Econometric Analysis of the Relationship between Entrepreneurship and Economic Growth in Jordan

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Abstract: Entrepreneurship plays a crucial role in driving economic growth, both in developed and developing countries. It creates new job opportunities, encourages innovation, and stimulates market competition. Recently, there has been a growing interest in entrepreneurial activities in Jordan, both at the governmental and private levels. This study aims to examine the impact of entrepreneurship on economic growth in Jordan based on Schumpeter's theory. To achieve this, the study used the augmented Dickey-Fuller method to test the stationarity of time series. The Johansen cointegration approach and Vector Error Correction Model (VECM) were used to determine the dynamic relationship between variables in the long and short run. Additionally, the Granger causality test was used to determine the direction of causality. The study results showed a statistically significant relationship between the independent variables and the dependent variable, Gross Domestic Product Per Capita (GDPPC), in the long and short term. The variables representing entrepreneurship in the model were found to have a significant relationship with the real economic growth. The t-statistic value for the Medium and High-Tech manufacturing value added was (-2.59184), and for the Number of Self Employment, it was (-3.20875). the results also showed a significant negative effect of both the financial crises in 2008 and the Arab revolutions in 2011 on the Gross Domestic Product Per Capita.

Keywords: Economic Growth, Error Correction Model, Entrepreneurship, Schumpeter's growth model.

1. INTRODUCTION

Entrepreneurship is a part of business life, accomplished through the entrepreneurial ability to change and learn. It enables individuals to survive and grow in business uncertainty. It has multiple sources, including opportunity-based entrepreneurship, market innovation, digital technology, and entrepreneurship education.

Entrepreneurship can be considered a national advantage, a road map for development and sustainable growth in any country, and entrepreneurs are the makers and drivers of this advantage. It is a dynamic process that creates value, increases wealth, and improves well-being. The importance of entrepreneurship lies primarily in that it is a catalyst for innovation. Great entrepreneurs have the power to change the way we live and work. If they are successful, their innovations could improve living standards, and create wealth through entrepreneurial ventures, they also create jobs and contribute to economic growth.

Achieving economic growth is one of the most critical issues that concern decision-makers in the world today. Therefore, recent studies are directed toward studying alternative economic growth drivers for the fiscal and monetary policies used to achieve economic growth, the most important of which is entrepreneurial activities. However, this study attempts to provide new information for the following central question: Can economic growth be achieved by promoting entrepreneurial activities in Jordan? So, The main objective of this study is to examine the impact of entrepreneurial activities on economic growth in Jordan. To achieve this objective, the study will include the following sub-objective: The impact of growth in medium and high-tech manufacturing value added and Self-employment on Jordan's economic growth will be examined.

Annual growth rate of the real GDP in Jordan increased to 2.50 percent in 2022 from 2.20 percent in 2021. Annual GDP Growth in Jordan averaged 2.28 percent from 2009 until 2022, reaching an all-time high of 5.00 percent in 2009 and a record low of -1.60 percent in 2020.

The Jordanian economy is still listed among the developing economies and is mainly classified as a service economy. The service sector constitutes more than 65% of the gross domestic product of the Jordanian economy (DOS, 2023). The production activities are limited, even though they significantly contribute to productivity, economic growth, and employment enhancement. Despite the current economic growth in Jordan, bringing the gross domestic product to about 42.3 billion US dollars, the unemployment rate is also

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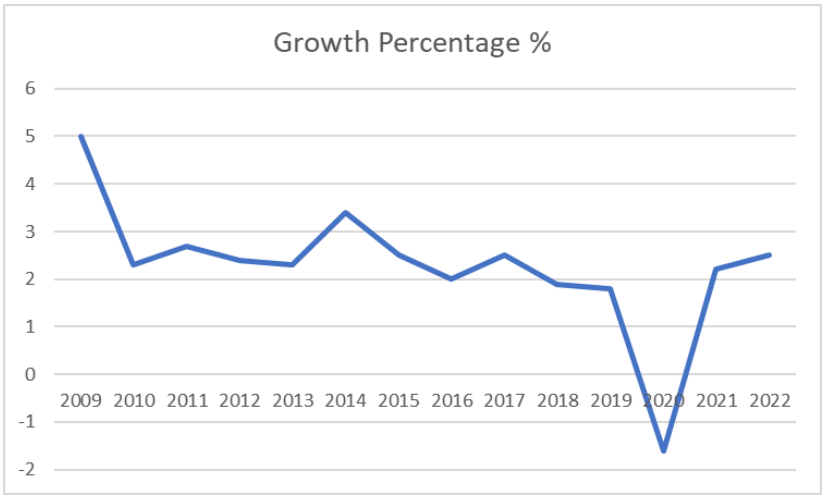

Fig. (1). Annual growth in real GDP in Jordan from 2009 to 2022.
Source: Jordan Department of Statistics (DOS) website.

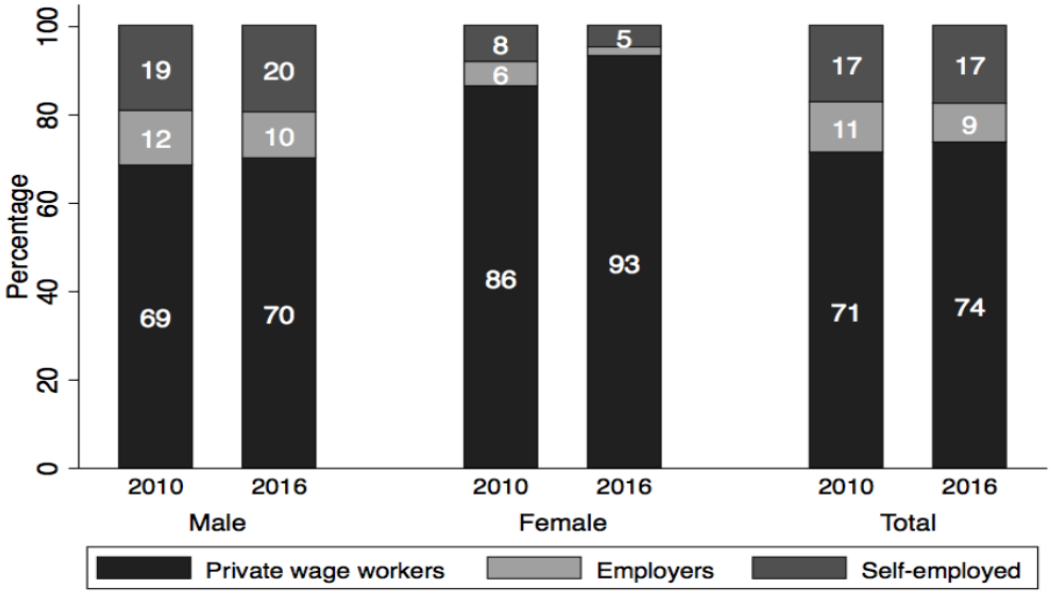

Fig. (2). Work type by gender and wave, Jordanian private sector workers aged 15-64 (percentage).
Source: (Rizk et al., 2018). Their calculations based on JLMPS 2010, 2016

constantly rising, reaching nearly 23%. The growth is supported by the strong performance of the infrastructure led by the service sector, not the production one. (Word bank, Jordan Economic Monitor 2022).

On the other hand, the last census of companies in Jordan in 2018 showed 167,519 active enterprises, of which 166,638 (99.5%) are Micro-, Small and Medium-sized Enterprises (MSMEs). Micro-enterprises, with 1-4 employees, accounted for 89.7% of the total, followed by small enterprises (5-19 employees) with 8.0%. Medium enterprises (20-99 employees) by 1.7%, and large enterprises by 0.5%. (MSME Financial Inclusion Study in Jordan 2022). Own account workers in Jordan are demographically dissimilar from wage workers in the private sector. They tend to be older, male, and have more work experience. While they have lower educational attainment than remote sector wage workers, own account workers exhibit relatively higher wealth outcomes. Regarding job characteristics, the self-employed were likelier than other private sector workers to work outside a fixed establishment, with many engaged in transportation-related activities. Employers and self-employed workers were also concentrated in wholesale and retail trades in both 2010 and 2016. They frequently reported being overqualified (Rizk *et al.*, 2018).

The activities of entrepreneurs are considered to be a critical driver of economic dynamics. Entrepreneurs generate employment opportunities not only for themselves but also for others. Beyond job creation, entrepreneurial activities may influence a country's overall economic performance in several ways: (1) entrepreneurs enter markets with new products, technologies, or production processes; (2) they increase productivity and competition; and (3) they accelerate structural change. Without new entrepreneurs, economies may stagnate. (Kritikos, 2015).

The results of the entrepreneurship indicators issued by Global Entrepreneurship Monitor (GEM) show a decrease in these indicators in Jordan compared to the rest of the world, especially the indicators of Total early-stage Entrepreneurial Activity (TEA) and The rate of Employee Entrepreneurial Activity (EEA). The TEA indicator measures the proportion of the adult working-age population actively trying to start a business or owning and managing a business that is less than three and a half years old. In contrast, the EEA indicator measures the rate of involvement of employees in entrepreneurial activities, such as developing or launching new goods or services or setting up a new business unit (Galindo et al.,2020). In Jordan, the TEA was (8.2%) in 2017. Among the countries participating in the Global Entrepreneurship Monitor (GEM) survey, Jordan occupied the 46th position globally, while the percentage improved in 2019 to 9.1% and occupied the 34th globally. The rate of Employee Entrepreneurial Activity (EEA) in 2017 was (1.5%). EEA rate became (0.69%) in the year 2019. (Global Entrepreneurship Monitor, Jordan National Report (2019-2020)).

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

2.1. Theoretical Background on Economic Growth

Economic growth entails the sustained, long-term increase in the total production of goods and services within a country's economy, typically manifested by a rise in gross domestic product (GDP) (Roser, 2021). The pursuit of economic growth prompts an exploration of the driving forces behind this objective. If economic growth is a dynamic process, do the same factors determine, in the same proportion, the extent of growth in the future? Classical economists perceived the determinants of economic growth as investments and the enhancement of productive capacity. In the first half of the twentieth century, neoclassical economists identified three factors contributing to economic growth: land, capital, and labor. This elucidates the rationale for economic growth in capitalist countries characterized by an abundance of these factors. Hence, the greater the utilization of these factors, the more significant the economic growth (Piętak, 2014).

Solow growth theory aligns with the neoclassical perspective, asserting that the economy naturally adapts to attain balanced, stable growth over the long term. According to this theory, under the assumption that the economy produces one commodity using two factors of production—namely, capital and labor—the production equation is as follows:

$$Yt = F(Kt, At, Lt) \quad (1)$$

Equation No. 1 illustrates the interplay of capital stock growth, labor force, and technological progress (knowledge) within the economy. It delineates the repercussions of this interaction on the country's production of goods and services. To accomplish the objectives of my study, I employed the Solow growth model to investigate the influence of Gross Capital Formation, and labor variables on economic growth, specifically the changes in Gross Domestic Product (GDP) Per Capita.

2.2. The Economic Impact of Entrepreneurial Activities

Joseph Schumpeter (1911), a pioneer and significant contributor to the field of entrepreneurship, defined it as an innovative activity—specifically, the introduction of a new good, a new method of production, and the opening of a new market (Sabella, 2014). A central tenet of the Schumpeter growth model posits that long-run growth stems from innovations. Growth occurs when innovations enhance the productivity parameter (At) by improving the quality of the intermediate product. In each period, one person, the entrepreneur, has an opportunity to attempt an innovation. If successful, the innovation gives rise to a new version of the intermediate product, surpassing the productivity (At-1) of the previous version. To be specific, the productivity of the intermediate good in use transitions from its last period's value (At-1) to (At = γAt-1), where γ > 0.

$$A_t = \sum_{A_t \text{ if entrepreneur fails}}^{\gamma A_{t-1} \text{ if the entrepreneur is successful}} \quad (2)$$

The rate of economic growth corresponds to the proportional growth rate of the final good (Yt/L), which is equivalently the proportional growth rate of the productivity parameter, At:

$$g_t = \frac{A_t - A_{t-1}}{A_{t-1}} \quad (3)$$

According to Joseph Schumpeter's theory, the growth rate will be determined by this probability distribution in every period:

$$g = E(gt) = Z.(Y{-}1) \quad (4)$$

The interpretation of equation 3 is that, in the long run, the economy's average growth rate equals the frequency of innovations multiplied by the size of innovations (Aghion, 2015).

2.3. Literature Review: Startups and Economic Growth

Numerous studies have demonstrated a robust correlation between the establishment of startup companies and economic development. Wennekers et al. (2014) emphasized that entrepreneurial activity in the early stages serves as a more crucial metric for entrepreneurship than other indicators. Recent cross-sectional analyses reveal a significant U-shaped relationship between early-stage entrepreneurial activity and levels of economic development. This U-shaped curve's upward trajectory is driven by two distinct "cycles," distinguishing individual entrepreneurs at the lower end from ambitious and innovative entrepreneurs at the higher end. As advanced economies exhibit dominance in self-employment at both ends, it profoundly impacts the labor market and external regulation of the business sector. Conversely, at the upper end of the entrepreneurship spectrum, a clear positive correlation emerges between the prevalence of ambition, innovative and export-oriented business startups, and average per capita income. This correlation may qualitatively dominate, marking the initiation of an innovation-driven economic development stage with a transformative relationship between entrepreneurship and innovation. Consequently, entrepreneurship has evolved

into a pivotal policy concern for many countries seeking sustainable economic development.

Aku-Sika (2020) evaluated the influence of startups and self-owned businesses on economic growth and development, using Ghana as a case study. The results indicated that independent variables such as startups, self-employment, education, and gross domestic savings significantly and positively impact economic growth. In a study by Aparicio et al. (2015), the authors delved into institutional factors promoting opportunity entrepreneurship for higher economic growth rates. They suggested that institutions may not have an automatic effect, as commonly assumed in growth models, and found that informal institutions exert a greater impact on opportunity entrepreneurship than formal institutions. Policy implications highlighted the potential for economic growth by fostering appropriate institutions to enhance opportunity-driven entrepreneurship.

Saballa (2014) investigated the relationship between entrepreneurship and economic growth in the West Bank. Contrary to much research, the results showed that entrepreneurship activities had no significant impact on economic growth. Girnara (2020) analyzed startup impact, growth, ecosystem analysis, and their influence on the Indian economy. Positive effects on GDP, GNI, per capita GDP, and exports were observed, while negative impacts were noted on imports, foreign exchange reserves, and the balance of payment. In summary, startups contribute positively to the growth of the Indian economy but negatively affect the balance of payments.

On the contrary, Kim *et al*. (2022) failed to find evidence supporting a positive link between aggregate entrepreneurship and economic growth. They categorized early-stage entrepreneurship into opportunity-driven versus necessity-driven and differentiated between advanced and developing economies. Particularly for developing economies with a significant emphasis on manufacturing, opportunity-driven entrepreneurship was positively correlated with growth. This suggests that substantial scientific advances in manufacturing create opportunities for innovative entrepreneurs, while other entrepreneurs gradually adapt to the slower pace of technological progress in the services sector. Building on Abu Aisha's 2018 study, an OLS regression was conducted to estimate the impact of entrepreneurship on GDP growth in Kuwait. Empirical results indicated a positive impact of entrepreneurship on GDP growth, although it was statistically insignificant. Afghah et al. (2014) examined the relation between entrepreneurship as a intellectual capital and economic growth in 50 selected countries including Iran during the years 2004 and 2012. The outcomes of their research indicate that entrepreneurship has positive and significant effect on economic growth.

Dabkowski, (2011) also found that entrepreneurship contributes to growth moderately. He used Total Factor Productivity as a measure of economic growth, and took a Panel data of 26 European countries. Business Birth Rate, Self-employment Rate, Business Investment and Labour Productivity Growth were all found to be highly significant in his study. Peprah and Adekoya, (2020) used data from the World Development Indicator on 10 African countries (Botswana, Morocco, Mauritius, Namibia, Nigeria, Rwanda, Senegal, Sierra Leon, South Africa, and Zambia) to examine the relationship between entrepreneurship and economic growth. They found that entrepreneurship is positive and significantly stimulates economic growth. Similar results were obtained by researchers in a study of Adegbola et al. (2020), which showed that in the developing economies like Nigeria, there exist a positive relationship between entrepreneurship and economic growth.The instrument used for this study is primary data, it was obtained through properly structured questionnaire. While the results of the Doran et al. (2018) showed that entrepreneurial activity is found to have a negative effect in middle/low-income economies, in contrast to the high-income countries. They took 14 difference indicators of entrepreneurship to analyse the contribution of entrepreneurial activity, aspirations, and attitudes to Gross Domestic Product (GDP) per capita. Feki and Mnif (2016) analyze the relationship between entrepreneurship and economic growth for a panel of developing countries over the 2004–2011 periods. They used two measures of entrepreneurship: the new density and the potential of innovation. They found that if the short-term impact of technological innovation on growth is negative, this effect is positive in the long term.

This study contributes by examining the impact of entrepreneurship on economic growth. Its objective is to add to the existing literature, emphasizing the significance of entrepreneurial activities as an alternative to fiscal and monetary policies for achieving economic growth. The focus is on entrepreneurial activities in the growing context of Jordan. Our study's proposed growth model builds on the theoretical background and previous research, particularly influenced by the model presented by Abu-Aishah (2018). However, we employ natural logarithms for the study variables, and we specifically consider the variable of Medium and High-Tech manufacturing value added.

In light of the aforementioned literature, the following specific hypotheses align with the study objectives:

H_{01}: The Number of Self Employment (LSE) has no significant positive effect on economic growth in Jordan.

H_{02}: The Medium and High-Tech manufacturing value added (LMHT) has no significant positive effect on economic growth in Jordan.

H_{03}: The Compensation of Employees (LCE) has no significant positive effect on economic growth in Jordan.

H_{04}: The Fixed Capital Formation (LFCF) has no significant positive effect on economic growth in Jordan.

3. METHODOLOGY

This study intends to examine the impact of entrepreneurship activities on economic growth in Jordan from 1990 to 2022. The natural logarithm is added to all variables of the econometric model to obtain elasticities directly (relative change) between variables, and it also helps in dealing with multiplicative relationships. In line with Schumpeter theory and according to the literature (Abu-Aishah, 2018; Dabkowski, 2011), the econometric model is as follows:

$$Log\text{GDPPC} = \beta 0 + \beta 1\text{LogNSE}_t + \beta 2\text{MHT}_t + \beta 3\text{LogCE}_t + \beta 4\text{LogFCF}_t + \varepsilon \quad (5).$$

Where:

$GDPPC_t$: Gross Domestic Product per Capita in constant Jordanian Dinar (Constant JOD).

NSE_t: The annual Number of Self-Employment.

MHT_t: Medium and High-Tech manufacturing value added as a percentage of total manufacturing value added.

CE_t: The the annual Compensation of Employees.

FCF_t: The annual gross Fixed Capital Formation as percentage of GDP.

Since time series variables usually appear non-stationary and their linear combination can be constant, we first subject each series to the standard unit root and cointegration tests. In this study, we applied the Augmented Dickey-Fuller (ADF) unit root test to Determine the stability properties of variables or integration orders. To determine if they share a common path in the long run, i.e., whether they are complementary or not, is up to us VAR-based cointegration test as proposed by Johansen. After finding the cointegration, we first estimate the long-run relationship between them. Then, The Vector Error Correction Model (VECM) evaluates dynamic interactions between variables. The Granger causality test was employed to ascertain whether one time series variable can predict another. It aids in evaluating whether past values of one variable offer insights into the future values of another.

3.1. Definition of Variables

In this section, we define the study variables used in the analysis.

3.1.1. Dependent Variable: Economic Growth

As a dependent variable, the natural logarithm of GDP per Capita (current JOD) of Jordan from 1990 to 2022 was considered. It is used as a proxy for economic growth. According to the definition of World Bank Data Base (2023), Gross domestic product (GDP) represents the sum of value added by all its producers. Value added is the value of the gross output of producers less the value of intermediate goods and services consumed in production before accounting for fixed capital consumption. The United Nations System of National Accounts calls for value added at either basic prices (excluding net taxes on products) or producer prices (including net taxes on products paid by producers but excluding sales or value-added taxes). Both valuations exclude transport charges that are invoiced separately by producers. Total GDP is measured at purchaser prices. Value added by industry is generally measured at basic prices. When value added is counted at producer prices. GDP growth rates and their components are calculated using the least squares method and constant price data in the local currency.

3.1.2. Independent Variables

1- The number of Self-employment (SE) and The Medium and high-tech manufacturing value added (MHT) are used as proxies to represent the entrepreneurship variable.

A- The Number of Self - Employment (NSE): Self-Employment are those workers who are working on their account. Typically, they work as sole proprietors or pair with one or a few partners or in a cooperative. They represent a percentage of the total employment that is owned by private individuals. For this variable data was obtained from the International Labour Organization, ILOSTAT database (Aku-Sika, B. (2020)).

B- The Medium and high-tech manufacturing value added (MHT): This indicator is calculated as the share of total value added from economic activities of medium and high technology industry to industrial value added. The medium and high technology industry is defined using the Organization for Economic Co-operation and Development (OECD) classification as follows by the International Standard Industrial Classification of All Economic Activities (ISIC). Industrial value added is the value added by the manufacturing industry. Industrial development generally entails a structural shift from resource-based and low-technology activities to medium- and high-tech (MHT) manufacturing activities. The modern and highly complex production structure provides better opportunities for skill development and technological innovation. MHT activities are also high-value-added manufacturing industries with high technology intensity and labor productivity. The increasing share of MHT sectors also reflects the impact of innovation.

2- Jordan expenditure on labor (EL): The annual Compensation of Employees (wages and salaries) for 1990 to 2022 was taken. It is an important component of the overall economy. It reflects the income earned by workers in the labor force.

3- Gross fixed capital formation (% of GDP). It also called "investment ratio from GDP", is defined as the acquisition of produced assets (including purchases of second-hand assets), including the production of such assets by producers for their use, minus disposals. The relevant assets relate to assets intended for use in the production of other goods and services for more than a year.

4. EMPIRICAL RESULTS AND DISCUSSIONS:

This important section presents the results of experimental tests of the study variables. The following time series analysis procedures were used: unit root testing for all study variables, cointegration tests, lagged rank selection, ARDL model estimation, and Granger causality tests. Two dummy variables, DUM11 and DUMF, were used to overcome abnormal situations that directly affected the Jordanian economy during the study period, which were the Arab revolutions in 2011, as the number of refugees that Jordan received exceeded all its capabilities and affected all political, security, economic, and social fields, and led to a rise in unemployment numbers. Likewise, the demand for energy consumption has become very large, which has imposed heavy costs on the Jordanian budget and increased external debt to a very high degree (Shahwan, 2018). The second dummy variable represents the global financial crisis in 2018; it is a severe contraction of liquidity in global financial markets that originated in the United States due to the collapse of the U.S. housing market. The global crisis's impact on Jordan is driven by the country's high de-

Table 1. Augmented Dickey-Fuller (ADF) test results (unit root test).

Series	Log level 0:unit roots (1)			First difference 0:unit roots (0)		
	Test statistics	Critical value 5%	p-value	Test statistics	Critical value 5%	p-value
LogGDPPC	-1.214131	-2.957110	0.6560	-4.774930	-2.960411	0.0006**
Log NSE	0.353359	-2.957110	0.9775	-6.583883	-2.960411	0.0000**
Log MHT	-2.077638	-2.957110	0.2545	-6.498420	-2.960411	0.0000**
Log GCF	-1.214131	-2.957110	0.6560	-4.774930	-2.960411	0.0006**
Log CE	-1.140976	-2.957110	0.6871	-7.602997	-2.960411	0.0000**

Source: Researcher calculation using EVIEWS software.

Table 2. VAR lag order selection criteria results.

Endogenous variable LPCGDP						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	89.90534	NA	2.40e-09	-5.660356	-5.426823	-5.585647
1	217.4192	204.0222*	2.65e-12	-12.49462	-11.09342*	-12.04636
2	245.2630	35.26872	2.55e-12	-12.68420	-10.11534	-11.86240
3	280.1405	32.55233	2.04e-12*	-13.34270*	-9.606172	-12.14735*

Source: Researcher calculation using EVIEWS software.

Table 3 Johansen's Cointegration test: the Trace Test results.

Hypothesis		Eigenvalue	Trace Statistic	5%Critical Value	Probability
H0	H1				
r=0	r ≥ 1	0.928985	175.5286	125.6154	0.0000**
r ≤ 1	r ≥ 2	0.771874	98.82747	95.75366	0.0302**
r ≤ 2	r ≥ 3	0.571134	55.96962	69.81889	0.3792
r ≤ 3	r ≥ 4	0.466891	31.41791	47.85613	0.6440
r ≤ 4	r ≥ 5	0.218515	13.17604	29.79707	0.8834
r ≤ 5	r ≥ 6	0.135696	6.025840	15.49471	0.6925
r ≤ 6	r ≥ 7	0.060077	1.796754	3.841466	0.1801

Source: Researcher calculation using EVIEWS software.

pendence on food and oil prices, which increased oil and commodities prices (Ahid et al., 2012).

4.1. Unit Root Test

The results of the unit root test show that the null hypothesis is accepted at levels for all study variables because the value of the t statistics is less than the critical value and the p-value is not significant in the Augmented Dickey-Fuller (ADF) test. The null hypothesis was rejected at the first difference because the t statistics are higher than the critical values, and the probability values are important, therefore all variables are stationary at the first difference. As shown in Table **1**.

4.2. Lag Order Selection Criteria

The study model is sensitive to the length of the lag. Therefore, the study used lag length criteria to obtain the optimal lag length for VECM. As shown in Table **2**, the results show that the appropriate optimal lag length is lag order 3, as suggested by most of the selection criteria.

4.3. Johansen's Cointegration Test

The Johansen multivariate cointegration test was used to test the cointegration between the study variables, as it proved that all series are integrated in the same order. This cointegration test allows testing of long-run equilibrium relationships (cointegration) between time series of model varia-

Table 4. Johansen's Cointegration test: the Maximum Eigenvalue Test results.

Hypothesis		Eigenvalue	Max Eigen Statistic	5%Critical Value	Probability
H0	H1				
r=0	r ≥ 1	0.928985	76.70110	46.23142	0.0000**
r ≤ 1	r ≥ 2	0.771874	42.85785	40.07757	0.0237**
r ≤ 2	r ≥ 3	0.571134	24.55171	33.87687	0.4159
r ≤ 3	r ≥ 4	0.466891	18.24187	27.58434	0.4751
r ≤ 4	r ≥ 5	0.218515	7.150204	21.13162	0.9478
r ≤ 5	r ≥ 6	0.135696	4.229086	14.26460	0.8344
r ≤ 6	r ≥ 7	0.060077	1.796754	3.841466	0.1801

Source: Researcher calculation using EVIEWS software.

bles. Table **3** shows the results obtained from Johansen's method.

The trace test assesses the null hypothesis that the number of cointegrating vectors is less than or equal to r (where r represents the relevance of the relationship among variables based on hypotheses), ranging from 0 to 6. In each instance, the null hypothesis is tested against a general alternative. Conversely, a maximum eigenvalue test evaluates the null hypothesis r = 0 against the alternatives r = 1, r = 2, and so forth. The reported trace test statistics for the non-cointegration hypotheses are (H0: r = 0) and (H0: r ≤ 1), with values of (175.5286) and (98.82747), respectively. These values surpass the critical values of (125.6154) and (95.75366) at the 5% significance level. Consequently, the null hypotheses are rejected, indicating a lack of cointegration in favor of alternative hypotheses. This test concludes the existence of two cointegrating relationships among LPCGDP, LGCF, LCE, LNSE, and LMHT. The maximum eigenvalue test, as presented in Table **4**, corroborates these findings, revealing the presence of two integration relationships among the study variables.

4.4. Vector Error Correction Model (VECM)

Table **5** shows the results of VECM. The long and short-term causal relationship between the dependent variable LGDPPC and the independent variables. The error correction coefficient results show that the coefficient with LGDPPC as the dependent variable is negative and statistically significant indicating that there is a convergence from short dynamics towards long-run equilibrium. The adjustment coefficient was 0.022494 towards long-run equilibrium in case of a disequilibrium situation. On the other hand, the results show that the LCE variable is significant in the long term at a significance level of 5%, as the statistical value of the T-test is (-3.40126). This indicates a causal relationship between the employee's compensation variable, L C E, and the dependent variable, Gross Domestic Product Per Capita (LGDPPC) in the long run.

The results also show that the LGFCF variable is also significant in the long term at the 5% level, as the statistical value of the T-test reached (-5.06716). This indicates a causal relationship between the Gross fixed capital formation (% of GDP) variable and the dependent variable, GDP Per Capita, in the long run. We also have a long-term causal relationship between the variable Medium and high-tech manufacturing value added (% manufacturing value added), MHT, and the GDP Per Capita. The statistical value of the T-test for this variable was (-2.59184), so the LMHT variable is significant in the long term at a significance level of 5%.

Table **5** also shows a causal relationship in the long run between the Number of Self-Employment, LNSE, and the dependent variable, Gross Domestic Product Per Capita, LGDPPC, as the T-statistic value for this variable was (-3.20875). Therefore, the variable LNSE is significant at a level of 5% in the long run. On the other hand, the results showed that the Dummy variables, which represent the abnormal situations during the period of study, the Arab revolutions in 2011, and the global financial crises in 2018 are significant in the long run at the 5% level of significance, as the T-statistic value for this variable were (11.5961), (8.97273) respectively. This means that there is a causal relationship in the long run between these variables, DUM2011, and DUM2008 with the dependent variable LGDPPC.

Based on the results of VECM, the equation that shows the long-term equilibrium relationship between the variables in the model can be written as follows:

$LogGDPPC(-1)$ = 0.010309 (-1) + 0.612875 LogCE(-1) +1.037850 LogGCF(-1) +0.971547

[-3.40126] [-5.06716]

LogMHT(-1)+1.0424101LogNSE(-1) -1.293431 DUM11(-1) - 1.171732 DUMF(-1) (11)

[-2.59184] [-3.20875] [11.5961] [8.97273]

Equation No. 11 indicates that a 1% increase in workers' compensation results in a 0.612875% rise in gross domestic product per capita. Similarly, a 1% increase in the percentage of fixed capital formation from GDP leads to a 1.037850% increase in GDP per capita. These findings align with Abu Aisha's study in 2018. Furthermore, a 1% increase in Medium and High-Tech manufacturing industries corresponds to a 0.971547% increase in GDP per capita, and a 1% rise in the Number of Self-Employment leads to a substantial 1.0424101% increase in GDP per capita, in line with

Table 5. Vector Error Correction Model (VECM) test results.

Model equation: Log GDPPC=f(Log CE,Log FCF,Log MHT,Log NSE,DUM11,DUMF)				
Repressors	**Coefficients**	**Std.Error**	**T-Statistics**	**P- value**
Log CE (-1)	-0.612875	0.18019	-3.40126	0.0019**
Log FCF (-1)	-1.037850	0.20482	-5.06716	0.0000**
Log MHT (-1)	-0.971547	0.37485	-2.59184	0.015**
Log NSE (-1)	-1.042410	0.32486	-3.20875	0.0025**
DUM11(-1)	1.293431	0.11154	11.5961	0.0000**
DUMF(-1)	1.171732	0.13059	8.97273	0.0000**
R-squared	Adjusted R squared	Sum sq. resides	S.E. of equation	F-statistic
0.676150	0.546610	0.009124	0.021359	5.219631
Log-likelihood	Akaike AIC	Schwarz SC	Mean dependent	S.D. dependent
75.78027	-4.605536	-4.181202	0.003471	0.031721
Error Correction		D (Log GDPPC)		
CointEq1		Coefficients -0.022494 Std.Error (0.01284) t-Statistics [-1.75245]		

Source: Researcher calculation using EVIEWS software.

Table 6. VAR Granger Causality/Block Exogeneity Wald Tests.

Dependent variable: LGDPPC			**H0: The independent variable doesn't Granger cause of LGDPPC.**	
Excluded	**Chi-sq**	**df**	**Prob.**	**Result at a significance level of 5%**
LGCFP	25.12350	1	0.0000	Reject H0: Causality.
LMHTP	5.831585	1	0.0157	Reject H0: Causality.
LSE	13.90337	1	0.0002	Reject H0: Causality.
DUM2008	2.452002	1	0.1174	Accept H0: No Causality.
DUM2011	61.61953	1	0.0000	Reject H0: Causality.
LCE	3.967352	1	0.0464	Reject H0: Causality.

Source: Researcher calculation using EVIEWS software.

Schumpeter's theory. The equation also highlights the negative impact of Arab revolutions, particularly the Syrian ones, and the global financial crisis in 2008 on GDP per capita.

The coefficients in Equation 11 represent the elasticities of the variables, measuring the sensitivity of GDP per Capita to the changes in each variable within the model. The elasticities for the entrepreneurship variables, Medium and High-Tech manufacturing (MHT), and the Number of Self-Employment (NSE), are approximately unity at 0.97 and 1.042, respectively. This indicates a considerable sensitivity of GDP per Capita to changes in the entrepreneurship variables, MHT and NSE. These findings align with Schumpeter's theory and previous studies such as Feki and Mnif (2016), Adegbola et al. (2020), and Dabkowski (2011). Additionally, the elasticity of the Gross Capital Formation percentage from GDP (GCF) is close to unity at 1.0378, signifying a notable sensitivity of GDP per Capita to changes in the percentage of GCF from GDP. In contrast, the elasticity of Compensation of Employees is relatively low at 0.61, indicating a comparatively lower sensitivity of GDP per Capita to changes in CE.

4.5. Granger Causality Test

In this segment of the study, we examine the causal relationship between independent variables and Gross Product Per Capita (GDPPC). The Granger causality test is conducted using block homogeneity Wald-tests (employing the Chi-square test, X2) under the VAR mechanism, as the Johansen cointegration test suggests a long-run relationship between independent variables and GDPPC. The test results are presented in Table **6**. Accordingly, the null hypotheses stating that Gross Capital Formation Percentage (LGCFP), Medium and High-Tech Manufacturing Percentage (LMHTP), Num-

ber of Self-Employment (LNSE), Compensation of Employees (LCE), and the Arab revolutions in 2011 (DUM2011) do not Granger cause GDPPC are decisively rejected. Conversely, the null hypothesis positing that the financial crises in 2008 (DUM2008) did not Granger cause GDPPC is accepted.

The econometric violations for normality test, multicollinearity, and heteroskedasticity were tested and taken into consideration in this model.

5. CONCLUSION AND PRACTICAL RECOMMENDATIONS.

5.1. Conclusion

The study examines the impact of entrepreneurship on economic growth in Jordan during the period (1990 – 2022) and identifies the mechanism through which entrepreneurship variables affect economic growth. This study uses a multivariate co-integration method by Johansen and Juselius (1990). Following a detailed time series analysis, the findings reveal that self-employment drives economic growth in Jordan; it has a significant positive impact, which indicates to importance of self-employment and individual business sustainability on economic growth in Jordan. a problem in the growth and sustainability of these companies. Given this result, policymakers should pay serious attention to individual business and self-employment by supporting productive entrepreneurial ideas and facilitating the procedures for registering individual companies. This result is consistent with many previous studies, including (Girnara, 2020), (Abu-Aisheh, 2018), and (Aparicio et al., 2015), which showed a positive impact of startups on economic growth.

The results also showed that Schumpeter's theory was achieved in Jordan concerning innovation through the positive and significant effect of the variable Medium and High-Tech manufacturing value added (MHT) on Gross Domestic Product Per Capita (GDPPC).

5.2. Recommendations

From the results of this study, we conclude several recommendations for decision-makers: First, The need to pay attention to strengthening medium- and high-tech manufacturing industries because of their positive impact on economic growth by encouraging innovation, which is considered one of the most important goals of this study. The critical elements of entrepreneurship and providing the appropriate environment that embraces and supports these innovations. Second: Self- self-employment holds significance as it fosters entrepreneurship, economic diversity, and individual empowerment. Government can support it by providing access to financial resources, offering training and mentorship programs, simplifying regulatory processes, and creating a conducive business environment. Additionally, tax incentives and initiatives to enhance market access can further encourage and sustain self-employment. Third: The necessity of paying attention to investment in fixed assets because of its significant positive impact on economic growth by increasing the value of the budget allocated to capital formation in the general budget, finally, encouraging young people to establish productive entrepreneurial projects because this reflects positively on economic growth to a greater extent than the demand resulting from paying the salaries of this group within workers' compensation.

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