ANALYSIS OF THE FACTORS AFFECTING ECONOMIC GROWTH AND PRODUCTION IN THE SERVICES SECTOR OF THE IRAQI ECONOMY

M. M. Tali

Collage of Administration and Economics - University of Kerbala Iraq, Karbala
E-mail: mahdi.m@uokerbala.edu.iq

The study analysed economic growth in Iraq from 2003-2014 using mathematical model and (ARDL) Model methodology. It found that the lack of modern technology utilization in the Iraqi economy led to an inverse relationship between human capital and physical capital and Total Factor Productivity (TFP) in the services sector. The study's key recommendations emphasize the importance of investing in human capital, such as education, healthcare, and research and development, to enhance economic growth. The study highlights the need for knowledge and technological advancements to improve total factor productivity and achieve long-term economic growth.

Introduction: The study investigates the relationship between output and human capital in the Iraqi economy using mathematical and econometric models and (ARDL) Model analyze the relationship between variables, focusing on the short and long term. This approach aids in economic analysis by applying mathematical methods and statistical software, such as Eviews. The ARDL Model is advantageous as it can handle time series data at the Iraqi economy level, The research aims to validate the relationship between capital (physical and human) and Total Factor Productivity (TFP) in Iraq using modern mathematical methods. It connects economic growth with physical capital, human capital, and total factor productivity. The Iraqi economy faces inadequate policies that hinder economic and social development and sustainability of growth. Understanding the contribution of factors of production to economic growth in the services sector is crucial for developing effective policies. The study hypothesizes that TFP includes human capital and qualitative variables that are difficult to measure. Two complementary methodologies were employed: economic theory related to economic growth and mathematical methods to assess the extent of factors of production contributing to economic growth in the services sector. The study's spatial and temporal boundaries cover the period from 2003 to 2014.

A mathematical model was created to analyze Iraqi economy's services sector's economic growth and production factors, identifying key variables and utilizing mathematical relationships to represent their interactions.

Where: $$Y_t = TFP_t \times K_t^{\alpha} \times L_t^{\beta} \times G_t^{\gamma} \times X_t^{\delta}$$

Y_t:The Economic Output in the Services Sector (service sector GDP) at time (t), K_t: The Capital Used in the Services Sector at Time (t); L_t: Employment in the Services Sector at Time (t); TFP_t:Total Factor Productivity (TFP) in the Services Sector, Which Can Reflect the Impact of Innovation, Technology, and Managerial Efficiency G_t: Government Spending on the Services Sector at Time (t), X_t: Influencing external factors, such as foreign investments, political stability, and economic policies (t). and that: α, β, γ, δ: The elasticities of output with respect to capital, labor, government spending,

and external factors, respectively, determine the impact of each factor on economic growth in the services sector. The autoregressive distributed lag (ARDL) model also represents a combination of two models [1]: the distributed lag model and the autoregressive model. In the presence of a situation where the dependent variable yt is influenced by the explanatory variable x_t and lagged values of (xt-r), the effect of the explanatory variable is not limited to the current time period (t) but extends over multiple previous time periods (t-r). The ARDL model is expressed by the following equation [2]:

$$y_t = \beta + \beta_0 x_t + \beta_1 x_{t-1} + u_t \ldots\ldots \quad \ldots(1)$$

Dynamic behavior can be expressed through the lagged values of the dependent variable (yt). This means that the dependent variable itself acts as an explanatory variable, but with a time lag of previous periods (yt-i). This represents an autoregressive model and is given by the following formula:

$$y_t = \lambda_1 y_{t-1} + \lambda_2 y_{t-2} + \cdots + \lambda_p y_{t-p} + u_t \ldots. \quad .(2)$$

According to Equation (1) above, the ARDL model contains a right-hand side that includes lagged explanatory growth (x_{t-1}), in addition to the dependent variable itself having previous values (y_{t-i}), Therefore, it takes the following form [3]:

$$y_t = \alpha + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + u_t \ldots\ldots\ldots \quad (3)$$

Where (x,y) represent variables that are stationary at either level zero, one, or a combination of both. The possibility of a long-term relationship (cointegration) among the studied variables is also tested using the ARDL model, regardless of whether the variables are static, zero-degree, one-degree, a combination of both. According to the bound test approach, the lower and upper bounds for the F-statistic are determined based on the null hypothesis (H_0), which implies no long-term cointegration relationship between the model's variables. If the calculated F-statistic is lower than the upper bound, we accept the null hypothesis and reject the alternative hypothesis, which suggests no cointegration exists. Conversely, if the F-statistic exceeds the lower bound, we reject the null hypothesis and accept the alternative hypothesis, indicating the possibility of a cointegration relationship. If the calculated values fall between the upper and lower bounds, the result is considered inconclusive. In practice, the Error Correction Model (ECM) and Bound Test are applied after determining the stationarity level of the studied variables. The following equation is then applied:

$$\Delta y_t = a_0 + \sum_{i=0}^{r} a_{1i} \Delta y_{t-1} + \sum_{i=0}^{r} a_{2i} \Delta p_{t-i} + \sum_{i=0}^{r} a_{3i} \Delta m_{t-i} + \beta_1 y_{t-1} + \beta_2 p_{t-1} + \beta_3 m_{t-1} + \varepsilon t \ldots\ldots\ldots\ldots (4)$$

Where:

Δ:First Difference of Variable Values, α_0: Constant Term, r: Optimal Lag Length, a_{3i}, a_{2i}, a_{1i}: Short-term Coefficients of the Dynamic Relationship, β3 ،β2 ،β1: Long-term Coefficients through which the Possibility of Cointegration is Determined, t: time, ε_t: Random Error Term. So, according to the above equation, the possibility of cointegration among the variables under study, based on the bound test, will be estimated. The short-term relationship will then be determined using the Error Correction Model (ECM) as follows:

$$\Delta y_t = a_0 + \sum_{i=0}^{r} a_{1i}\,\Delta y_{t-1} + \sum_{i=0}^{r} a_{2i}\,\Delta p_{t-i} + \sum_{i=0}^{r} a_{3i}\,\Delta m_{t-i} + yECT_{t-1} + \varepsilon t \ldots..(5)$$

Where (ECT) represents the error correction term added to the model, while (y) represents the proportion of the deviation corrected from period (t-1 to period t). The study uses the ARDL model to analyze the relationship between physical and human capital in the Iraqi economy. The model, which includes 35 observations from 2003 to 2014, shows that a 100% increase in physical capital would result in a 91% decrease in GDP, indicating the destruction of physical capital, particularly infrastructure, due to the 2003 events. Conversely, a 100% increase in human capital would lead to a 191% increase in physical capital, indicating that the services sector in the Iraqi economy relies more on human capital than on physical capital. The Total Factor Productivity (TFP) or Solow Residual is -3%, indicating a significant weakness in the use of technology, skills, and scientific knowledge in this sector. The model's long-term estimates indicate no significant long-term response for the studied variables.

Distribution of Total Growth Rate Among Production Factors in the Services Sector

Factors	Growth rate 1	Elasticity (Factor Share of Production) 2	Distribution of Growth Rates Among Production Factors 1×2=3	Percentage Contribution of Production Factors 3/ Growth Rate of TotalOutput
Physical Capital	0.036527	-0.913028	-0.033350	-69.04%
Human Capital	0.062320	1.913028	0.119219	246.80%
Total Factor Productivity(TFP)	-0.0375647	---------	-0.0375647	-77.76%
Output	0.048305			100 %

Source [4,5,6,7]: The table is created by the researcher based on the statistical software (EViews.9).

The table above shows that the contribution of physical capital to the growth of total output in the services sector is -69.04%. The negative sign indicates idle capital, represented by the destroyed infrastructure due to the events of 2003, which severely weakened the infrastructure in the services sector. On the other hand, the contribution of human capital was 246.80%, indicating that the growth of total output in the services sector is characterized by an abundance of human capital and a scarcity of physical capital. The Solow residual indicates that TFP, which accounted for-77.76% of the growth share in the total output in the services sector, is very low. This reflects the lack of modern technology usage in the services sector, particularly information and communication technology (ICT). In conclusion, this study led to an analysis of the factors influencing economic growth in the Iraqi economy during the period 2003-2014. The study developed a mathematical model and used cointegration based on the ARDL model methodology. The study reached several findings: The private sector contributes little to the gross domestic product (GDP), with the services sector being weak due to the dominance of the oil production sector. Labor productivity in the services sector

from 2003 to 2014 was 3.76, while capital productivity was around 0.37. Mathematical tests show that total factor productivity (TFP) at the macroeconomic level is positive in the long run, validating the study hypothesis. Physical capital's elasticity is -0.91, while human capital's elasticity is 1.91 in the services sector. Physical capital contributes 13.23% to GDP growth, while human capital contributes 75.31%. Total factor productivity (TFP) contributes 11.45%. In contrast, physical capital contributes -69.04% to services sector output growth, human capital contributes 246.80%, and TFP contributes -77.76%.

The recommendations include increasing capital investments, improving workforce education and training, and enhancing technology and productivity. They also suggest diversifying GDP sources by supporting other productive sectors, particularly the services sector, through private sector contributions and foreign investments. The focus should be on developing a skilled workforce with high and medium technical skills through educational and training directives. Quality education is also emphasized as a fundamental pillar in human capabilities and knowledge competition.

REFERENCES

1. *Binuomote S. O., Odeniyi K. C., Farayola O.* Econometric Estimation of Rice Import Demand in Nigeria (1970-2008). An Application of Autoregressive Distributed Lags.

2. ARDL Modelling Approach to Cointegration, Continetal J. Agricultural // Economics. 2012. Vol. 6 (2):1-8. Pp.168-175.

3. *Hassler U., Woltrs J.* Autoregressive Distributed Lag Models and Cointegration, Working paper, University Berlin, 2005.

4. Ministry of Planning and Development Cooperation: Central Organization for Statistics and Information Technology. Annual Statistical Group. Various Issues. (2003-2014).

5. Central Bank of Iraq: General Directorate of Statistics and Research // Annual Economic Report, 2008. p. 18.

6. Republic of Iraq: Central Bank of Iraq // General Directorate of Statistics and Research, Annual Bulletin. 2008. pp. 14-15.

7. Central Bank of Iraq: General // Directorate of Statistics and Research, Annual Bulletin, Baghdad. 2011. p. 1.

8. *Solow R. M.* Technical Change and Aggregate Production // Review of Economics and Statistic. 1957. No 39.