

Self-Investment in Lebanon: Interplay with Economic Growth from a Gender Perspective

Oussama El Dimashki^{1*} & Samia Al Kaakour¹

1- Planforge, Lebanon.

*Corresponding Author: help@planforge.net

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Abstract

Self-investment is an essential component of economic growth. This article uses macroeconomic variables such as the Gross Fixed Capital Formation (GFCF) and the female and male school tertiary enrolment to represent self-investment in Lebanon in order to examine its effect on economic growth. A time series data was extracted from the World Bank over the period 1991-2022 in Lebanon. An Autoregressive Distributed Lag (ARDL) model is employed for data from variables integrated in order “0 and 1”. The results of the estimation of the short-run relationship indicate a positive effect of government expenditure on education and female school enrollment tertiary on economic growth but a negative effect on female and male Labor force, the information and communication technology (ICT) imports, the Gross Fixed Capital Formation (GFCF) and the male school enrollment tertiary on economic growth. In addition, the estimation of the long-run relationship denotes a positive impact of the information and communication technology (ICT) import, government effectiveness, male labor force, and male and female tertiary enrollment on economic growth. In contrast, the female labor force and government expenditure on education negatively impact economic growth. This article examines the effect of self-investment on economic growth in Lebanon, where we conclude that there is a lack of public policy in terms of education, gender equality, and investment in infrastructure and technology.

Keywords: Economic growth, self-investment, gender, endogenous growth theory, expenditure on education, labor, human capital, governance

المخلص

الاستثمار الذاتي هو جزء مهم من النمو الاقتصادي. يستخدم هذا المقال المتغيرات الاقتصادية الكلية مثل إجمالي تكوين رأس المال الثابت (GFCF) وتسجيل التعليم العالي للإناث والذكور لتمثيل الاستثمار الذاتي في لبنان من أجل اختبار تأثيره على النمو الاقتصادي. تم استخراج بيانات السلسلة الزمنية من البنك الدولي على مدى الفترة من 1991 إلى 2022 في لبنان واستخدام نموذج Autoregressive Distributed Lag (ARDL)، لبيانات تم دمجها بتكامل ترتيب 0 و 1. تشير

نتائج تقدير العلاقة في الفترة القصيرة إلى تأثير إيجابي لإنفاق الحكومة على التعليم وتسجيل الإناث في التعليم العالي على النمو الاقتصادي، بينما يظهر تأثير سلبي للقوى العاملة الإناث والذكور، واستيراد تكنولوجيا المعلومات والاتصالات (ICT)، وإجمالي تكوين رأس المال الثابت (GFCF)، وتسجيل التعليم العالي للذكور على النمو الاقتصادي. بالإضافة إلى ذلك، يظهر تقدير العلاقة في المدى الطويل تأثيرًا إيجابيًا لاستيراد تكنولوجيا المعلومات والاتصالات (ICT) وفعالية الحكومة والقوى العاملة الذكور و تسجيل التعليم العالي للذكور والإناث على النمو الاقتصادي، بينما تؤثر القوى العاملة الإناث وإنفاق الحكومة على التعليم سلبيًا على النمو الاقتصادي. يسهم هذا المقال في دراسة تأثير الاستثمار الذاتي على النمو الاقتصادي في لبنان، حيث نستنتج منه ضعفًا في السياسات العامة في مجال التعليم والمساواة بين الجنسين والاستثمار في البنى التحتية والتكنولوجيا.

Introduction

Self-investment refers to the allocation of resources such as time, effort, and capital toward personal and professional development. This includes acquiring education, skills, and knowledge and improving one's capabilities and productivity. In the context of economic growth, self-investment plays a crucial role in driving long-term economic development.

The relationship between self-investment and achieving long-term economic growth is represented by human resources development and self-investment in education and skill development. Human resources refers to individuals' knowledge, skills, and abilities that contribute to their productivity and economic output or gross domestic product (GDP). A well-educated and skilled workforce can drive innovation, productivity gains, and economic growth. Therefore, human resources development is vital in driving economic growth and prosperity. When individuals invest in their education and skill development, they enhance their human resources.

Moreover, education plays a crucial and significant role in a country. It is a determinant of economic growth and can be considered a proxy for self-investment. Conversely, the government's budget strategy affects economic growth in the long term by allocating public funding to different economic sectors (Muktdair-Al-Mukit, D. 2012).

In addition, education is a self-investment through formal schooling or informal learning; it equips individuals with knowledge and intellectual capabilities. Education provides a foundation of skills, theoretical understanding, and practical knowledge that individuals can apply in their professional endeavors. It enhances their ability to analyze complex problems, think critically, and make informed decisions.

Background and Context

Due to Lebanon's economic situation and political instability, economic growth shrunk from 2.7 percent in 2023 to 2.4 percent in 2024, as per the United Nations Department of Economic and Social Affairs (Bechara, S., & Hage Boutros, P., 2024). Thus, education in Lebanon has declined, which creates a big issue for the Lebanese population, affecting labor and capital, the human development index, the standard of living, and economic growth.

Based on endogenous growth theory, human capital, labor, and technology are considered the most important components of economic growth. Therefore, this article sheds light on the importance of economic growth's components, such as human capital, government expenditure on education, school enrollment in tertiary, and gross fixed capital formation, which are components of human capital as a measurement of self-investment and drivers of economic growth. In addition, labor force participation can reflect employment, influencing economic growth. Furthermore, technology has an impact on the productivity of labor and Governance which is an essential factor affecting economic growth.

Research Question

Does governmental expenditure on tertiary education, infrastructure, and Information and Communication Technology (ICT) reflect the positive impact of self-investment in driving economic growth in Lebanon?

Objectives and Hypotheses

This article sets out to investigate the impact of self-investment on economic growth in Lebanon. We will examine this impact through various indicators, including government expenditures on tertiary education (both male and female), investment in infrastructure, communication, and technology (ICT), and human capital development. Our study aims to determine whether such investment hinders or fosters economic growth in the country. To guide our research, we have formulated several hypotheses, which we will test using the data and methods outlined in this article.

Consequently, the objectives of this study are to urgently examine and address gender disparities in self-investment. We aim to assess the influence of government policies and expenditure through the government's effectiveness on education in Lebanon, considering its investment in technological infrastructure. Furthermore, it identifies challenges to self-investment in Lebanon to propose policy recommendations aimed at enhancing self-investment and fostering sustainable economic growth.

Thus, for examining those variables, it is essential to assume these hypotheses:

H1: A positive impact of self-investment on economic growth

H2: A positive impact of ICT on economic growth

H3: A Positive impact of government effectiveness on economic growth.

Significance of the Study

This article underscores the practical implications of self-investment, which can be applied by governments and policymakers. Recognizing the importance of human resources development, governments often invest in education and training programs to enhance the skills and knowledge of their population. By encouraging self-investment in human resources, societies can cultivate a skilled and knowledgeable workforce that drives economic growth, fosters innovation, and improves overall well-being. Our research findings provide a solid foundation for such policy decisions.

Therefore, self-investment can lead to an increase in productivity and innovation in the economy. When individuals invest in developing their skills and capabilities, they become more efficient and effective. This, in turn, enhances productivity at the individual level and contributes to overall economic productivity and output. Additionally, self-investment in research and development can spur innovation, leading to technological advancements and economic growth.

It is important to note that while self-investment is crucial for long-term economic growth, it is not the sole determinant. Other factors such as infrastructure, institutional frameworks, macroeconomic stability, and access to finance also play significant roles. However, self-investment acts as a catalyst, empowering individuals to contribute to their growth and the overall economic development of a nation. From this point of view, self-investment can be represented by the Cobb-Douglas production function and based on endogenous growth theory.

Literature Review

Economic growth is driven by technological progress, population growth, and direct investment. The endogenous theory of growth connects economic growth to human capital, investment, and innovation, thereby influencing skills and unemployment.

The endogenous growth theory originated from the neoclassical growth model, highlighting the importance of capital accumulation. This model is formulated by Solow and Swan (1956), illustrating how economic policy can incentivize higher savings rates, leading to a country's growth rate aligning with the rate of technological progress over the long run, with technological change considered exogenous. This theory is based on the function of production Cobb-Douglas $Y = AK^\alpha L^\beta$, where Y is the output, A denotes the productivity, K signifies capital, and L represents the labor; α and β represent the elasticities. This model distinguishes between technological progress and capital accumulation. Solow highlights the importance of technical progress in the long run, with productivity considered endogenous. Nonetheless, the neoclassical model applies equally to endogenous and exogenous technology, examining how capital accumulation impacts real wages, real income, and interest rates, whether technology is exogenous or endogenous.

Furthermore, according to Romer (1990), the endogenous growth theory, often referred to as "innovation-based," encompasses the product-variety model. This model posits that productivity growth is driven by innovation through the creation of new products. Therefore, according to Aghion and Howitt (1998), the innovation-based theory encompasses another branch known as the Schumpeterian model, elaborated upon by this model, which focuses on "creative destruction," which revolves around innovations that enhance quality and render old items obsolete. In this paradigm, faster sector growth often leads to higher

company turnover as creative destruction generates new innovators and displaces existing ones. The newest innovator becomes each intermediate product's sole producer and marketer (Aghion et al., 2008).

According to Schumpeter (1912,1939), innovation is an exogenous factor of economic growth that can lead to a gradual and progressive transformation in the economic system (Witt, U. 2016). He considers that innovation gives rise to competitiveness and that economic growth is achieved by education. This idea was formally defined by Solow (1956) in the exogenous growth model (Schiliro. D, 2017).

A new version of economic growth theory is explained by Romer (1986,1990) who highlights the endogeneity of productivity (Romer, P.M, 1990). The endogenous growth model, based on innovation, studies the long-term growth that is endogenous and dictated by technological progress brought about by R&D in the private sector (Omar, 2019).

Keynes argues that public spending is a critical factor in determining economic growth on the foundation of Keynesian theory. Due to multiplier effects on aggregate demand, an increase in government consumption was likely to result in increased employment, profitability, and investment. Government spending raised aggregate demand as a result, and depending on expenditure multipliers, this increased output. This suggests that public debt service, pensions and gratuities, healthcare, education, and agriculture spending will all increase productivity and development by improving the quality of the labor force and having a multiplier effect on the economy (Nwude, C. et al., 2023). A study examined the factors influencing economic growth and Total Factor Productivity (TFP) in Lebanon from 1980 to 2014. The analysis begins by estimating TFP within a growth accounting framework using an Autoregressive Distributed Lag (ARDL) modeling approach to explore the relationship between economic growth and macroeconomic variables such as foreign direct investment (FDI), openness, claims on the private sector, and official development assistance. The result indicates a significant relationship between economic growth and the studied variables, except for claims on the private sector, which appear to be insignificant. The TFP model results reveal a significant association between claims on the private sector and openness while demonstrating an insignificant link between foreign direct investment and official development assistance (Saad, 2017).

Another study examines the relationship between public expenditure in the education sector and economic growth in Indonesia, especially since the government has committed to allocating 20% of the state budget to education. Utilizing time series data spanning from 1988 to 2018 and applying the Cobb–Douglas production function as the economic theory for measurement employing the Autoregressive Distributed Lag bound tests, the results showed a positive association in the long term and a negative association in the short term. Conversely, gross fixed capital formation exhibits a positive relationship, while

the labor variable displays a negative association in both short and long terms (Suwandaru A. et al., 2021).

Furthermore, a study investigated the effect of expenditure on education, welfare services, and health care on economic growth for 15 advanced welfare states over the period 1980-2015 using the fixed effects model as an estimation technique to denote a positive impact on economic growth in the medium and long term (Kim et al., 2020).

In addition, a study that applied the Cobb-Douglas production function model to the time series data of capital, labor, and Gross Domestic Product (GDP) for the United States economy from 1951 to 2008 reveals that the marginal contribution to GDP from capital input is 0.403 while the marginal contribution from labor input is 1.094. These findings indicate that the U.S. economy is labor-intensive, and the labor force and capital positively impact economic growth (Fagan, G. et al., 2016). Moreover, in West Tenggara Province, economic growth is influenced positively by the capital expenditure denoted by a study using multiple regression analysis over 2012-2022 (Aulia, R.R. et al., 2024). Furthermore, a study investigated the relationship between public expenditure on education and economic growth in Nigeria. It analyzed time-series data and employed Ordinary Least Squares (OLS) and Granger causality tests. The empirical findings led to the conclusion that public expenditure on education has a positive and significant impact on economic growth in Nigeria. Consequently, the study advocates for increased government spending on education in real terms to align with the UNESCO recommendation of allocating 26% of the national annual budget to the education sector (Jones, 2019).

Moreover, a research article explored the correlation between national innovation and macroeconomic variables such as GDP, self-employment, and FDI. The Global Innovation Index (GII) and its sub-indices were employed to quantify innovation by analyzing a dataset encompassing 120 countries with historical data from 2013 to 2019, utilizing the generalized linear and panel-corrected standard error models. The results reveal a positive and significant relationship between the GII and its sub-indices and a country's economic prosperity as measured by GDP per capita. Furthermore, the research identified a positive association between the GII and its constituent variables with the domestic institutional framework, national infrastructure, local human capital and technology, and creative outputs. The findings also indicate a negative impact of the GII and its components on domestic self-employment (Dempere J. et al., 2023).

Furthermore, an empirical study examining the impact of public expenditure on education on the long-run economic growth in Bangladesh over the years 1995-2009 denotes a positive and significant effect of public expenditure on education on economic growth, contributing to a 0.34% increase in GDP per capita in the long run (Muktdair-Al-Mukit, D., 2012).

Moreover, expenditures on education positively affect economic growth. As demonstrated in a study on Nigeria over the period 2016–2022, prioritizing the funds for the education and health sectors by employing multiple regression analysis is recommended. (Okoroigwe, E. S. 2024).

In addition, governance involves establishing rules and regulations that shape various aspects of society. Unemployment, in turn, can be influenced by Governance, which encompasses accountability, ethics, implementation, and decision-making processes. Governance is characterized by transparency, a long-term vision of public interest, and the assurance of a fair juridical and political system (Ighoshemu et al., 2022). This aligns with Romer's point of view in endogenous growth theory by examining the role of institutions in free markets and property rights (Schilirò, 2019).

This article studied the impact of self-investment on economic growth, considering the macroeconomic variables, using time series data extracted from the World Bank. The model employed is the Autoregressive Distributed Lag (ARDL) model over the period 1991-2022 in Lebanon, using the statistical software EViews 12.

The estimation of the model used a linear function based on the Cobb-Douglas production function.

$$Y_t = A_t L^\alpha K^\beta \quad (1)$$

Where A is the total factor productivity, Y is the total production, L is the labor, K is the capital, and α and β are the output elasticities (Felipe, J et al., 2020).

$$GDP_t = \beta_0 + \beta_1 LFF_t + \beta_2 LFM_t + \beta_3 SCHTF_t + \beta_4 SCHTM_t + \beta_5 GOVEXP_t + \beta_6 ICTIM_t + \beta_7 GOVEFF_t + \beta_8 GFCF_t + \varepsilon_t \quad (2)$$

Model Specification

Table 1: Data used for the estimation, extracted from the World Bank

Variable name	Description	Abbreviation	Unit
Gross domestic product	The annual percentage growth rate of GDP at market prices is determined using constant local currency, with aggregates calculated at constant 2015 prices and expressed in U.S dollars. It represents the summation of gross value added by all residents. It is used as a proxy for economic growth.	GDP	Percentage
Labor force participation rate, Female and Male	The labor force participation rate is the percentage of the population aged 15-64 that is actively engaged in economic activities. This includes all individuals who contribute their labor to the production of goods and services during a specified period.	LFF/LFM	Percentage
School enrollment tertiary Female and Male	The gross enrollment ratio is the relationship between total enrollment and the population within the age group corresponding to the specified level of education. Successful completion of secondary education is typically a minimum admission requirement.	SCHTF/SCHTM	Percentage
Government expenditure on education	General government expenditure on education, encompassing both current and capital spending, along with transfers, is presented as a percentage of the total general government expenditure across all sectors, which may include health, education, and social services among others.	GOVEXP	Percentage
ICT goods imports	Imports of information and communication technology (ICT) goods comprise various categories such as computers and peripheral equipment, communication equipment, consumer electronic equipment, electronic components, and technology goods	ICTIM	Percentage
Government effectiveness	Government effectiveness reflects perceptions regarding the quality of public services, the effectiveness and independence of the civil service from political influences, the quality of policy development and execution, and the government's credibility in upholding these policies. The percentile rank signifies the country's position relative to all nations included in the aggregate indicator with 0 representing the lowest rank and 100	GOVEFF	Percentile rank

Gross fixed domestic investment comprising capital formation	indicating the highest. Adjustments to percentile ranks account for changes over time in the composition of countries covered by the Worldwide Governance indicators (WGI). The annual growth rate of gross capital formation is calculated using constant local currency and aggregates are expressed in U.S. dollars. It was previously known as gross domestic investment comprising expenditures on increasing the fixed assets of the economy and net changes in inventory levels. It contains the purchase of plant, machinery, equipment, as well as the construction of infrastructure like roads, railways, schools, offices, hospitals...	GFCF	Percentage
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Source: World Bank

Descriptive Statistics

The descriptive statistics were used to summarize and organize data from population on sample research; it contains: Means, Standard deviation, maximum and minimum values, Skewness and Kurtosis (Holcomb, 2016).

Table 2: Descriptive Statistics

Variables	Mean	Standard deviation	Maximum value	Minimum value
GDP	3.160	4.0615	10.232	-6.914
LFF	25.650	3.738	33.120	21.887
LFM	71.534	1.794	76.058	69.285
SCHTF	44.533	7.350	57.372	29.807
SCHTM	36.305	4.623	43.625	26.572
GOVEXP	7.272	0.933	8.575	5.503
ICTIM	3.060	0.728	4.742	2.180
GOVEFF	44.534	9.648	57.377	20.476
GFCF	3.124	14.645	28.690	-45.493

Source: Author’s computation (EViews 12)

The gross domestic product had a mean’s value 3.16 which is greater than its standard deviation value 4.0615, this means the data are clustered around the mean; in addition, all the other independent variables had the mean’s value greater than their standard deviation’s value. In contrast, the mean’s value of the Gross Fixed Capital Formation (GFCF) was less than its standard deviation value which denotes that the data are spread out from the mean.

To precise the model to use in the estimation, it is important to test the stationarity of the variables.

Stationarity Test

Testing the stationarity was used in time series analysis to examine if the data remains steady over a period of time. When it comes to economic variables, there is a high likelihood of a nonstationary series in most cases. Therefore, the test of Dickey-Fuller (1979) and Phillips Perron (1988) are used in this article (Jalil, A. et al., 2019).

Table 3: Stationarity Test

		Stationarity Test		
		Level	First difference	Second difference
GDP	ADF	0.0000****	0.0000****	0.0000****
	PP	0.0095**	0.0000****	0.0001***
LFF	ADF	0.4588	0.0000****	0.0000****
	PP	0.9868	0.0000****	0.0000****
LFM	ADF	0.0986	0.0000****	0.0000****
	PP	0.1064	0.0000****	0.0000****
SCHTF	ADF	0.0437*	0.0007***	0.0001***
	PP	0.9240	0.0006***	0.0001***
SCHTM	ADF	0.8908	0.0001***	0.0000****
	PP	0.8916	0.0001***	0.0000****
GOVEXP	ADF	0.2264	0.0000****	0.0001***
	PP	0.0095**	0.0000****	0.0001***
ICTIM	ADF	0.0032**	0.0003***	0.0006***
	PP	0.3201	0.0001***	0.0000****
GOVEFF	ADF	0.9993	0.0033**	0.0000****
	PP	0.9999	0.0036**	0.0001***
GFCF	ADF	0.5120	0.0000****	0.0000****

Source: Author’s computation (EViews 12)

*, **, ***, **** denotes 5%, 1%, 0.1% and 0.01% respectively.

The table above denotes that the variables such as government effectiveness (GOVEFF), male and female school enrollment, male and female labor force and the gross fixed capital formation are stationary at the first difference and integrated in order 1, I (1), and the other variables such as gross domestic product, government expenditure on education and ICT import are stationary at level. Therefore, it was necessary to apply the Autoregressive Distributed Lag (ARDL) model.

Autoregressive Distributed Lag (ARDL) Model

When working with variables that integrated different orders such as I (0), I (1), or a combination of the two, the ARDL cointegration technique is recommended (Pesaran and Shin (1995) and Pesaran et al (1996b)). The F-statistic (Wald test) is used to determine the underlying variables' long-term relationships. According to this method, the series long-term association is considered established when the F statistic is greater than critical value of I (1) and I (0) (Nkoro, E. et al., 2016).

The estimation of a model starts with the bound test in order to know if there is a long run relationship or not.

$H_0. \Delta=\gamma_1= \gamma_2=... \gamma_k =0$, No cointegration

$H_1. \delta \neq 0$ or $\gamma_1 \neq 0$ or $\gamma_2 \neq 0$. or $\gamma_k \neq 0$, existence of cointegration (Qu, B., Huang, Y., She, J., Liao, P., & Lai, X., 2024).

The estimation of Wald Bounds test indicates that F-Bounds is 303.4780 which is greater than the value of I (0) and I (1), which denotes the existence of the long run relationship; thus, we accept the alternative hypothesis of existence of cointegration, and we reject the null hypothesis.

The estimation of short run model is indicated by the equation below:

$$\begin{aligned} \Delta GDP_t - 1 = & 1.399 - 0.144\Delta GFCF_t - 1 + 3.036\Delta GOVEXP_t - 1 - 7.995\Delta ICTIM_t - 1 - \\ & 0.0001*** \quad 0.0002*** \quad 0.0002*** \quad 0.0001*** \\ & 106.05\Delta LFF_t - 1 - 6.103\Delta LFM_t - 1 + \Delta 0.940SCHTF_t - 1 - 1.901\Delta SCHTM_t - 1 - \\ & 0.0001*** \quad 0.0001*** \quad 0.0001*** \quad 0.0001*** \\ & 0.1400\Delta GOVEFFET - 1 + \varepsilon_t \quad (3) \\ & 0.0001*** \end{aligned}$$

According to the short run equation, the table above indicates a negative relationship between economic growth and GFCF owing to the absence of investment in infrastructure such as public schools and universities, airports, harbors, roads, energy plants and bridges which can reflect negatively on economic growth (GDP).

On the contrary, the impact of government expenditure on education is positive and significant on economic growth; when the government expenditure on education increases 1 unit, the economic growth increases 3.03 units which denotes that when the government increases the expenditure on education, it will affect the human capital performance and productivity which will automatically increase the economic growth.

Moreover, there is a negative and significant impact of ICT import on economic growth; when the import of ICT increases 1 unit, the economic growth decreases 8 units owing to the wrong allocation of technology used in investing in human capital.

In addition, the male and female labor force have a negative impact on economic growth in the short run; this can be explained by the absence of self-investment in human capital which reflects negatively on the labor market and can lead to a negative effect on economic growth.

The relationship between the female school tertiary enrollment is positive and significant; when the school tertiary enrollment increases 1 unit, the economic growth increases 0.94 units. On the contrary, the male school tertiary enrollment has negative impact on economic growth; when the school tertiary enrollment of males increases 1 unit, the economic growth decreases 1.90 units owing to self-investment in female in tertiary school that affects the economic growth.

ARDL-Long Run Estimation Equation

$$\begin{aligned}
 GDP_t = & -617.526 - 0.112GFCF_t + 1.00GOVEFF_t - 0.737GOVEXP_t + 15.402ICTIM_t - 7.474LFF_t + \\
 & 0.0093^{**} \quad 0.1978 \quad 0.0083^{**} \quad 0.0255^* \quad 0.0103^* \quad 0.0119^* \\
 & 8.787LFM_t + 0.026SCHTF_t + 1.446SCHTM_t + \varepsilon_t \quad (4) \\
 & \quad \quad \quad 0.0101^* \quad 0.8106 \quad 0.0090^{**}
 \end{aligned}$$

According to the equation above, there is a positive and significant relationship between government effectiveness and economic growth in Lebanon; when the GOVEFF increases 1unit, the economic growth increases 1 unit. This is crucial and has significant implications for the country's overall development. Lebanon has faced various challenges including political instability, corruption, and economic uncertainties, lack of public services provided by the government which have influenced the effectiveness of its government and, consequently, its economic growth.

In contrast, there is a negative relationship between economic growth and government expenditure on education; when the government expenditure

increases 1 unit, the economic growth decreases 0.73 units. This refers to the mismanagement of public expenditure on education; also, there is a lack of development of human resources and deallocation of government expenditure on education.

There is a positive and significant impact of ICT import on economic growth (GDP); when the ICT increases 1 unit, the economic growth increases 15.40 units. Therefore, this relationship is dynamic and is influenced by government policies, private sector initiatives, and the overall economic environment.

In contrast, the relationship between the economic growth (GDP) and female labor force is negative and significant; when female labor force increases 1 unit, the economic growth decreases 7.47 units. This refers to the challenges such as gender-based discrimination, unequal access to education and employment opportunities, and cultural factors which can influence the extent of female labor force participation. This relationship is different between the male labor force and economic growth; when the male labor force increases 1 unit, the economic growth increases 8.78 units. This relationship is intricate involving economic output, occupational diversity, education, income generation, entrepreneurship, and the influence of government policies. A robust and dynamic male labor force contributes significantly to the overall economic well-being and development of the country.

In addition, the impact of male school enrollment tertiary and economic growth is positive and significant; when the male school enrollment tertiary increases 1 unit, the economic growth increases 1.44 units; this is because the government's policies prioritize and invest in higher education playing a crucial role in shaping this relationship. Government policies that prioritize and invest in higher education play a crucial role in shaping this relationship.

Diagnostic Tests

To examine if the model has no heteroskedasticity, we applied the Breusch-Pagan-Godfrey test. The result of this test indicates that $p\text{-value}=0.744 > \alpha=0.05$; Therefore, the null hypothesis is accepted, and the alternative hypothesis is rejected which means that the data are Homoscedastic.

In addition, we applied the normality test to know if the data are normally distributed. The result of this test denotes a value of probability of Jarque-Bera $0.629 > \alpha=0.05$ which indicates that the data are normally distributed.

Findings and Conclusion

This article investigated the impact of self-investment on economic growth considering the gender aspects. The estimation of Autoregressive Distributed Lags (ARDL) model indicates the presence of a long run relationship between variables. Based on the Cobb-Douglas function, this article embodied the function of production in the economic growth; the capital is represented by the Gross Fixed Capital Formation with the male and female school enrollment in

tertiary, while the labor is male and female (15-64) and using a control variable such as government effectiveness and government expenditure on education.

On the one hand, the estimation of ARDL model in the short run indicates a positive and significant impact of government expenditure on education and school enrolment in tertiary (female) on economic growth while the Gross Fixed Capital Formation, labor force (female), ICT import, labor force (male and female) and male school enrolment tertiary have a negative influence on economic growth. On the other hand, the estimation of long run equation indicates a negative and significant relationship between the gross fixed capital formation, government expenditure on education and female labor force on economic growth while the government effectiveness, ICT imports, male labor force, male and female school enrolment tertiary have a positive impact on economic growth.

Regarding the first hypothesis, which considers a positive impact of self-investment on economic growth, it is related to gross fixed capital formation and tertiary school enrolment (female and male). Gross fixed capital formation did not confirm the hypothesis while tertiary school enrolment has a positive impact on economic growth in the short run for females but a negative one for males. However, the long run of tertiary school enrolment is positive and significant for males but positive and insignificant for females. It refers to the education system in Lebanon's universities; the brain drain of educated males is a reason why the enrolment in tertiary did not present a significant impact on economic growth in the long run. It is noteworthy that the number of females enrolled in tertiary is greater than that of males which reflects in its significance in the short run.

The results of the relationship between information and technology and economic growth are confirmed with the second hypothesis in the long run where there is a positive impact of information and technology on economic growth while it is negative in the short run. This means that economic growth is influenced by the import of technology in the long run while there is a lack of use of technology in the short run (Nauffal, D. I., 2019).

Additionally, the third hypothesis considers the positive impact of government effectiveness on economic growth in the short run. While this relationship is not confirmed, government effectiveness has a negative impact on economic growth in the long run owing to the lack of regulations and policies related to education in the public sector in Lebanon. This stands as a barrier against enhancing human capital and innovation and subsequently economic growth.

Therefore, this article contributes the effect of self-investment that is represented by the Gross Fixed Capital Formation and enrolment in tertiary on economic growth in a gender perspective, where it indicates that the government should encourage a supportive ecosystem for ICT development investing in digital infrastructure and fostering innovation. These are crucial aspects for leveraging the positive impact of ICT import on economic growth. Since the

participation of women is still weak especially in the public institutions, it is important to improve the governance since the governance has a negative impact on economic growth in Lebanon in the long run where the government effectiveness is an indicator affected by the weak public policy in terms of education and social protection and infrastructure (Milbourne, R. et al. 2003).

In addition, the female labor force participation is negative in the long run while the male labor force is positive; this can explain the existence of U-shaped relationship between female labor force and economic growth. Moreover, Lebanon has gender disparity in terms of wage and work participation which makes the effect of female labor force on economic growth negative (Kumari, R., 2018). In order to enhance the female participation, it is important to empower women economically which is the case in some non-governmental organizations that are helping women to participate in politics and different economic sectors, where women representation in politics is merely 8 members in the parliament (UNWOMEN, 2022).

Hence, fostering an environment that promotes gender equality and inclusivity is vital for maximizing the positive contributions of women to the Lebanese economy.

Consequently, this article concludes the weakness of governance and the education in the public sector in Lebanon. While the expenditure of government on education has a positive impact in the short and long term on economic growth, the school enrolment in tertiary education is still weak for males in the short run and positive and significant in the long run for males. Therefore, it is important to shed light on the importance of reforms in the public education sector and the implementation of new public policies that consider education, economic sectors, the enhancement of human capital and gross fixed capital formation as an important factor for economic growth. These measures can have a positive impact on performance of the Lebanese economic sector.

Moreover, it would be important to research the impact of education in comparing the difference between the public and private universities taking the curriculum into account.

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Mr. Oussama El Dimashki is a senior economist and co-founder of PLANFORGE Economic Consultancy. He holds a Master's degree (M1) in Economic Sciences from the Lebanese University, Faculty of Economics and Business Administration. He is specialized in providing comprehensive economic consultancy services. With a strong academic background, an experience in teaching economics and sociology at the secondary level for 25 years, and expertise in economic analysis, Mr. Dimashki actively pursues higher education and engages in economic research. He possesses analytical skills and strategic thinking. He also has a valuable asset in developing tailored business strategies and conducting detailed economic analyses.



dimashki.o@planforge.net

Ms. Samia Mounir Al Kaakour is an economic consultant and the co-founder of PLANFORGE Economic Consultancy. She is a PhD candidate, Université Saint Joseph (USJ)-Faculté des sciences économiques (FSE). Ms. Kaakour has experience in quantitative analysis and econometric modelling. Her research portfolio includes work with UNESCO among other organizations.



s.kaakour@planforge.net