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Exploring The Impact Of Financial Technology On The Economic Growth In Jordan

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Abstract

The current study explores the impact of financial technology (FinTech) on the economic growth in Jordan using annual time series data from (1990 – to 2021). The autoregressive distributed lag approach has been performed to test Cointegration, while the vector error correction model is applied to examine long-term and short-term causality. However, the results show that FinTech products (number of individuals using the internet, number of broadband subscriptions, number of Mobile cellular subscriptions, number of automated transfer machines, and number of branches) contribute to further growth in financial inclusion, which in turn increases economic growth in Jordan. These findings recommend that policymakers in Jordan pay more attention to increasing the ability to access financial services.

Keywords: ARDL, Economic Growth; FinTech; Jordan; VECM.

JEL Classifications: B22; B23; F65.

1. Introduction

The world has witnessed massive and rapid changes and transformations in recent years due to developments in technology. Information and communication technology (ICT) directly affects human life, especially the economic, social aspects, and culture, so ICT has become the engine of economic growth for countries. ICT allowed the world to progress and adapt to the new environment, which raised the growth challenge for governments. The current era has led to the emergence and expansion of internet applications, such as electronic commerce, electronic banking, and financial technology (FinTech), which made ICT contribute to creating economic value. The emergence of the FinTech model as one of the fourth industrial revolution innovations has become connecting consumers to financial services and allowed them to save and borrow by opening mobile accounts, which are simpler and less expensive than opening traditional financial accounts. These innovations offer the opportunity to boost economic growth and expand financial inclusion in all countries. Different studies examined the impact of FinTech and ICT on economic growth in developed and emerging countries (Bernini & Brighi, 2017; Cheng et al., 2021; Li & Wei, 2021; Liu et al., 2021; Shen et al., 2021; Shkarlet et al., 2018; Usman et al., 2022; Wong et al., 2021; Younas et al., 2022).

After the 2008 crisis, the attention of economic and financial policymakers began to focus on the issue of financial inclusion and the ability to access financial services for different segments of society, especially the targeted groups and disadvantaged of the financial system. This topic impacts social stability, political stability, financial development, and economic development as well as the protection of the financial consumer system. The Central Bank of Jordan (2022) reported that about 50% of the world's adult population does not deal with banks. Therefore, the issue of financial inclusion has become one of the important agendas for financial, monetary, and economic policymakers. In addition, 67% of citizens in Jordan above the age of 15 years do not have access to the formal financial system in terms of account ownership. 38% of adults are excluded from any formal financial services, and 24.8% of adults are completely excluded from any formal and informal financial services (Central Bank of Jordan, 2022). Thus, the main objective of this paper is to explore the impact of FinTech products on economic growth in Jordan. To achieve this objective, the current study employs different time series models (1990 – to 2021). The following section discusses the literature review. Section 3 presents data, while methodology and empirical results are given in Section 4. Section 5 deliberates concluding remarks.

2. Review of Literature

Chatterjee (2020) examined the impact of ICT on economic growth using a dynamic panel data model in 41 countries. The results showed that ICT applications like mobile phones and internet penetration played a positive role in economic growth. Das et al. (2018) investigated the combined effects of ICT on economic growth per capita for a sample of 43 developing countries from 2000 to 2014. The findings showed that ICT had a positive impact on economic growth. Idun and Aboagye (2014) examined the relationship between bank competition, financial innovations, and economic growth in Ghana using the bound testing autoregressive distributed lag (ARDL) co-integration approach. In the long run, the results showed that bank competition was positively related to economic growth while financial innovation was negatively related to economic growth. In the short run, bank competition was negatively related to economic growth. Similarly, financial innovation was positively related to economic growth in the short run. In terms of causality, the results revealed unidirectional Granger causality running from bank competition to economic growth. However, there was bidirectional Granger causality between financial innovation and economic growth.

Raheem et al. (2020) explored the role of ICT and financial development in economic growth for the G7 countries from 1990 to 2014. The results revealed that ICT and financial development had a negative effect on economic growth. Salahuddin and Gow (2016) estimated the effects of internet usage on economic growth using annual time series data for South Africa from 1991– to 2013. The ARDL approach is performed to examine the long-term relationship. The ARDL approach indicated a positive and significant long-term relationship between internet usage and economic growth. Sassi and Goaied (2013) examined the effect of ICT on economic growth in some Middle East North African countries using a dynamic panel model. The results showed a positive and significant direct impact of the proxies of ICT on economic growth.

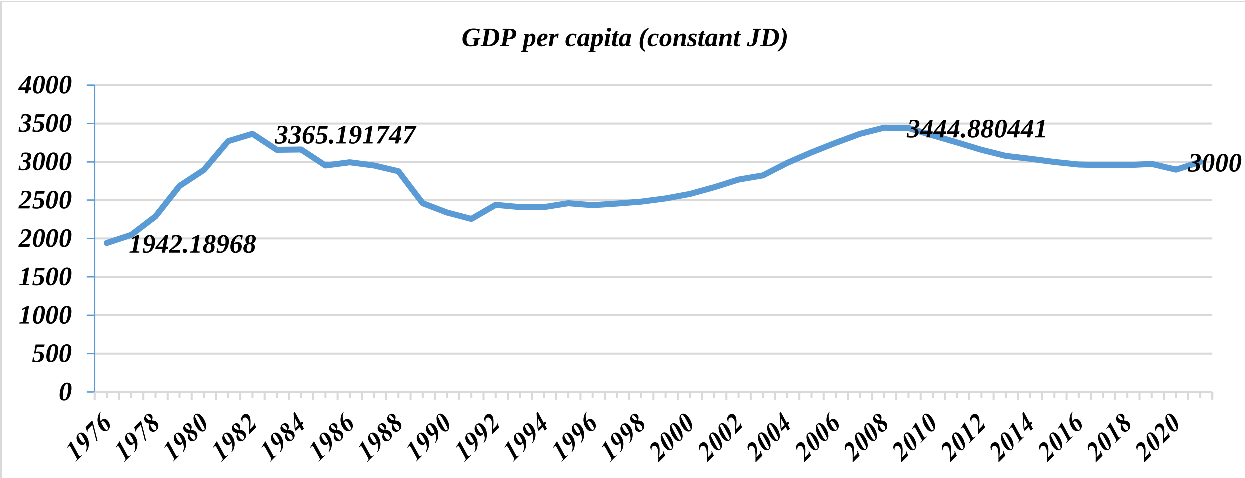
3. Data

Table 1 shows the definitions and summary statistics of variables related to financial technology products and the proxy of economic growth in Jordan. The data used in this paper was retrieved from the World Bank (2022). Figure 1 presents the development of gross domestic product (GDP) per capita in Jordan (1990 – to 2021). It shows a noticeable increase in GDP per capita, especially in 1982 and 2008, which registered about 3365JD and 3444JD, respectively.

Table 1. Variables definitions and summary statistics (1990 – 2021)

Variable	Definition	Summary statistics				
		Obs	**Mean**	**Sta. dev**	**Max**	**Min**
Gross domestic product (GDP) per capita	It measures economic growth and a country's economic output per person and is calculated by dividing the GDP of a country by its population (GDP per capita in constant local currency unit, thousands of Jordanian Dinar (JD)).	32	3.50	5.20	50.1	-11.1
Internet (INT)	Individuals using the internet (% of the population).	32	33.5	29.5	44.1	0.01
Broadband (BRD)	Fixed broadband subscriptions (per 100 people).	32	20.2	11.3	172	0.01
Mobile (MOB)	Mobile cellular subscriptions (per 100 people).	32	53.5	47.2	181	0.03
Automated Teller Machines (ATMs)	Is the number of automated teller machines (per 100000 people).	32	53.3	40.1	167	11
Branches (BRA)	Are bank branches (per 100000 people).	32	31.6	23.1	104	5.15

Figure 1. The development of GDP per capita in Jordan from (1990 – to 2021)



Source: World Bank (2022).

4. Methodology and Empirical Results

This study hires the ARDL approach developed by Pesaran et al. (2001). The ARDL approach is superior to other co-integration models (Engle & Granger, 1987; Johansen & Juselius, 1990) because it is statistically a more assertive approach to determining the Cointegration relation in a small sample size. The ARDL approach to Cointegration involves two steps. The first step is to examine the existence of a Cointegration among variables. If there is evidence of Cointegration among variables, the afterward step is to estimate long-term and short-term causal relationships using the vector error correction model (VECM).

Table 2. Results of ADFGLS test (with trends and constants)

Variable	ADFGLS stat	Variable	ADFGLS stat	I(d)
$LGDP_t$	-2.6150	$\Delta LGDP_t$	-5.3643^{*}	1(1)
$LINT_t$	-2.6275	$\Delta LINT_t$	-7.2342^{**}	1(1)
$LBRD_t$	-2.7167	$\Delta LBRD_t$	-6.4667^{*}	1(1)
$LMOB_t$	-2.9191	$\Delta LMOB_t$	-7.9886^{**}	1(1)
$LATMs_t$	-2.5343	$\Delta LATMs_t$	-8.2245^{***}	1(1)
$LBRA_t$	-2.5569	$\Delta LBRA_t$	-9.2232^{***}	1(1)

(1) L indicates the log transformation.
(2) Significant at: $(10\%)^{*}$, $(5\%)^{**}$, and $(1\%)^{***}$ levels.
(3) Source: EVIEWS software package (version 13).

The first step is to conduct a unit root test to ensure that none of the variables are integrated at I(2). The Augmented Dickey-Fuller generalized least squares (ADFGLS) test checks stationarity levels. Table 2 showed that all variables are stationary at the first difference (integrated at I(1)). Consequently, the ARDL approach is applied to test Cointegration. The estimation of the long-term coefficients of the ARDL approach is presented in the following equation:

$$\begin{bmatrix} \Delta LGDP_t \\ \Delta LINT_t \\ \Delta LBRD_t \\ \Delta LMOB_t \\ \Delta LATMs_t \\ \Delta LBRA_t \end{bmatrix} = \begin{bmatrix} \beta_{1t} \\ \beta_{2t} \\ \beta_{3t} \\ \beta_{4t} \\ \beta_{5t} \\ \beta_{6t} \end{bmatrix} + \sum_{i=2}^{k=1} \begin{bmatrix} \delta_{11i} & \delta_{12i} & \delta_{13i} & \delta_{14i} & \delta_{15i} & \delta_{16i} \\ \delta_{21i} & \delta_{22i} & \delta_{23i} & \delta_{24i} & \delta_{25i} & \delta_{26i} \\ \delta_{31i} & \delta_{32i} & \delta_{33i} & \delta_{34i} & \delta_{35i} & \delta_{36i} \\ \delta_{41i} & \delta_{42i} & \delta_{43i} & \delta_{44i} & \delta_{45i} & \delta_{46i} \\ \delta_{51i} & \delta_{52i} & \delta_{53i} & \delta_{54i} & \delta_{55i} & \delta_{56i} \\ \delta_{61i} & \delta_{62i} & \delta_{63i} & \delta_{64i} & \delta_{65i} & \delta_{66i} \end{bmatrix} \begin{bmatrix} LGDP_{t-2} \\ LINT_{t-2} \\ LBRD_{t-2} \\ LMOB_{t-2} \\ LATMs_{t-2} \\ LBRA_{t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix} \quad (1)$$

The F(statistics) can be compared against the critical values of the upper and lower bounds (Pesaran & Pesaran, 2009). If the F(statistics) value is higher than the upper bound critical value, the null hypothesis is not accepted, and the Cointegration exists among variables. If the F(statistics) value is lesser than the lower bound critical amount, then the null hypothesis is accepted, and the Cointegration does not exist among variables. Table 3 reports the results of the calculated F(statistics) values. The null hypothesis of no Cointegration is not accepted for all variables since the calculated F(statistics) values are more significant than the upper bound critical values.

Table 3. Results of the calculated F(statistics) test values

Dependent variable	**SIC lag**	**Computed F(statistics) value**	**Result**
FLGDP (LINT, LBRD, LMOB, LATMs, LBRA)	2	5.212*	Cointegrated
FLINT (LGDP, LBRD, LMOB, LATMs, LBRA)	2	4.881*	Cointegrated
FLBRD (LGDP, LINT, LMOB, LATMs, LBRA)	2	4.511*	Cointegrated
FLMOB (LGDP, LINT, LBRD, LATMs, LBRA)	2	6.115*	Cointegrated
FLATMs (LGDP, LINT, LBRD, LMOB, LBRA)	2	4.897*	Cointegrated
FLBRA (LGDP, LINT, LBRD, LMOB, LATMs)	2	5.110*	Cointegrated
Critical values of Pesaran and Pesaran (2009)	I(0)		I(1)
(5%)* Significance level	2.476		3.646

(1) The lag length is estimated using the Schwarz Information Criterion (SIC).
(2) Source: MICRO FIT software package (version 5.5).

The ARDL approach tests the existence or absence of a Cointegration among variables, but not the causality's direction. If the Cointegration does not exist among variables, then the Granger causality test would be a vector autoregressive model in the first difference (Bekhet & Mugableh, 2016; Bekhet & Mugableh, 2012; Mugableh & Oudat, 2018). However, if the Cointegration has existed among variables, the causal relationships among variables are examined using VECM as in the following equation:

$$\begin{bmatrix} \Delta LGDP_t \\ \Delta LINT_t \\ \Delta LBRD_t \\ \Delta LMOB_t \\ \Delta LATMs_t \\ \Delta LBRA_t \end{bmatrix} = \begin{bmatrix} \beta_{1t} \\ \beta_{2t} \\ \beta_{3t} \\ \beta_{4t} \\ \beta_{5t} \\ \beta_{6t} \end{bmatrix} + \sum_{i=2}^{k=1} \begin{bmatrix} \alpha_{11i} & \alpha_{12i} & \alpha_{13i} & \alpha_{14i} & \alpha_{15i} & \alpha_{16i} \\ \alpha_{21i} & \alpha_{22i} & \alpha_{23i} & \alpha_{24i} & \alpha_{25i} & \alpha_{26i} \\ \alpha_{31i} & \alpha_{32i} & \alpha_{33i} & \alpha_{34i} & \alpha_{35i} & \alpha_{36i} \\ \alpha_{41i} & \alpha_{42i} & \alpha_{43i} & \alpha_{44i} & \alpha_{45i} & \alpha_{46i} \\ \alpha_{51i} & \alpha_{52i} & \alpha_{53i} & \alpha_{54i} & \alpha_{55i} & \alpha_{56i} \\ \alpha_{61i} & \alpha_{62i} & \alpha_{63i} & \alpha_{64i} & \alpha_{65i} & \alpha_{66i} \end{bmatrix} \begin{bmatrix} \Delta LGDP_{t-2} \\ \Delta LINT_{t-2} \\ \Delta LBRD_{t-2} \\ \Delta LMOB_{t-2} \\ \Delta LATMs_{t-2} \\ \Delta LBRA_{t-2} \end{bmatrix} + \begin{bmatrix} \lambda_{1t} \\ \lambda_{2t} \\ \lambda_{3t} \\ \lambda_{4t} \\ \lambda_{5t} \\ \lambda_{6t} \end{bmatrix} \left[ECT_{t-1} \right] + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix} \quad (2)$$

The VECM allows for estimating long-term and short-term Granger causality. The long-term causality could be estimated through the t(statistics) on the lagged error correction terms (λ_{it}). In contrast, the short-run causality could be measured through the F(statistics) on the lagged variables (α_{ijt}).

Table 4. The results of the VECM Granger causality (dependent variable is $\Delta LGDP_t$)

Variable	**Short-term Wald test F(statistics)**		**Diagnostic tests**	
	Coefficient	**P(value)**	**Test**	**Value**
$\Delta LINT_t$	0.621	0.001^{***}	Coefficient of determination (R^2)	0.80
$\Delta LBRD_t$	0.414	0.043^{**}		
$\Delta LMOB_t$	0.541	0.001^{***}	F(statistics)	489 (0.00)
$\Delta LATMs_t$	0.453	0.002^{***}		
$\Delta LBRA_t$	0.512	0.001^{***}		
ECT_{t-1}	**Long-term t(statistics)**			
	Coefficient	P(value)	Normality test (Jarque Bera)	2.561 (0.211)
	-0.801	0.001^{***}		

(1) Significant at: $(10\%)^{*}$, $(5\%)^{**}$, and $(1\%)^{***}$ levels.
(2) Source: EVIEWS software package (version 13).

Table 4 reported the VECM Granger causality results in the long-term and short-term, where gross domestic product per capita is a dependent variable. Starting with the long-term, the computed coefficient of the lagged error correction (-0.801) is statistically significant at the 1% level. Thus, a long-term causality runs from internet, broadband, mobile, ATMs, and branches to gross domestic product (GDP) per capita. In the short term, there is a causality running from all variables to gross domestic product (GDP) per capita. These results are the same as those obtained by (Chatterjee, 2020; Cheng et al., 2021; Das et al., 2018; Idun & Aboagye, 2014; Salahuddin & Gow, 2016). The widespread use of FinTech products among members of society contributes to further growth in financial inclusion, increasing economic growth in Jordan.

5. Concluding Remarks

The present paper attempts to examine the impact of FinTech products (number of individuals using the internet, number of broadband subscriptions, number of Mobile cellular subscriptions, number of automated transfer machines, and number of branches) on the economic growth in Jordan using annual time series data from (1990 – to 2021). The results of the ADFGLS test show that all variables are stationary at the first difference. The findings of the ARDL approach reveal that the null hypothesis is rejected, and the Cointegration exists among variables. The results of the VECM show that there is a long-term and short-term causality running from FinTech products to economic growth. These findings provide imperative implications for policymakers in Jordan. The FinTech-financial inclusion association is an effective policy for achieving economic growth in Jordan. The inability to achieve the objective of this policy can be attributed to poor financial infrastructure, inadequate basic financial literacy, and inappropriate regulations of consumer protection.

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