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THE EFFECT OF REMITTANCES ON POVERTY AND ECONOMIC GROWTH IN JORDAN: EVIDENCE FROM AUGMENTED AUTOREGRESSIVE DISTRIBUTED LAG MODEL

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Abstract. This study investigates the effects of remittances on poverty and economic growth in Jordan from 1970 to 2022. The study makes use of the augmented autoregressive distributed lag (AARDL) cointegration method to investigate the relationships between remittances, poverty, and economic growth. The study also incorporates control variables including foreign direct investment, inflation, interest rates, government expenditures, and the composite trade index to take into consideration their potential impact on the outcomes. The findings support remittances' role as an economic development accelerator by demonstrating their strong positive impact on Jordan's economic growth. Remittances have a detrimental impact on poverty as well, suggesting a potential role for them in efforts to eradicate it. The research also confirms the anticipated impacts of the control variables, indicating that while inflation, interest rates, and the composite trade index have favourable effects on poverty, government expenditures and foreign direct investment have negative consequences. The policymakers and stakeholders in Jordan will need to consider the implications of these findings carefully. Policymakers can create measures to draw in and successfully channel remittance flows by recognising the beneficial effects of remittances on economic growth and poverty alleviation. The findings also highlight how important it is to encourage foreign direct investment, control inflation and interest rates, and facilitate trade diversification in order to boost economic growth and lower poverty.

Keywords: AARDL, economic growth, poverty, remittances, Jordan.

JEL Classification: B23, F43, I32, F24, Q01.

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1. Introduction

Given its significant economic, social, and cultural effects on both sending and receiving countries, international migration is still a key issue on the global agenda. More than one in seven people, or around one billion people worldwide, are migrants (Carpiniello, 2023). Due to their expanding volume and the effects they have on destination nations, remittances – payments sent by migrants to their family back home – have gained in importance. Between 1970 and 2023, the amount of remittances and employee remuneration received by poor nations increased dramatically, from roughly $700 million to $1100 billion (World Development Indicators [WDI] (World Bank, 2023)). Remittances are preferred to foreign direct investment, official development aid (ODA), and portfolio stock inflows as the most reliable

source of foreign money for poor nations (Ekanayake & Moslares, 2020; Zaman et al., 2021; Coffie, 2022; Tchekoumi & Nya, 2023). It is important to keep in mind that official estimates of remittances may be too low because informal channels contribute significantly and might increase overall remittances by up to 65% (World Bank, 2023). Remittance earnings can sometimes account for a sizeable amount of a nation's GDP; in Jordan, they range from 18% to 25% (WDI (World Bank, 2023)).

Remittances are generally used for consumption rather than productive investments as far as the economy is concerned. Because of this, the degree to which remittances boost productivity and economic growth depends on the wise use of these funds (Butkus et al., 2020; Dujava, 2020; Bajra, 2021; Saliba et al., 2022; Rexhepi, 2023). Because of this, how households use remittance revenues is a key factor in deciding how they affect growth. Among the advantages of remittances, it is important to highlight their contribution to the reduction of poverty and their capacity to enable more streamlined consumption patterns, which has a multiplier effect on aggregate demand and output (Umair, 2023). Remittances can be used by recipient households for current expenses, asset building, the development of human capital, or insurance (Cui et al., 2023; Wu et al., 2023). On the other hand, because interest must be paid, development loans like Official Development Assistance (ODA) have higher expenses. Additionally, payments made via legal and informal channels avoid the possibility of governmental misallocation that can happen with official development assistance (ODA). Remittances and child education are correlated, according to recent research that looked at household investments in human capital development in underdeveloped nations (Virak & Bilan, 2022; Yameogo & Omojolaibi, 2022; Djeunankan et al., 2023).

Therefore, the effects of remittances for households may not, however, be long-lasting, especially if they are not invested appropriately. The opportunity cost of international migration also differs for skilled and unskilled labour, where skilled labour is defined as people who have received specialised training or who have a skill set necessary for their line of work. One-third of Tajik migrants hold a secondary professional or higher education degree, according to the Statistic Committee of the Jordan of Alshirah et al. (2022), showing increased migration opportunity costs. Despite remittances' growing importance in overall international financial flows, their effects on poverty and economic development in Jordan have not been sufficiently researched. This research aims to fill that gap by examining the impact of remittances on economic growth and poverty reduction in Jordan. Augmented Autoregressive Distributive Lags (AARDL) will be employed to analyze the period from 1970 to 2022, making this study the first of its kind in Jordan.

2. Literature review

Workers' remittances, employee compensation, and migrant transfers have been conventionally regarded as the three indicators to be examined. These three factors are usually applied by the researchers as a whole to determine the wide area of remittances. Nevertheless, all the sources are not equally good. The category of workers' remittances is considered to be the most trustworthy indicator of monetary flows that can be ascribed to migrants' overseas labour activities. Accessing its political relevance and the different ways through which remittances might impact economic growth, the effect of remittances on growth has been

investigated in recent times, due to its popularity. The positive hypothesis that remittances provide a useful contribution to growth is primarily supported by the findings of some studies. For example, Islam (2022) uses the data of 1986 to 2019 of South Asian economies, to study the link between remittances and economic growth with the help of panel data. FDI inflow and TOP (these are examples of control variables). The research employs various tests, including GLS, FMOLS, CS dependency, unit root and D-H panel causality tests. Thee GSL and FMOLS estimates agree together that remittances are beneficial for the economic growth as well. The D-H test of the causality reveals a one-directional causal effect from the remittances to economic growth. The data reveal that for stimulating economic growth, South Asian countries should look for attracting additional remittances through policies on encouraging international movement, educational institutions for migrants, and export items variety, and should also focus on FDI inflows of selective type.

Remittances effects on economic growth in South Africa from 1970 to 2019 are discussed by Nyasha and Odhiambo (2022). The objective of this study is to get the numerical data indicating that whereby remittances help in economic growth of the underdeveloped countries in spite of contradictory literature. The results that is contrary to the meanings are found suggesting remittances have a negative effect on economic growth in South South Africa, regardless the short term or long-term study, applying the autoregressive distributed lag (ARDL) bounds testing method. However, Ali et al. (2022) devoted themselves to finding out how the money supply (M2) affects GDP in Pakistan during 1972 to 2018. Furthermore, they conclude that money supply (M2), investment in capital (CI), working force (LF), and GDP are stationary at the I(1) level while inflation is stationary at the I(0) level by performing the unit root tests and the ARDL method. The research notes the positive impact of M2 (Pakistani money supply) on GDP, which makes a case for the use of appropriate monetary policy instruments to help achieve economic equilibrium. Batool et al. (2022) conducted time series analysis using the data obtained from 1980 to 2020 to show the association between the development of the financial sector, money flows, and economic growth. The study whose methodology is ARDL reveals that the financial sector and remittances have a complementary relationship both in the short and long run showing that the development of the financial sector intensifies the growth of remittances and same level of growth.

Additionally, Jayaraman and Makun (2022) study the sectoral and asymmetric effects of remittances on India's per capita annual income, based on the variables such as Information and Communication Technology (ICT) and financial sector. The findings display that the adverse impacts of the decrease in remittances face per capita GDP growth results prevail over the positive effects by using nonlinear technology. This shades in how the policies must be created in such a way that allows these 3 components to coexist in order to support economic growth. Also, the paper of Kersan-Kabić and Tijanić (2022) tells us how remittances contribute to the economic growth of countries in Central and Eastern Europe. This analysis based on panel data covering the EU enlargement period of 2004 to the present, confirms that both sides of the migration deal are positively and significantly affecting economic growth. Factors that are in addition to final consumption, gross fixed capital formation, trade balance and foreign direct investments also affect economic growth. They do, though, say that considerations about the benefits of remittances have to be taken into account with the drawbacks of

emigration. From 1985 to 2019, Tung and Thang (2022) look into how remittances affected income inequality in 18 emerging economies. Their research shows that remittances and income disparity are negatively correlated, with larger remittance receipts being linked to lower levels of income inequality. Income disparity can be decreased in part through trade openness, economic liquidity, and foreign direct investment.

On the other hand, rising government spending, inflation, and GDP per capita can all exacerbate the income disparity. Using a fixed-effects model, Bucevska (2022) examines the impact of remittances on economic growth in six SEE nations and discovers that remittances significantly boost economic growth. Using panel data, Chowdhury et al. (2023) explore the role of remittances in driving economic development in low-income Asian border countries and find that they have a markedly detrimental effect. Olaniyan et al. (2022) investigate the connection between remittances, the establishment of financial institutions, institutional development, and economic growth in ECOWAS nations. Remittances are found to have a detrimental impact on economic growth, but when combined with the expansion of the financial sector, they are found to have a positive impact, validating the complementarity hypothesis. Furthermore, strong institutions in the ECOWAS region can be replaced by remittances, and strong institutions have a good impact on growth. In order to encourage the mobilisation of savings and profitable investment for economic growth, the study emphasises strengthening the roles of financial sector organisations in the remittance process.

Amaka et al. (2023) apply the error correction model (ECM) in this research to study the impact of remittances on poverty reduction in Nigeria. Their research indicated that an increase in remittance inflows has an impact that the poverty rate descends. Other features that have a share in the fight against poverty include gross domestic product recalculated for inflation and real per capita, foreign direct investment, and financial market access. Trade openness displays a positive link with poverty, whereas inflation is generally negatively correlated. Barkat et al. (2023) found that remittances not only had a huge positive impact on energy poverty in developing countries but also that the impact was large. The connection between remittances and energy poverty is getting moderated by inequality in economics, income poverty, human development, and quality of institutions, respectively. Higher urbanization as well as the improvement of economic performance both offer greater access to energy. In the study of the effects of remittances on economic growth in the CEMAC region done by Tchekoumi and Nya (2023), a threshold effect as a factor showing non-linearity relationship was discovered. Remittances positively and significantly affect the economic growth under regime one, but it has a reverse impact under regime two, which includes political stability, private investment, and trade openness.

Khan (2023) finds how their remittance inflows may allow India economies to grow through positive shocks in the short and long run. Djeunankan et al. (2023) promote the body of knowledge on remittances and energy poverty by adding the evidence that remittances share energy needs of the developing countries. Remittances are known to reduce energy poverty through three transmission channels: income inequality, economic growth, and schooling. Alsamara and Mrabet (2023) employ the augmented mean group nonlinear method to study the asymmetrical effect of the financial outflows on the economic growth of the Gulf Cooperation Council (GCC) countries. They are to find that an increase of remittances outflows is more negatively valuable than a drop does to the oil free national GDP level.

When it comes to fluctuations in oil prices, the negative effects are only made worse by this. Hosan et al. (2023) study on the impacts of remittances on multidimensional energy poverty in Bangladesh showed that households with remittance income suffer much less energy poverty than others. They suggest that increase in re-mitances can help eradicate energy poverty in Bangladesh and other such countries and enunciate the necessity to have policies that look into the wellbeing of migrant labour and flow of cash towards clean energy. In the recent study of the two countries, Romania and the Republic of Moldova Vasile et al. (2023) conducted a multidimensional explitaion on remittances concerning the macroeconomic factors of the labour market, financial impact, and microeconomic results on consumption, health costs, educational, and household modernization.

The study of the literature covered well several articles presenting findings related to remittances impact on pro-growth, poverty, energy poverty, income inequality, and many more issues in different countries and regions. Although it shall be clear that the previous research in Jordan has nothing in common at all with the existing gap in the literature. The ideas about the economies of South Asia, South Africa, Pakistan, Central and Eastern European countries, emerging economies, low-income Asian border nations, ECOWAS regions, Nigeria, developing countries and CEMAC region are emphasized in the literature review. This research area is diverse, encompassing a number of issues, such as the benefits of remittance for economic growth and the potential harm that it may cause to income inequality as well as the energy poverty. The current research in Jordan, even though it can be seen as a contributory, is directed towards revealing the exact impact of remittances on poverty and economic growth therein. Besides advancing the autoregressive distributed lag (ARDL) cointegration model and frequency-domain-causality (FDC) analysis, it also makes contributions to the methodological side of the research. Through Carter visit, the study may be able to explore the special role and effect of remittances in Jordan; the dynamics and the impact may be different from other locations and nations as studied in literature. This study underscores the need for a deeper understanding of how remittances impact economies and societies under various circumstances as it is in this context that it has a place in the literature. Given the role of remittances in the fight against poverty and in economic growth, the paper may be extended to include policy recommendations based on the results. By focusing on these elements, the study can help close the knowledge gap regarding the precise connection between remittances, poverty, and economic growth in Jordan while also emphasising the significance of using cutting-edge econometric techniques like ARDL and FDC to increase the analytical rigour.

3. Methodology

3.1. Data sources and model

The secondary time-series data employed in the current analysis spans from 1970 to 2022. The main objective of this research is to assess the impact of remittances on poverty and economic growth in Jordan. To address additional significant variables, the study incorporates government expenditure, inflation, interest rates, foreign direct investment, and a composite trade index as control variables. Poverty is measured using the poverty headcount ratio

at $3.65 a day (2017 PPP) (% of population), while economic growth is indicated by Gross Domestic Product Per Capita in current USD. Remittances are measured using personal remittances received in current US dollars. Foreign direct investment is represented by net inflows (BoP, current US$), inflation is represented by the consumer price index (2010 = 100), interest rates are represented by the real interest rate (%), and government expenditure is represented by general government final consumption expenditure in current US dollars. To enhance the measurement of trade intensity, the study adopts the composite trade intensity proposed by Squalli and Wilson (2011). The primary data source for this study is the World Development Indicators (World Bank, 2023). The models used are as follows:

$$GDPC_t = \aleph_0 + \aleph_1 REM_{t-1} + \aleph_2 FDI_{t-1} + \aleph_3 INF_{t-1} + \aleph_4 IR_{t-1} + \aleph_5 GEP_{t-1} + \aleph_6 CTI_{t-1} + \vartheta_t; \quad (1)$$

$$POV_t = \aleph_0 + \aleph_1 REM_{t-1} + \aleph_2 FDI_{t-1} + \aleph_3 INF_{t-1} + \aleph_4 IR_{t-1} + \aleph_5 GEP_{t-1} + \aleph_6 CTI_{t-1} + \vartheta_t. \quad (2)$$

3.2. Unit root

Researchers examined if the variables were stationary using several unit root tests, such as the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Dickey-Fuller Generalised Least Squares (DF-GLS), and Kapetanios and Shin Unit Root Test (KSUR), before estimating the augmented autoregressive distributed lag (ARDL) model. We used specially built unit root tests to handle any uncertainties in break dates and to make common unit root tests (ADF, PP, DF-GLS, and KSUR) more effective. One of these tests that was used was the LS (2013) unit root test, which incorporates a minimal LM test with one structural break. In terms of size and power characteristics, the LS (2013) test demonstrated higher performance compared to previous structural break tests as the Clemente-Montanes Reyes (CMR). It provided reliable break date identification, which decreased the possibility of wrong estimates and break date forecasts.

3.3. Augmented autoregressive distributed lag bounds test

This study uses the ARDL cointegration technique, which was introduced by Pesaran et al. (2001), to analyse the effects of remittances, foreign direct investment, inflation, interest rate, government expenditure, and composite trade intensity on economic growth and poverty in Jordan. Although there are a number of cointegration approaches, for example Johansen and Juselius (1990), these methods are only applicable to data series with preset integration orders. Because the data series do not adhere to a fixed integration sequence, the ARDL model provides more flexibility. This model accepts variables with varying integration orders, such as I(0)/I(1), but is not acceptable when any variable has an integration order of I(2). Additionally, applying lag selection for both explanatory and dependent variables can resolve endogeneity problems and give strong results even with a small sample. The fact that the ARDL model allows the independent variables to be I(0)/I(1), even if the dependent variable is integrated, makes it more popular among academia. Nevertheless, some authors pointed out some drawbacks, specifically with the necessity of explanatory variables to be I(1), and the recommended t-test, which may eventually produce an incorrect analysis and even a case of degeneration, as suggested by Pesaran et al. (2001). Thus, in order to remove these problems, Sam along with his co-authors (Sam et al., 2019) recommended the incorporation of F-test for explanatory factors along with other tests i.e. F-test and t-test.

They insisted on the need of the second t-test or F-test on the lagged explanatory variables, because they considered the ARDL test as a lack from this respect in focusing only on the single lagged explained variable. This solution aims to alleviate the case 1 problem as Pesaran and co-authors (Pesaran et al., 2001) and Narayan and Smyth (2005) observed it. However, a modified model was built, which included an additional t-test on the coefficients of the lagged explanatory variables. The model is clarified in the following:

$$\Delta \ln GDPC_t = \aleph_0 + \sum_{i=1}^{y} \aleph_1 \ln GDPC_{t-1} \sum_{i=1}^{u} + \aleph_2 \Delta \ln REM_{t-1} + \sum_{i=1}^{h} \aleph_3 \Delta FDI_{t-1} + \sum_{i=1}^{z} \aleph_4 \Delta \ln INF_{t-1} +$$
$$\sum_{i=1}^{e} \aleph_5 \Delta \ln IR_{t-1} + \sum_{i=1}^{f} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=1}^{x} \aleph_7 \Delta \ln CTI_{t-1} + \gamma_1 \ln GDPC_t + \gamma_2 \ln REM_t +$$
$$\gamma_3 \ln FDI_t + \gamma_4 \ln INF_t + \gamma_5 \ln IR_t + \gamma_6 \ln GEP_t + \gamma_7 \ln CTI_t + \gamma W_t + \vartheta_t. \quad (3)$$

$$\Delta \ln POV_t = \aleph_0 + \sum_{i=1}^{y} \aleph_1 \ln POV_{t-1} \sum_{i=1}^{u} + \aleph_2 \Delta \ln REM_{t-1} + \sum_{i=1}^{h} \aleph_3 \Delta FDI_{t-1} + \sum_{i=1}^{z} \aleph_4 \Delta \ln INF_{t-1} +$$
$$\sum_{i=1}^{e} \aleph_5 \Delta \ln IR_{t-1} + \sum_{i=1}^{f} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=1}^{x} \aleph_7 \Delta \ln CTI_{t-1} + \gamma_1 \ln POV_t + \gamma_2 \ln REM_t +$$
$$\gamma_3 \ln FDI_t + \gamma_4 \ln INF_t + \gamma_5 \ln IR_t + \gamma_6 \ln GEP_t + \gamma_7 \ln CTI_t + \gamma W_t + \vartheta_t. \quad (4)$$

F-test is implemented in the ARDL approach of model analysis to establish the insignificance of the coefficients and to judge the overall significance level of the coefficient affect. T test is employed, additionally, as an extra test for the lagged explaining factors. There is no difference as long as the regressors are I(0) or I in terms of the distribution under the null hypothesis (H0). This is because there is no the level relationship. As an alternative to conventional critical values (CV), two sets of asymptotic critical values are offered: one for I(1) regressors and another for strictly for I(0) regressors. The pln Null hypothesis of "no long-run association" cannot be rejected when the statistics from the t-test and F-test show that there are no long-term associations between the parameters and which are below the lower bound critical constant. However, the rejection of the null hypothesis is implied if the F-test and t-test statistics are greater than the upper bound CV that indicates the existence of the long-term relationships of the parameters. It cannot be established that a long-run association is there when the test statistic value comes between the two critical points. This is the error correction model (ECT) that was used to evaluate the short-run properties:

$$\Delta \ln GDPC_t = \aleph_0 + \sum_{i=1}^{y} \aleph_1 \ln GDPC_{t-1} \sum_{i=1}^{u} + \aleph_2 \Delta \ln REM_{t-1} + \sum_{i=1}^{h} \aleph_3 \Delta FDI_{t-1} + \sum_{i=1}^{z} \aleph_4 \Delta \ln INF_{t-1} +$$
$$\sum_{i=1}^{e} \aleph_5 \Delta \ln IR_{t-1} + \sum_{i=1}^{f} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=1}^{x} \aleph_7 \Delta \ln CTI_{t-1} + \gamma ECT_t + \vartheta_t; \quad (5)$$

$$\Delta \ln POV_t = \aleph_0 + \sum_{i=1}^{y} \aleph_1 \ln POV_{t-1} \sum_{i=1}^{u} + \aleph_2 \Delta \ln REM_{t-1} + \sum_{i=1}^{h} \aleph_3 \Delta FDI_{t-1} + \sum_{i=1}^{z} \aleph_4 \Delta \ln INF_{t-1} +$$
$$\sum_{i=1}^{e} \aleph_5 \Delta \ln IR_{t-1} + \sum_{i=1}^{f} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=1}^{x} \aleph_7 \Delta \ln CTI_{t-1} + \gamma ECT_t + \vartheta_t. \quad (6)$$

The error correction, on the other hand, measures the rate at which each period of the equation returns to its equilibrium value after an appropriate shock given to the original variable. The predicted values of the error correction term range from –1 and 0 where zero means no progress towards equilibrium and –1 signifies full convergence. In the next period, an element of the shock being realised will be entirely removed if the value is given as –1. As for the setup of the relationship the three statistics were used which are as below:

$$F_{ovrall}^{test} H_0: \aleph_1 = \aleph_2 = \aleph_3 = \aleph_4 = \aleph_5 = 0; \tag{7}$$

$$t_{DV}^{test} H_0: \aleph_1 = 0; \tag{8}$$

$$F_{IV}^{test} H_0: \aleph_2 = \aleph_3 = \aleph_4 = \aleph_5 = 0. \tag{9}$$

As Pesaran et al. (2001) revealed, the F-test and t test are the statistical tests that are used. These are represented in Equations (7) and (8) in turn. As shown by Equation (9), there is the updated F-test by Sam et al. (2019). Cointegration is claimed only if all three tests show statistically significant values, which exceed the reference points. The cointegration relationship will be made invalid if this requirement wasn't met. Here the system is classical, it enters the degenerate state 1 with the t-statistic and the F in the overall being significant and the F in the independent statistics not. The degenerate case 2 is called the t- and F- significant but only F-independent are significant.

3.4. Augmented autoregressive distributed lag model

The study aims to look into the impact of remittances (REM), foreign direct investment (FDI), inflation (INFL), interest rate (IR), government expenditure on education and health (GEP) as well as corruption control (CTI) on economic growth and poverty in Jordan. The estimation process of ARDL model consists of two stages, the first stage focusing on cointegration testing to determine whether there is a long-run causal relationship between the variables. To conduct this test, we employ the following model:

$$\begin{aligned}\Delta \ln GDPC_t = {} & \aleph_0 \ln GDPC_{t-1} + \aleph_1 \Delta \ln REM_{t-1} + \aleph_2 \Delta FDI_{t-1} + \aleph_3 \Delta \ln INF_{t-1} + \\ & \aleph_4 \Delta \ln IR_{t-1} + \aleph_5 \Delta \ln GEP_{t-1} + \aleph_6 \Delta \ln CTI_{t-1} + \in_1 \ln REM_t + \in_2 \ln FDI_t + \\ & \in_3 \ln INF_t + \in_4 \ln IR_t + \in_5 \ln GEP_t + \in_5 \ln CTI_t + \vartheta_t; \end{aligned} \tag{10}$$

$$\begin{aligned}\Delta \ln POV_t = {} & \aleph_0 \ln POV_{t-1} + \aleph_1 \Delta \ln REM_{t-1} + \aleph_2 \Delta FDI_{t-1} + \aleph_3 \Delta \ln INF_{t-1} + \\ & \aleph_4 \Delta \ln IR_{t-1} + \aleph_5 \Delta \ln GEP_{t-1} + \aleph_6 \Delta \ln CTI_{t-1} + \in_1 \ln REM_t + \in_2 \ln FDI_t + \\ & \in_3 \ln INF_t + \in_4 \ln IR_t + \in_5 \ln GEP_t + \in_5 \ln CTI_t + \vartheta_t. \end{aligned} \tag{11}$$

This study examines how remittances (REM), foreign direct investments (FDI), inflation (INFL), interest rates (IR), government spending on health and education (GEP) and control of corruption (CTI) influence economic growth and poverty in Jordan using an ARDL framework. Two stage estimation involves first stage which focuses on cointegrating tests to ascertain if there exist long run causality among the variables. For the purpose of examining such possible long run causal relationships between variables, lags such as first difference operator

Δ, error term ut, and lagged dependent variable *yt*–1 are estimated using AIC (Akaike Information Criterion). It uses F statistic to examine long run equilibrium relationships between variables. Also, ARDL model evaluates the short run dynamics of variables together with their long-term counterparts. In addition, below is an explanation of ARDL model:

$$\Delta \ln GDPC_t = \aleph_0 + \sum_{i=1}^{y1} \aleph_1 \ln GDPC_{t-1} \sum_{i=1}^{y2} + \aleph_2 \Delta \ln REM_{t-1} + \sum_{i=1}^{y3} \aleph_3 \Delta FDI_{t-1} +$$
$$\sum_{i=1}^{y4} \aleph_4 \Delta \ln INF_{t-1} + \sum_{i=1}^{y5} \aleph_5 \Delta \ln IR_{t-1} + \sum_{i=1}^{y6} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=1}^{y7} \aleph_7 \Delta \ln CTI_{t-1} + \varepsilon_t; \quad (12)$$

$$\Delta \ln POV_t = \aleph_0 + \sum_{i=1}^{y1} \aleph_1 \ln POV_{t-1} \sum_{i=1}^{y2} + \aleph_2 \Delta \ln REM_{t-1} + \sum_{i=1}^{y3} \aleph_3 \Delta FDI_{t-1} +$$
$$\sum_{i=1}^{y4} \aleph_4 \Delta \ln INF_{t-1} + \sum_{i=1}^{y5} \aleph_5 \Delta \ln IR_{t-1} + \sum_{i=1}^{y6} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=1}^{y7} \aleph_7 \Delta \ln CTI_{t-1} + \varepsilon_t. \quad (13)$$

The given model's short-term relationship is estimated using the ARDL-ECT model:

$$\Delta \ln GDPC_t = \aleph_0 + \sum_{i=1}^{y1} \aleph_1 \ln GDPC_{t-1} \sum_{i=0}^{y2} + \aleph_2 \Delta \ln REM_{t-1} +$$
$$\sum_{i=0}^{y3} \aleph_3 \Delta FDI_{t-1} + \sum_{i=0}^{y4} \aleph_4 \Delta \ln INF_{t-1} + \sum_{i=0}^{y5} \aleph_5 \Delta \ln IR_{t-1} +$$
$$\sum_{i=0}^{y6} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=0}^{y7} \aleph_7 \Delta \ln CTI_{t-1} + \gamma ECT_t + \vartheta_t; \quad (14)$$

$$\Delta \ln POV_t = \aleph_0 + \sum_{i=1}^{y1} \aleph_1 \ln POV_{t-1} \sum_{i=0}^{y2} + \aleph_2 \Delta \ln REM_{t-1} +$$
$$\sum_{i=0}^{y3} \aleph_3 \Delta FDI_{t-1} + \sum_{i=0}^{y4} \aleph_4 \Delta \ln INF_{t-1} + \sum_{i=0}^{y5} \aleph_5 \Delta \ln IR_{t-1} +$$
$$\sum_{i=0}^{y6} \aleph_6 \Delta \ln GEP_{t-1} + \sum_{i=0}^{y7} \aleph_7 \Delta \ln CTI_{t-1} + \gamma ECT_t + \vartheta_t. \quad (15)$$

3.5. Frequency-domain-causality (FDC)

The recurrence space technique, in contrast to the traditional causality tests, provides a wide sense of understanding of causation over different frequency domains. In this method, the degree of cause and effect variation and the reduction of the causal effects at different frequency ranges are examined by the investigation of the distribution of causality within the frequencies beside high to low. The recurrence domain causality method has a mediated effect of the predictability of elements' environmental factors through slow and fast fluctuations allowing for the evaluation of each individual factor's predictability which is valuable

to forecast the future trends of environmental degradation. One of its strengths lies in its linear dependency of the components with conjoint consideration for different time frequencies, where it predicts the level and impact of each factor's variation at the respective time frequency. But despite this fact, the conventional Granger causality model with a linear relationship between variables, can lead to unsatisfactory results. The decline of the necessary causality should control to an extent the time when policymakers intervene. Involving examples, the POV can correlate with some GDPs, if they are consistent with the measures of environmental component variation, such that it can be adjusted based on adaptive measures of stakeholders with environmental degradation experiences. On the other hand, corrective action may notbe called for if these transient environmental changes exert no impact on economic stakeholders or if they have minimum impact on some of them. In empirical studies done across different disciplines including economics, finance and neuroscience, frequency domain causality technique has been employed to look into correlating the intra-cerebral data. In this study, the frequency-domain causality approach is employed as the method to probe into the association of environmental factors and their impacts.

Let $Q_t = \left[w_{1t,}\, z_{1t}\right]$.

As a result, the system's VAR depiction can be expressed as follows:

$$\delta(K)R_t = \vartheta_t; \tag{16}$$

$$R_t = \delta\left(\varphi\right)\vartheta_t = \delta_{11}\left(\varphi\right)\delta_{12}\left(\varphi\right); \tag{17}$$

$$R_t = \delta\left(K\right)\vartheta_t = \begin{vmatrix} \delta_{11}(\varphi)\ \delta_{12}\left(\varphi\right) \\ \delta_{21}\left(\varphi\right)\delta_{22}\left(\varphi\right) \end{vmatrix} \begin{vmatrix} \vartheta_{1t} \\ \vartheta_{2t} \end{vmatrix}; \tag{18}$$

$$= \mu\left(\varphi\right)\vartheta_t = \begin{vmatrix} \mu_{11}\left(\varphi\right)\ \mu_{12}\left(\varphi\right) \\ \varphi_{21}\left(\varphi\right)\mu_{22}\left(\varphi\right) \end{vmatrix} \begin{vmatrix} \omega_{1t} \\ \omega_{2t} \end{vmatrix}. \tag{19}$$

Following the neo-classical growth theory, remittances enhance capital accumulation, which makes savings and investment more possible (Farmer, 2021). This model implies that remittances also play a role in the pattern of development as they create an extra source of income. Regression modeling analyses can be taken as analytical tools through which to evaluate the said effects and their ties to factors such as government policies, investment, and human capital. Theoretically, remittances can also sustain long-run economic development by accumulating capital and enhancing productivity in recipient countries; this is also part of the neo-classical Growth Model (Ur Rehman & Hysa, 2021). According to theories of poverty reduction of varying perspectives, certain remittances are used and viewed in terms of how they affect poverty levels in recipient countries. From these views, remittances can have a direct effect on poverty since they can be added to the time the family earns income. Raised household income can further improve standards of living by providing access to basic medical, educational, and nutritional requirements for the families (Kamalu et al., 2019, 2022). That impact of remittances on the poverty reduction can be measured analytically by analysing poverty with the help of poverty analysis techniques such as FGT indices or poverty rate. Propensity score matching algorithms as well play a role in establishing the causal rela-

tionship between poverty and remittances with other socioeconomic characteristics included in the analysis. This is an indication that remittances have the capacity to perform a very critical task which is poverty reduction, increase in household welfare and social-economic transformation in the receiving regions.

4. Results and discussion

4.1. Descriptive statistics and correlation matrix

The variables under study possess the characteristics shown in Table 1, which bring us useful information on the descriptive statistics. These statistics show us which is an average, which is not very and which is the shape of the distribution of each variable. These statistics must necessarily be considered as a basis of evaluation of the obtained findings and the conclusions made from the data (Ahmad et al., 2015a, 2015b; Umar et al., 2015). The results obtained bring various important conclusions. So, the mean of lnGDPC that denotes growth of economy in natural logarithm is 7.54 approximately. The distribution may be considered only slightly skewed, given the minimum value of the set is 6.02 and the maximum is 8.41. The slight left skewness of the curve is seen with the standard deviation of 0.64, and the peak has a moderate value. Secondly, the poverty, or lnPOV, has a mean near 2.49. Shown is an unsymmetric distribution of the data between the minimum value of 0.59 and the maximum value of 3.48. A histogram demonstrate moderate skewness, and the standard deviation of 0.69 indicates relatively high variability.

Thirdly, lnREM, natural logarithm of remittance is about 20.91 which is the average value. In this figure, the distribution of data shows a minimum value of 16.85 and a maximum value of 22.57, but there is a slight leftward skew. The distribution is characterized by high peak with long tails, and a standard deviation 1.34 illustrates quite a lot of discrepancy. Finally, mean value value of lnFDI is nearly 18.50. This distribution appearing to be slightly to the right of a center by spanning between 21.99 and 9.97 from left to right. The distribution is characterized by a higher peak with heavy tails, and the standard deviation of 2.65 alludes to a distinct variance. The last one is the natural logarithm of inflation rate, or lnINF, that is varying around –0.163. The analysis figure demonstrates a somewhat right skewed distribution having a minimum value of 2.09 and a maximum value of 4.89. The distribution demonstrates a central deformation and the standard deviation of 0.82 shows moderate dispersion. The natural logarithm of interest rates yields on average 1.93. As can be seen from the distribution of the data, it is left skewed, with minimum value of –0.13 and the maximum value of 2.55. The skew-quadratic distribution has a high peak and thick tails, and the standard deviation of 0.45 shows the small variability.

The natural logarithm of government spending, or lnGEP, has a mean value of approximately 21.38. Data points to a distribution that is slightly left-skewed, with a minimum value of 19.27 and a maximum value of 22.72. The distribution features a modest peak, and the standard deviation of 0.95 shows moderate variability. The natural logarithm of composite trade intensity, or lnCTI, has an average value of roughly –4.10 on position eight. With a minimum value of –5.96 and a maximum value of –2.92, the data show a significantly left-skewed distribution. A moderate peak is present in the distribution, and the standard deviation of 0.83

indicates considerable variability. Table 3 provides more details on the Pearson correlation matrix effects for the series. The independent variable correlation values were less than 0.85, indicating that the model does not suffer from multicollinearity problems (Ahmad et al., 2018; Ibrahim et al., 2020; Atiku et al., 2022).

Table 1. Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
ln$GDPC_t$	7.53511	7.543643	8.406847	6.017716	0.643637	–0.55264	2.854133
lnPOV_t	2.489411	2.379546	3.48124	0.587787	0.685475	–0.39928	2.987575
lnREM_t	20.90599	21.15505	22.57487	16.84661	1.33921	–1.23611	4.182992
lnFDI_t	18.50254	18.76427	21.98739	9.970603	2.647779	–0.82948	3.617956
lnINF_t	3.876346	4.135134	4.891254	2.093846	0.816181	–0.661	2.34724
lnIR_t	1.928596	2.009052	2.545265	–0.13244	0.452494	–2.09674	9.648783
lnGEP_t	21.37659	21.27139	22.72339	19.26655	0.947633	–0.1915	2.30161
lnCTI_t	–4.10129	–4.35301	–2.92062	–5.96357	0.833694	–0.13816	1.925178

Table 2. Correlation matrix

Variables	ln$GDPC_t$	lnPOV_t	lnREM_t	lnFDI_t	lnINF_t	lnIR_t	lnGEP_t	lnCTI_t
ln$GDPC_t$	1.000							
lnPOV_t	0.219 (0.113)	1.000						
lnREM_t	0.547* (0.000)	0.408** (0.002)	1.000					
lnFDI_t	0.671* (0.000)	0.284** (0.039)	0.575* (0.000)	1.000				
lnINF_t	0.685* (0.000)	0.452* (0.000)	0.530* (0.000)	0.456* (0.000)	1.000			
lnIR_t	–0.397** (0.003)	0.416* (0.001)	–0.276** (0.044)	–0.412** (0.002)	–0.287** (0.037)	1.000		
lnGEP_t	0.372* (0.000)	0.219 (0.113)	0.737* (0.000)	0.584* (0.000)	0.644* (0.000)	–0.400* (0.003)	1.000	
lnCTI_t	0.528* (0.000)	–0.249 (0.071)	0.456* (0.000)	0.492* (0.000)	0.601* (0.000)	–0.589* (0.000)	0.641* (0.000)	1.000

There is a correlation between the variables in the Table 2, with a diagonal value of (1). The correlation between GDP per capita and the logarithm of poverty is 0.75, indicating a significant positive linear link. An inverse relation is implied by a negative number. This matrix indicates the potential correlations between variables; it does not imply that one variable causes another.

4.2. Lag selection criteria

Table 3 presents the results of various tests conducted to determine the appropriate lag length for the analysis. Among these tests, the Schwarz Information Criterion (SIC) approach yields the most parsimonious result compared to other methods. Therefore, a relatively later lag length is preferred for the purposes of our inquiry. Consequently, this study employs the SIC approach for lag length selection (Atiku et al., 2021).

Table 3. Lag section criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–106.1954	NA	2.39e-07	4.620220	4.890480	4.722756
1	205.7052	521.9561	5.34e-12	–6.110417	–3.948337*	–-5.290127*
2	257.6957	72.15007	5.34e-12	–6.232478	–2.178578	–4.694434
3	309.5870	57.18636	6.67e-12	–6.350492	–0.404771	–4.094693
4	391.6607	66.99892*	3.69e-12*	–7.700438*	0.137104	–4.726885

Traditional unit root tests result which do not adjust for the breaks found in the data, including DF-GLS, ADF, PP, and KSUR, are portrayed in Table 4. Based on these tests, all variables show stationarity at level one as the first difference, and therefore the order of integration is equal to I(1). It is worth noting that the outcomes of these standard unit root tests can be uncertain if the series are not subject to any structural changes (Ahmad et al., 2015c; Ismail et al., 2024). The study employs the CMR (Clemente-Montanes Reyes) and LS (Leybourne and Savin) tests in the case of unidentified structural breaks which occur twice in a series, in order to address the issue. Table 5 presents the results from LS and CMR unit root tests as shown in the Table 4.

Table 4. Traditional unit root tests

Variables	ADF	PP	DF-GLS	KSUR
$\ln GDPC_t$	–2.863 (0.174)	–2.037 (0.580)	–0.336 [–2.619]	–1.910 (0.556)
$\ln POV_t$	–1.694 (0.753)	–2.686 (0.242)	–0.870 [–2.619]	–1.506 (0.795)
$\ln REM_t$	–3.203 (0.083)	–1.970 (0.617)	–0.860 [–2.619]	–1.618 (0.291)
$\ln FDI_t$	–2.691 (0.239)	–3.732 (0.020)	–0.236 [–2.619]	–2.574 (0.200)
$\ln INF_t$	–2.481 (0.337)	–1.686 (0.757)	0.178 [–2.619]	–1.845 (0.597)
$\ln IR_t$	–2.575 (0.291)	–3.420 (0.048)	–2.160 [–2.619]	–2.053 (0.467)
$\ln GEP_t$	–2.510 (0.322)	–2.437 (0.360)	0.473 [–2.619]	–2.119 (0.427)
$\ln CTI_t$	–3.403 (0.051)	–2.954 (0.070)	–1.402 [–2.619]	–1.690 (0.114)

End of Table 4

Variables	ADF	PP	DF-GLS	KSUR
$\Delta \ln GDPC_t$	–8.346* (0.000)	–4.224** (0.004)	–3.237* [–2.619]	–3.659** (0.015)
$\Delta \ln POV_t$	–6.515* (0.000)	–3.430** (0.047)	–4.923* [–2.619]	–4.066** (0.005)
$\Delta \ln REM_t$	–6.172* (0.000)	–5.194* (0.000)	–2.728* [–2.619]	–4.255** (0.003)
$\Delta \ln FDI_t$	–5.754* (0.000)	–8.235* (0.000)	–3.003* [–2.619]	–4.663** (0.002)
$\Delta \ln INF_t$	–4.220* (0.004)	–4.666* (0.000)	–3.177* [–2.619]	–4.437** (0.008)
$\Delta \ln IR_t$	–8.467* (0.000)	–10.617* (0.000)	–8.625* [–2.619]	–4.702** (0.001)
$\Delta \ln GEP_t$	–4.096* (0.006)	–4.980* (0.000)	–2.984* [–2.619]	–3.383** (0.037)
$\Delta \ln CTI_t$	–4.313** (0.003)	–4.492* (0.001)	–2.733* [–2.619]	–4.141** (0.004)

Note: (*) means the finding is statistically significant at the 1% level, while (**) indicates the finding is significant at the 5% level. The p-values are shown in parentheses (), while the t-statistics are presented in square brackets [].

Table 5. Modern unit roots

Variables	LS		CMR		
	Intercept and trend	Break-Year	du1	du2	Break-Year
$\ln GDPC_t$	–4.055	1986 and 2007	–2.397	–0.416	1980 and 2007
$\ln POV_t$	–3.857	1987 and 2007	10.126	–7.605	1986 and 2006
$\ln REM_t$	–4.562	1977 and 1992	–2.326	1.477	1996 and 2008
$\ln FDI_t$	–3.886	1977 and 1996	–1.240	0.893	1998 and 2004
$\ln INF_t$	–4.432	1989 and 2007	–1.727	–1.216	1989 and 2005
$\ln IR_t$	–2.286	2001 and 2013	–0.817	0.662	2004 and 2013
$\ln GEP_t$	–3.913	1987 and 2009	–2.424	–0.322	1997 and 2008
$\ln CTI_t$	–4.295	1978 and 2003	2.115	–1.655	1989 and 2005
$\Delta \ln GDPC_t$	–8.021*	1986 and 2007	8.053*	9.300*	1980 and 1987
$\Delta \ln POV_t$	–7.822*	1987 and 2007	–9.405*	3.194*	1994 and 2012
$\Delta \ln REM_t$	–7.687*	1977 and 1992	5.098*	2.061**	1984 and 1989
$\Delta \ln FDI_t$	–8.949*	1977 and 1996	4.626	5.773*	1992 and 1995
$\Delta \ln INF_t$	–8.375*	1989 and 2007	10.518*	4.893*	1987 and 2006
$\Delta \ln IR_t$	–8.583*	2001 and 2013	–8.317*	4.423*	2001 and 2008
$\Delta \ln GEP_t$	8.876*	1987 and 2009	5.969*	5.297*	1979 and 1987
$\Delta \ln CTI_t$	7.265*	1978 and 2003	2.752**	6.863*	2001 and 2006

Note: (*) means the finding is statistically significant at the 1% level, while (**) indicates the finding is significant at the 5% level.

The result shows that they are all non-stationary when taking into account two structural breaks for level of the Jordan number. such that a unit-root question may exist. This is where it has been determined that the variables are stationary. Bearing in mind, the stationarity of all model variables is attainted when two structural breaks are simulated. The implication here refers to the fact that the two given series in question must have increasing orders, which is to say, I(1). The present research tackles the possible issue of the structural breaks in the series and delivers more reliable results on stationarity and order of integration of the variables as LS and CMR unit root tests are used to get rid of the structural breaks in the series.

The aims of the study can be achieved by using one of the statistical methods which are long-term relationships between variables i.e. the limits test (Pesaran et al., 2001; Narayan & Smyth, 2005; Sam et al., 2019). Applying the augmented autoregressive distributed lag (AARDL) model, the long-run correlations of Jordan's economic growth, poverty and remittances were inspected and examined together with the control variables.

Table 6 presents the outcomes of boundary test results and serves as a reference critical values (CV) to establish the boundaries of test statistics' significance. Corrected F-values were taken from Narayan and Smyth (2005), F-test values from AICE were taken from Pesaran et al. (2001), and F-test values with explanatory factors in the AICE model were taken from Sam et al. (2019). The outcomes of the extended Augmented ARDL cointegration test suggest that these series are cointegrated. As the variables are interlinked and move as the time passes, this ascertains that remittances bring long-term effect of poverty and increase growth in Jordan. Further, the test statistics in the three tests reveal highly significant evidence of cointegration with the 1% credibility level outperforming critical values at both the lower and the upper boundaries. The results of the bounds test indicate that remittances in Jordan could have a lasting influence on poverty and economic growth regardless of the level of remittances, once changes in the exchange rates and transfers take place. These results demonstrates that remittances which are considered a vital factor in the poverty reduction and improving economic growth of the country must take into consideration.

Table 7 outlines the outcomes of remittances to Jordan's economic growth and poverty at long, as well as short terms, as shown by the AARDL estimates. The studies demonstrate the connection of remittances to long-term economic growth. Jordan's economy is most sensitive to the remittances lifting of 1 percent whose expansion is as high as 38.9 percent. This shows that in time, remittances amount to a lot in growth of the economy by a way of boosted economic activity. Conversely, the results give evidence of a long-term poverty-enabling character of remittances. The study established that there is a relationship between a 1% rise in remittances and a 6.9% increase in poverty rates. The fact that remittances alleviate the poverty situation because households receive an extra income thereby creating greater income and resources justifies poverty minimalisation at the national level. When we look at before and after period, the data are revealed similar dynamics. An increase of only 1% in remittances as a result of an 8.5% increasement of economic growth makes that remittances have a significant positive effect on economic growth. It this way, the remittances are seen to directly boost Jordan's economic output and activity.

Table 6. Results of the Augmented ARDL bounds test

Estimated Models	$F_{overall}^{test}$	t_{DV}^{test}	F_{IV}^{test}
$\ln GDPC_t = f(\ln REM_t, \ln FDI_t, \ln INF_t, \ln IR_t, \ln GEP_t, \ln CTI_t)$	4.452*	5.033*	5.689*
$\ln POV_t = f(\ln REM_t, \ln FDI_t, \ln INF_t, \ln IR_t, \ln GEP_t, \ln CTI_t)$	27.009*	18.288*	22.319*

Note: (*) means the finding is statistically significant at the 1% level, while (**) indicates the finding is significant at the 5% level.

Table 7. Results of AARDL measurements

Dependent variable: $lnGDP_t$			Dependent variable: $lnPOV_t$	
Variables	Coefficients	P-value	Coefficients	P-value
$\ln REM_t$	0.3889** (4.033)	0.002	–0.069** (–2.749)	0.009
$\Delta\ln REM_t$	0.085** (2.115)	0.040	–0.231* (3.765)	0.000
$\ln FDI_t$	0.543* (7.876)	0.000	–0.025* (–3.574)	0.000
$\Delta\ln FDI_t$	0.127** (2.192)	0.033	–0.095** (–2.108)	0.043
$\ln INF_t$	–0.120** (–2.461)	0.018	0.617* (8.650)	0.000
$\Delta\ln INF_t$	–0.223** (–5.871)	0.000	0.218* (2.887)	0.000
$\ln IR_t$	–0.052** (–2.119)	0.040	0.231* (4.857)	0.000
$\Delta\ln IR_t$	–0.243 (–5.536)	0.000	0.072** (3.338)	0.002
$\ln GEP_t$	0.262** (3.377)	0.001	–0.110** (–2.268)	0.028
$\Delta\ln GEP_t$	0.643* (7.404)	0.000	–0.089** (–2.160)	0.044
$\ln CTI_t$	–0.036 (4.689)	0.000	0.039 (1.825)	0.075
$\Delta\ln CTI_t$	–0.243* (–1.152)	0.255	0.374* (5.088)	0.000
ECT_{t-1}	–0.678* (–11.789)	0.000	–0.779* (–20.665)	0.000
R^2	0.785		0.863	
Adj R^2	0.726		0.825	

Note: (*) means the finding is statistically significant at the 1% level, while (**) indicates the finding is significant at the 5% level.

An inimitable short-term downside of remittances to poverty elimination is negative. The greatest positive impact of remittances is attributed to a 1% increase in remittances as it can approximately lower poverty by 23.1%. This also implies that remittances offer an immediate relief to the poor family hence the gradual inclusion of the family in the lower class to the upper class and enhanced welfare of the family (Alsamara & Mrabet, 2023; Islam, 2022;

Djeunankan et al., 2023). This evidence collectively tells about double role of remittance in Jordan. On the other hand, remittances not only lead to economic growth, but also contribute to the general prosperity of the country throughout the time. While remittances might be used in the struggle against poverty, the main task of remittances is the provision of a short-term relief, being targeted to the households with a financial deficiency. These findings imply that remittances have favourable socioeconomic effects and highlight the significance of policies and methods that encourage and utilise remittance inflows to maximise their positive effects on Jordan's economy and fight against poverty.

The results of AARDL estimates given in Table 7 have By considering the role of some of the regulating factors, achieved both economic development and poverty reduction in Jordan. Some of the factors are government spending, inflation, Interests rate, Foreign Direct Investment (FDI) and Composite Trade Index (CTI). In this case, there are major findings that vary in their statistical significance and short-run effects. However, these factors still generally agree to the direction which is expected in economic theory. Both in the short term and the long term, FDI increases the rate of economic growth. FDI has a long-term and statistically significant impact on economic growth. It may imply that an increase of domestic FDI improves Jordan's economic growth, which in turn fits with the concept that foreign direct investments can induce growth in the size of economy, engender employment, and lead to technological advancements. The long run economic expansion is inversely to inflation and is statistically significantly related. This, in turn, is likely to lower the domestic purchasing power, distort the price signals and reduce the incentives of investors, which may thereby slow down the process of economic growth. Yet, the short-term effect of inflation on economic growth does not stand out statistically, which may imply that its effect is by no means remarkable in the short term.

This is in line with the hypothesis that a tight monetary policy, using the interest rate as a tool, has a long-term negative effect on economic growth. However, in the short-run, it is statistically not possible to relate interest rates to economic growth. This is evidence that although interest rates might still impact the long-term growth patterns, they are not expected to have an impact on the way the economy of Jordan grows in the short term. What should be also stressed is that the long-run impact of government spending is favourable and statistically significant on economic growth as well. This thus implies that increasing government spending can help expand the economy and be a determining factor for Jordanâ€™s economic growth in general. Unexpectedly, the composite trade index (CTI) variable exhibits a long-term negative impact on economic growth. However, in the medium term, there is no statistically significant correlation between CTI and economic growth. To properly comprehend this relationship, additional research and examination of the unique elements and dynamics of the composite trade index are required.

Based on the study, the long-term as well as short-term government spending, and foreign direct investment are negatively and statistically significant in lowering poverty. Such a correlation reveals the linkage between the increase of government expenditure and foreign direct investment to decreases in poverty in Jordan. The findings of this study are consistent with the theoretical expectation, because growth of the economy induced by government investment helps to decrease poverty levels by creating employment opportunities, promot-

ing social welfare and increasing income. Though on the contrary as forecast by the economic theories, the inflation, interest rates and the composite trade index have the positive long-term and short-term outcome on poverty. Poverty can be seen as a positive and highly significant factor explaining inflation in Jordan. This shows that high-poverty families spend a greater proportion of their incomes on nearly the same items and services that other irrespective of income levels do, meaning that high inflation rates lead to increases in poverty since it erodes purchasing power especially of those with fixed or low-income jobs. It can be reflected in higher pricing for vital necessities, therefore making them less available for the households with minimal incomes.

On the other hand, the impact of the interest rate variable on poverty is reflected both in the long run and in the short run duration despite no statistical significance is shown in the short run. High interest rates can, through the credit freeze and the constraining of economic opportunities, prevent people from getting credit and constrain the growth of industries. People who are in poverty could be impacted more than other groups of people because they may have challenges finding funding for housing, schooling or business startup that are affordable. In theory, the big trade, even if it means its effect on poverty is positive, it does not have any statistically significant short-term effect on poverty in Jordan. This implies that rather than having a straight association between the composite trade index and poverty in the short run, they tend to be loosely related. To understand the exact detail of the engine and mechanism by which trade impact on Jordan's poverty level, there is a need for more researches.

According to Table 8 below, where the Wald statistics are higher than the crucial values at the 1% and 5% significant frequency level (0.05, 1.0, 1.5, 2.5, and 3), remittances have a short- and long-term uni-directional causal relationship with economic growth and poverty. This clearly shows how important economic development and poverty are for anticipating remittances at various frequency. The research specifically offer proof that poverty and long- and short-term economic growth drive remittance flows at a higher frequency level. It implies that fluctuations in remittances can be evaluated for both long-run and short-run cycles using economic growth and poverty. Table 7 shows that the Wald statistics at the 1% and 5% significance levels are higher than the critical values, which demonstrates that Granger is, over the medium term, causally related to both economic growth and poverty. This demonstrates how achieving sustainable development goals is essential for predicting medium-term cycles in remittances and how poverty and economic growth interrelate.

Table 8. Test for causality in the frequency domain

Direction of Causality	Short-run		Medium-term		Long-run	
	0.5	1.0	1.5	2	2.5	3.0
$\ln GDPC_t \rightarrow \ln REM_t$	6.541**	6.420**	6.465**	6.489**	6.500**	6.503**
$\ln REM_t \rightarrow \ln GDPC_t$	1.325	0.852	0.318	0.183	0.143	0.131
$\ln POV_t \rightarrow \ln REM_t$	8.428*	8.163*	8.147*	8.144*	8.143*	8.142*
$\ln REM_t \rightarrow \ln POV_t$	0.162	0.922	0.162	0.921	0.162	0.162

Note: (*) means the finding is statistically significant at the 1% level, while (**) indicates the finding is significant at the 5% level.

5. Conclusions

Using the augmented autoregressive distributed lag (ARDL) cointegration technique and frequency-domain causality (FDC) analysis, this study investigates the impact of remittances on poverty and economic growth in Jordan from 1970 to 2022. The results offer important new understandings of how remittances, poverty, and economic development interact in the Jordanian setting. The findings show that remittances have a considerable beneficial impact on economic growth, suggesting that they could serve as a catalyst for economic progress in Jordan. Remittances also have a negative impact on poverty, indicating that they play a part in attempts to reduce it. These results underline the critical role that remittance inflows play in promoting economic development and lowering poverty in Jordan. Foreign direct investment, inflation, interest rates, government expenditures, and the composite trade index are among the control factors taken into account by the study. These factors show the expected trends and help us understand how they affect poverty and economic growth. Notably, poverty is negatively impacted by foreign direct investment and government spending, but inflation, interest rates, and the composite trade index are positively impacted. The results of this study have significant managerial ramifications for Jordanian stakeholders and policymakers. Policymakers can create strategies to effectively attract and route remittance flows once they are aware of the favourable effects of remittances on economic growth and the eradication of poverty. Further maximising the potential of remittances in fostering sustainable economic growth can be achieved by encouraging households who receive remittances to invest in income-generating ventures and by offering financial literacy programmes. The study's practical ramifications centre on the importance of remittances as a weapon for Jordan's economic development and reduction of poverty. Policymakers can create programmes and policies that help people use remittances productively, such as encouraging entrepreneurship and small businesses. Additionally, building an environment that is favourable to foreign direct investment and encouraging trade diversification will help to reduce poverty and promote sustainable economic growth. Although this study offers insightful information, it is important to recognise its limits. The analysis's foundation is secondary data, which could come with inherent constraints and measurement flaws. Second, because of the study's emphasis on the Jordanian setting, its capacity to generalise its conclusions to other nations or areas is constrained. Additionally, the study's time frame might not have included all pertinent economic and social aspects, which could have an impact on how reliable the conclusions are. Future studies can address the constraints indicated above in order to expand on this topic. To improve the accuracy and dependability of the findings, researchers can think about using primary data collection techniques. Additionally, extending the study's scope to incorporate additional nations or regions would give researchers a deeper knowledge of the connection between remittances, poverty, and economic development. Additionally, examining how remittances affect particular economic sectors or businesses could give decision-makers and other stakeholders additional in-depth knowledge.

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