	0.796534	0.75143	1.422785	1.929617
Kurtosis	4.383598	4.293531	1.830692	1.987047	2.001516	3.271759	7.691348
Jarque-Bera	17.85951	18.42036	5.844497	6.385393	5.83287	14.63993	66.11687
Probability	0.000132	0.0001	0.053813	0.041061	0.054126	0.000662	0
Sum	370335.7	52211.48	544146.1	757157.5	239838.1	94.76197	203.7628
Sum Sq. Dev.	1.11E+09	31296249	7.89E+09	9.52E+09	7.60E+08	70.47048	934.2272
Observations	43	43	43	43	43	43	43

Table 3. Phillips-Perron test results

Source: Created by the authors.

Variables	Phillips and Perron (PP) Test				Remarks
	Levels		First Difference		
	Stat	p-value	Stat	p-value	
LEXD	–1.3754	0.5851	–4.3436	0.0013	I(1)
LEXDS	–1.7443	0.4022	–11.0225	0	I(1)
LFDII	–0.2242	0.9273	–5.1301	0.0001	I(1)
LGDP	–0.0039	0.9528	–4.2791	0.0016	I(1)
LGS	0.313	0.9763	–5.2342	0.0001	I(1)
REXCH	–3.1093	0.0334	–	–	I(0)
INF	–5.2645	0.0001	–	–	I(0)

Table 4. VAR lag order selection criteria test

Source: Created by the authors.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–180.516	NA	2.78E–05	9.375809	9.671363	9.482672
1	133.8704	503.0185	4.99E–11	–3.89352	–1.529088*	–3.038616*
2	190.7229	71.06558*	4.25E–11	–4.28614	0.147166	–2.6832
3	258.7027	61.18186	3.27e–11*	–5.235135*	1.267051	–2.88415

The test of stationarity indicates that the variables (LEXD, LEXDS, LFDII, LGDP and LGS) are not stationary in their level I(0) at the 5% significance level, but stationary at the first difference I(1). However, INF and EXCH are stationary at level I(0). stationarity when (intercept).

After performing the unit root test, the optimal lag length is selected to determine how many lags should be included in the regression. Since adding too many lags inflates the standard errors of estimated coefficient, causing forecasting error and omitting lags cause an estimation bias. In case the optimal lag length is three lags, as can be seen from Table 4.

ARDL cointegration technique is preferable when dealing with variables that are integrated of different order, I(0), I(1), or combination of both orders. Long-run association of the series is established when the F-statistic exceeds the critical value. If the time series is not a cointegration at the level, then the existence of a long-term relationship between the variables and this combination is a cointegration over time. This approach helps in identifying the cointegrating vectors where there are multiple cointegrating vectors (Pesaran & Shin, 1999; Pesaran et al, 2001). When performing this test, the results are shown in Table 5.

Table 5. ARDL bounds test for the existence of cointegration

Source: Created by the authors.

Test Statistic	Value	K
F-statistic	6. 205064	6
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	1.99	2.94
5%	2.27	3.28
2.50%	2.55	3.61
1%	2.88	3.99

Both tests reject the null of zero cointegrating vectors. On the other hand, the hypothesis that there are four cointegrating vectors cannot be rejected. There exists a cointegrating relationship. So, it can be concluded that all variables move together in the long run.

The autoregressive distributed lag (ARDL) bounds testing approach is adopted to examine the long-run relationship. Results show that the long-run relationship among variables in the model does exist. This can be seen by looking at computed F-statistics. The computed value of the F-statistics is almost 6.2 and is greater than the upper bound of 3.99 at a 1% significance level. And these tests led to conclude there is cointegration between the variables of the model. Table 6 reports long-run estimated coefficients of the independent variables based on the ARDL model.

Table 6. Long-run estimated coefficients based on the ARDL model (3,3,0.0,2,0.0)

Source: Created by the authors.

Variable	Coefficient	Std. Error	t–Statistic	Prob.
C	–1.98715	0.761331	–2.61011	0.0151
LEXD(–1)	0.19018	0.12427	1.530383	0.0385
LEXDS(–1)	–0.34825	0.119554	–2.91288	0.0074
LFDII	–0.15311	0.054551	–2.80674	0.0096
LGDP	–0.4743	0.231716	–2.04692	0.0513
LGS(–1)	1.02049	0.321868	3.170528	0.004
REXCH	0.066787	0.028589	2.33612	0.0278
INF	–0.00771	0.003262	–2.36437	0.0261

Note: the dependent variable is LEXD.

Table 4 shows that there is an inverse relationship between foreign direct investment and external debt in the long term, and this is consistent with economic theory, meaning that an increase in direct foreign investment inflows by 1% leads to a decrease in external debt by 0. 15311%. Since the external debt service has a negative sign and a 10% significance level, this indicates the existence of an inverse relationship between the external debt service and the external debt in the long term, that an increase in external debt service by 1% leads to a decrease in external debt by 0. 34825%. Also notice

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that there is an inverse relationship between Gross Domestic Product and external debt in the long term, meaning that an increase in Gross Domestic Product by 1% leads to a decrease in external debt by 0. 4743%, and this is consistent with economic theory. Also, note that the coefficient of government spending appears with a positive sign, and this indicates the existence of a direct relationship between government spending and external debt in the long term, meaning that whenever government spending increases by 1%, the external debt increases by 1.02049%. As for the sign, the real exchange rate has a positive and significant effect on external debt. And the event of a rise in the real exchange rate by 1% (i.e., a real depreciation of the dinar) increases the level of external debt increases by more than USD 0. 066787. And in general, this is a small percentage with no significant big effect. Finally, inflation has a negative and significant effect on external debt. And the event of a rise in the real exchange rate by 1% decreases the level of external debt by more than USD 0. 00771. In general, this is a small percentage with no significant big effect.

Engle and Granger pointed out in 1987, in the case of a common complementarity relationship between the variables, the best model for estimating the relationship is the error correction model (ECM). Therefore, to estimate the effects and relationships in the short term, estimate the error correction model for study (Table 7).

Table 7. Results of estimating the error correction model (ECM)

Source: Created by the authors.

Variable	Coefficient	Std. Error	t–Statistic	Prob.
D(*LEXD*(–1))	–0.27699	0.131479	–2.10669	0.0453
D(*LEXD*(–2))	–0.46205	0.12245	–3.77341	0.0009
D(*LEXDS*)	–0.04644	0.035028	–1.32571	0.1969
D(*LEXDS*(–1))	0.144253	0.04378	3.294931	0.0029
D(*LEXDS*(–2))	0.154381	0.037449	4.122446	0.0004
D(*LGS*)	0.382349	0.102359	3.735381	0.001
D(*LGS*(–1))	–0.32921	0.120242	–2.73786	0.0112
CointEq(–1)*	0.19018	0.023858	7.971189	0

The short-run effect of external debt service, foreign direct investment, gross domestic product, government spending, real exchange rate, and inflation on external debt indicated by the error correction coefficient is significant and confined between the values 0 and –1. The statistical result says that the model corrects 19.1% of the fluctuations and changes in each period to return to equilibrium after each shock in the variables. This suggests that it takes 5.25 years to move from a short-run to long-run relationship.

To ensure the quality of the model and that it is free from standard problems, the following diagnostic tests must be performed. The constancy test such as a cumulative sum of recursive residual (CUSUM) of the model is shown in Figure 4. And note that the model is stable throughout the study period according to Brown et al. (1975), as the graph is a curve that falls within the limits of

Source: Created by the authors.

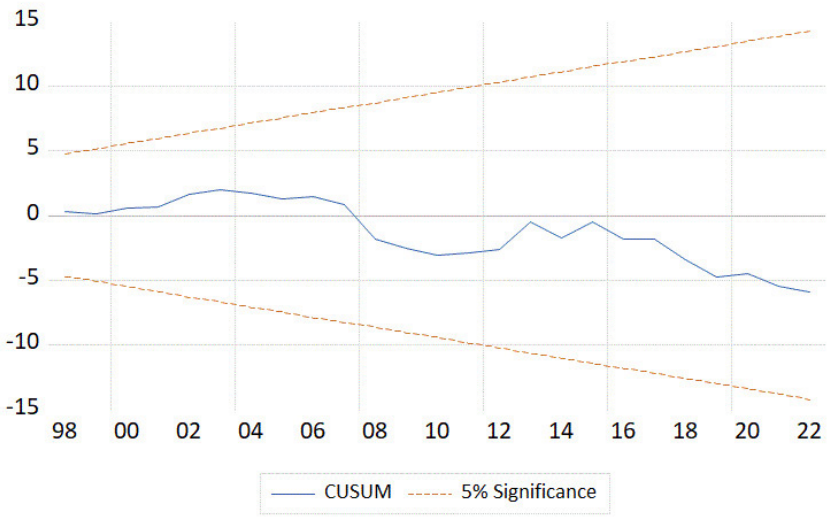

Figure 4. CUSUM stability test

Table 8. Breusch-Godfrey serial correlation LM test

Source: Created by the authors.

Breusch-Godfrey Serial Correlation LM	F-statistic	1.135175	Prob. F(14,25)	0.3778
	Obs*R-squared	15.54561	Prob. ChiSquare(14)	0.3419

Table 9. Heteroskedasticity test: ARCH

Source: Created by the authors.

Heteroskedasticity Test: ARCH	F-statistic	0.248674	Prob. F(1,37)	0.621
	Obs*R-squared	0.260366	Prob. Chi-Square(1)	0.6099

the critical point of the state, which indicates the structural stability of the ARDL model at a significant level.

The Breusch-Godfrey Serial Correlation, the LM test indicates that the null hypothesis is residuals are not serially correlated. If you look at the probability values indicated (0. 3419), it turns out that the values are greater than 0.05. That is, the null hypothesis that there is no serial correlation is accepted. It is shown in Table 8.

Table 9 using the ARCH test shows that the model does not suffer from the problem of instability of variance because the probability value is estimated at 0.6099, which is greater than 5%. That is, the null hypothesis that there is no problem of consistency of variance is accepted.

The Jarque-Bera normal distribution test for the series of residuals in Figure 5 was used to confirm that the probability value is equal to 0.568323, which is greater than the level of propaganda (5%), and this means accepting the null hypothesis that the residuals follow the normal distribution.

4. DISCUSSION

This study aimed to examine the impact of foreign direct investment (FDI), GDP, government spending, external debt service, foreign exchange rate and inflation on Jordan's external debt between 1980 and 2022, with the Autoregressive Distributed Lag (ARDL) model serving as the method of investigation. The results indicate a complex interplay between FDI and external debt, which is both multifaceted and period-specific, reflecting similar complexity found in numerous studies in the extant literature.

Drawing parallels between the results and prior research highlights that this study is part of a broader tapestry of investigations into the relationship between FDI and external debt. For instance, Jilenga and Gondje-Dacka's (2016) study in Tanzania showed a negative effect of FDI on economic growth, which contrasted with the positive correlation found in the studies of Wabwalaba (2017) in Kenya and Oche et al. (2016) in South Africa between FDI inflows and public debt. Such variations underscore the context-dependent na-

Source: Created by the authors.

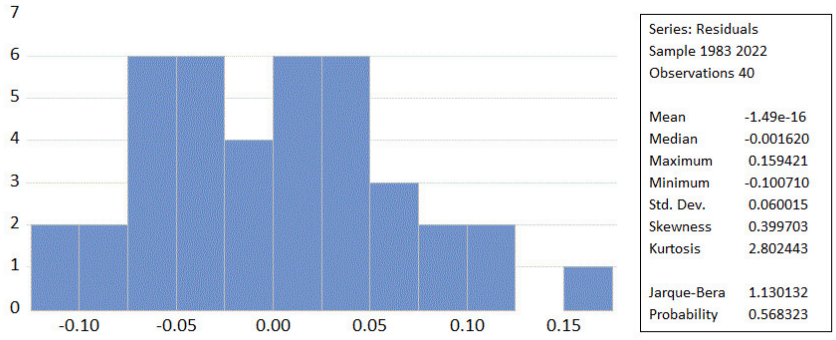

Figure 5. The Jarque-Bera normal distribution test

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ture of the FDI-external debt dynamic, which this study further illuminates in the Jordanian setting.

The findings build upon the work of Al-Fawwaz (2016), who investigated the determinants of external debt in Jordan without specifically focusing on the role of FDI. This study not only confirms Al-Fawwaz's results concerning the influence of economic factors on Jordan's external debt but also enriches the understanding of the issue by highlighting the intricate role FDI can play in this context.

The nuanced relationship discovered in this study aligns with two contrasting theoretical frameworks identified in the literature review. The first posits that FDI and external debt can serve complementary roles in driving economic growth and development (Tanna et al., 2018). Alternatively, as Krugman (1988), Clements and Nguyen (2003), and Mugambi (2014) suggest, increasing external debt can lead to fiscal imbalances, which can, in turn, deter FDI due to elevated default risk and contribute to a slow-down in economic growth.

The findings carry implications for Jordan's economic policymaking. Given the intricate role of FDI in influencing external debt, it is clear that a thoughtful, strategic approach to managing FDI inflows and external debt is necessary. Policymakers need to consider the nature, source, and targeted sectors of FDI to ensure that its benefits are maximized, while potential negative impacts are minimized.

Despite its contributions, this study is not without its limitations. Inherent in the ARDL model is a set of assumptions that, although statistically powerful, may not fully encapsulate the reality of economic dynamics. Furthermore, the focus on aggregate FDI may conceal potential differences in the effects of FDI coming from various sources or directed towards different sectors.

Future research should delve deeper into the impacts of these different types of FDI and examine the role of other macroeconomic factors in shaping the relationship between FDI and external debt. Longitudinal and comparative studies involving other countries in the region would also add valuable insights to the discussion and aid in painting a more complete picture of the dynamics at play.

CONCLUSIONS

This study was undertaken to investigate the impact of foreign direct investment (FDI) and other macroeconomic variables on Jordan's external debt over the time span of 1980 to 2022, utilizing the autoregressive distributed lag (ARDL) model. The findings indicate a complex relationship between FDI and external debt, marked by periods of both positive and negative influences. This complexity is in sync with the results from a variety of previous studies, suggesting that the effect of FDI on external debt is multifaceted and influenced by diverse factors, including the specific economic and policy environment, prevailing global trends.

These findings have significant implications for Jordan's economic policymaking. The interplay between FDI and external debt underscores the need for strategic management of FDI inflows and debt levels. Policymakers are advised to consider several aspects while crafting policies related to FDI, including its origin, the nature of the investment, and the sectors it targets. Efforts should be directed towards maximizing the benefits of FDI, such as economic growth and development, while also mitigating potential drawbacks like increased fiscal imbalances or external debt.

Future investigations should go deeper into the various impacts of different types of FDI and consider the influence of other macroeconomic factors in shaping the relationship between FDI and external debt. A comparative approach, incorporating data and trends from other countries within the region, could further enrich our understanding and provide a more holistic view of the dynamics at play.

This study has shed light on the complex interplay between FDI and external debt in the Jordanian context. As Jordan charts its path toward economic development, the insights gained from this nuanced

understanding will be crucial for formulating sound and effective economic policies, as well as setting strategic future directions for attracting FDI and external debt management.

AUTHOR CONTRIBUTIONS

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Funding acquisition: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Investigation: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Methodology: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Project administration: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Resources: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.Software:
Supervision: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Validation: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Visualization: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Writing – original draft: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.
Writing – review & editing: Atef Baniata, Ahmad Alnawasreh, Faten Nsairat.

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