

# Assessing the Effect of Integration in Logistics Sector on Economic Growth: Evidence from Sultanate of Oman

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## Abstract

Logistics has been recognized as an important weapon for competitive advantage to boost economic growth. This paper examines the integration in the logistics sector that may result in increasing the economic growth. The study is also considering the role of government policy on the relationship between the factors of integration and the economic growth. The finding of this study shows that there is positive effect of: (1) Infrastructure on economic growth, (2) productivity on economic growth, (3) competitiveness on economic growth, (4) Technological Advancement on economic growth. This study also found that (5) The Relationship between infrastructure, productivity, competitiveness, technological advancement on economic growth moderated by government policies

**Keywords:** logistic, infrastructure, productivity, economic growth, government policy

## 1. Introduction

Logistics driven by comprehensive and updated information flow, involves a range of extensive activity which secures transformation and distribution from source of raw material of goods to end user (Rodrigue, 2012). The CSMP has defined management logistics as a process of planning, implementing, and controlling of good, labor, information flow and storage from source of raw material for final customers (CSMP, 2013). Logistics system emphasizes organization of movement and distribution of required infrastructure and various flows such as material, finance and information in a given country (Navickas, 2011, Rodrigue, 2012).

## 2. Literature Review

### 2.1 Infrastructure and Economic Growth

In the literature, the relationship between infrastructure and economic growth is found to be unclear. However, much effort has been made within an econometric and input-output framework to estimate the linkage between infrastructure and economic growth (Tatyana Palei (2014)

Jin Zhoua et al (2021) argued that the investment in infrastructure is a typical fiscal tool to stimulate economic growth. It is considered that infrastructure impacts economic activities in three ways (Saygılı and Özdemir 2020) *firstly*, it directly contributes to production and employment through the enhancement of physical intermediaries, such as transportation and communication. *Second*, increase human capital and improve the social life of the community by providing better facilities such as education and health. *Third*, improve financial facilities such as financial transactions, loans, and other services. An increase in one type of infrastructure complements the development of another form of economic infrastructure (Jin Zhoua et al (2021). Moreover, the extensive literature suggests that continued large-scale infrastructure investment has weakened the capital-output share. This reduces investment efficiency and depletes economic resources (Banergee, Duflo, and Qian 2020; Cai and Ru 2016; Ouattara and Zhang 2019). Some studies (Jin Zhoua et al (2021) discuss the role of infrastructure in terms of growth efficiency, or sustainability, there is limited literature available that systematically attempts to assess the role of infrastructure from a growth quality perspective.

Improving the infrastructure is important to reduce the income gap and is a major determinant for the long run

GDP per capita. Referring to the World Development Report's (World Bank, 2018), the sufficient infrastructure plays a significant influence toward the economic growth. The infrastructure program focused on increasing the basic human needs and connectivity, including clean water, electricity, energy, and transportation. However, the differences in the availability of physical and human capital within the countries play a role in explaining differences in economic growth between countries (Weil, 2009)

*H<sub>1</sub>: There is positive linkage of Infrastructure on economic growth*

### 2.2 Productivity and Economic Growth

Productivity and economic growth are key factors in economic variables. Productivity depends on the availability and quality of resources and technologies used. As a result, productivity heavily influences the production process and production costs.

According to Suna Korkmaz & Oya Korkmaz, (2017) the efficient use of resources is one of the important issues in the economy. Due to the scarcity of available resources, their efficient use is a necessity. There is a production level set can be attained if they use their resources with full and efficiency. Economic growth usually results from the accumulation of factor inputs in the production process. Economic growth can also occur when companies are able to increase output levels by using available inputs more efficiently and effectively. This step is achieved when the company increases productivity. Productivity can be assessed in terms of level and in terms of growth.

Koji Nakamura, Sohei Kaihatsu, Tomoyuki Yagi (2018) found that the slowdown of productivity affected by the decreasing of total production factors. There are two reasons behind the slowdown: *first*, technology and resources such as capital and manpower are not used efficiently; and *second*, these resources are not effectively allocated among companies. To increase productivity, it is necessary to capital and a flexible workforce by changing work processes at the corporate level in line with changes in the socio-economic environment and the emergence of new technologies.

*H<sub>2</sub>: There is positive effect of productivity on economic growth*

### 2.3 Competiveness and Economic Growth

Porter (1990) argued that national competitiveness is one of the most important concerns for any countries (Lall, 2001). National competitiveness is the ability of a country to sell its goods to other nations, as the ability of a country to acquire, as the ability to adapt to changes in the external environment and as the national ability to attract scarce resources (Berger, 2009).

Romana and Polona (2016) concluded that economic growth and consequently the standard of living of its population are related to many factors that are inside or outside the control of policymakers, institutions, companies and individuals. Although variously conceptualized and measured, a country's competitiveness comprises endogenous and exogenous variables of economic growth.

Aleksandra Kordalska and Magdalena Olczyk (2015) argue that global competitiveness is a reliable predictor of economic growth. Moreover, Other researcher (Zagorsekova, et al (2018) found that there is positive relationship between competitiveness and economic growth.

*H<sub>3</sub>: There is positive effect of competitiveness on economic growth*

### 2.4 Technological Advancement and Economic Growth

Technological developments are important factors that increase the rate of economic growth and profitability as well as market share of a company. Social development occurs if a society is able to make technological advances and reflect them to their social and cultural life. Technological development makes important contributions to our life. By developing the technology has simplified the human life. Broughel and Adam Thierer (2019) stated that Technological advancement is a fundamental driver of economic growth. (Fouzia Saeed et al, 2020) Technological innovation is an important driver of economic growth and human progress. (Majeed, M.T.; Ayub, T (2018) stated the information communication technology indicators and economic growth on regional and international level.

Some researchers study technological progress as one of the root causes of: Cyclical movement of capitalist economy, quantify the share of technological progress in the rate of GDP growth; Learn the importance of technological progress in the information society; Express the scientific and technological revolution (Krume Nikoloski, 2016). Gurgul, Henryk and Lach, Łukasz (2012). They investigate technological and economic growth: evidence from Poland and they found that technological advancement has a significant effect on economic growth.

*H<sub>4</sub>: There is positive effect of Technological Advancement on economic growth*

### *2.5 The Role of Governmental Policies on the Relationship between Infrastructures, Productivity, Competitiveness, Technological Advancement on Economic Growth*

Lack of infrastructure impedes economic growth in many developing countries. Infrastructure investment has a contributing effect to increase productivity and contribute to future economic growth.

The role of government is to provide the needed infrastructure and create opportunities to boost economic growth. In many developing countries, existing capacity remains unused, not only due to a lack of adequate infrastructure, but also due to inadequate involvement of all parties involved in the planning and implementation process. Lack of necessary government intervention results in low productivity. Available policy instruments include possibilities such as public enterprises, accelerated depreciation provisions, low interest loans, subsidy programs, advance exemptions and reductions, tax concessions, incentives including tax holidays, and pioneer status for new types of business. All of this should be used effectively to accelerate and direct capital investment, driving economic growth and high productivity. But indiscriminate reliance on some of these instruments, particularly price controls, has proven unproductive in the long run (Joseph Prokopenko, 1998). Therefore, the role of government policies on the relationship between productivity and economic growth is important to elaborate in this research.

The role of government to increase economic growth has been much debated among many researchers. The issues that always arises is whether the role of government, through the composition of government spending or government consumption and excise, affects long -term economic growth. In the theory of the principle of economic growth, the neoclassical theory of Solow (1956) and Swan (1956), the answer to this issue is 'no' (Kneller et al., 1999). In this theory, the model is designed to show how the exogenous stock of capital, labor and technology affects economic growth. Although government can influence population growth, which in turn affects employment growth, this will not affect the long-term rate of per capita income growth (Kneller et al, 1999). In fact, the evidence is that in most developing countries it is difficult to lower population growth rates. The model also says that the level of savings affects the capital inventory and the level of output. This argument leads to a discussion of fiscal policy whether an increase in government spending will lead to a budget deficit and an increase in taxes will drive an increase in savings and lower domestic investment, then increase the level of national income (Mankiw, 2003).

There are many results in studying the relationship between fiscal policy and economic growth. Among those who argue that there is a positive relationship between government measures and economic growth are Rubinson (1977), Kormendi and Meguire (1985), and Barro (1990), who focus on productive production, and Kneller et.al (1999). Rubinson's (1977) study using the ratio of government income to GNI found that this ratio has a positive linkage with economic growth. He argued that this is especially true in developing countries when government spending offsets their dependence on other countries (Lin, 1994). In addition, Kormendi and Meguire (1985) also found a positive effect of government measures on economic growth. They use the average growth rate of the share of government consumption expenditure in GDP for 47 countries in World War II (Yin, 1994). His finding was followed by Barro (1990) but he found a significant positive effect only for productive government spending initially and then declining. Further, Kneller et al (1999) also observed the role of government in economic growth into two different perspectives, namely productive and unproductive government services. Productive government fiscal policy reflects spending and taxes that make a positive contribution to economic growth but not to unproductive fiscal policy.

*H<sub>5</sub>: The Relationship between infrastructure and economic growth moderated by government policies.*

*H<sub>6</sub>: The Relationship between productivity and economic growth moderated by government policies.*

*H<sub>7</sub>: The Relationship between Competitiveness and economic growth moderated by government policies.*

*H<sub>8</sub>: The Relationship between technological advancement and economic growth moderated by government policies.*

## **3. Methodology**

### *3.1 Population and Sample*

The target population is the 778 logistics service company in Oman. the sampling frame is a list of all the logistics services in Oman in the 5 key sectors which include: air transport service, marine transport service,

shipping and port agent, Land transport, transport agent. From the sampling frame, there were 5 key logistics service sectors of the 788 logistics service sectors in Oman. The logistics service sectors are divided into 5 groups/strata (See Table 1). The study involved a sample size of 152 based on this formula.

$$n = \frac{Z^2 pq^N}{e^2(N-1)+Z^2 pq} \quad (\text{Pagano \& Gauvreau, 2000})$$

Table 1. Sample size

Logistics service listing by sector	No. of Logistics service company	formula	Strata sample	Stratum percentage
Air transport service	72	152*72/788	14	9%
Marine transport service	181	152*181/788	35	23%
Shipping and port agent service	184	152*184/788	36	23%
Land Transport service	275	152*275/788	53	36%
Transport agent service	76	152*76/788	14	9%
<b>Total</b>	<b>788</b>		<b>152</b>	<b>100%</b>

### 3.2 Data Collection

This research has been conducted in Oman to investigate the infrastructure, productivity, competitiveness, technology advancement on economic growth. This research also investigates the moderating role on government policies on the relationship between infrastructures, productivity, competitiveness, technology advancement on economic growth. A research instrument is a tool used to obtain, measure, and analyses data from subjects around the research topic. Data collection are through the questionnaire five-item Likert scale as a mainly tool

## 4. Statistical Results

### 4.1 Descriptive Statistics and Correlations

This research focuses on logistics Service Company in Oman. The Logistics Services is a Logistics and Supply Chain management company with leadership in Project cargo, Freight Forwarding, Road freight, Customs Clearance and Warehousing Domain. They specialize in a total integrated Supply Chain solution to wide variety of Industry clients with a vast experience in real-world logistics and supply chain. They provide a highly optimized and customized logistics solution for every client requirement with high focus on efficiency. They offer a wide spectrum of services ranging from warehousing, transportation, freight forwarding, customs brokerage, consultancy & management services and cargo quilts. Overland Transportation, Warehousing management and distribution Custom clearance, Documentation Import and Export - Freight Forwarding Supply Chain Consulting Services Bonded Warehousing Free Zone-To-Free zone operations Automated Vehicle Tracking System Customized Logistics solutions

The descriptive statistics for each of the variables are shown in Table 2, including their mean, standard deviation, minimum and maximum value and the correlation. Mean for the four composite independent variables are 100.7053 for infrastructure, 30.1368 for productivity, 48.1895 for competitiveness, and 30.8947 for technology advancement respectively, with corresponding standard deviation (SD) of 14.25518, 5.52886, 8.56551, and 4.88698 respectively. Means of one dependent variable, economic growth was 11.74788.

Table 2. Descriptive statistics of IV and DV

	N	Min	Max	Mean	S.D
Infrastructure (Inf) ( 23 item)	95	35	115	100.7053	14.25518
Productivity (Prod) (7 items)	95	7	35	30.1368	5.52886
Competiveness (Comp) (11 items)	95	11	55	48.1895	8.56551
Technology advancement (TA) ( 7 items)	95	11	35	30.8947	4.88698
Government policies (GP) ( 19 items)	95	35	115	100.7053	14.25518
Economic growth (EG) (16 items)	95	24	80	67.2000	11.74788

Factors that influence the variance (VIF) were calculated to determine whether there are levels of multicollinearity. The decision was made based on tolerance value; if tolerance value more than 0.10 (no multicollinearity), if tolerance value less than 0.10 (serious multicollinearity). The VIF in this model has infrastructure (0.218), productivity (0.204) competitiveness (0.109) and technology advancement (0.160). All tolerance value between independent variables that indicated that no serious multicollinearity.

Correlation techniques are used to explore the relationship and prove the relationship hypothetical two or more variables when the data forming the second variable interval or ratio, and source of data from two or more variables is the same. Correlation between independent variable (integration in logistic sector that consist of infrastructure, productivity, competitiveness and technology advancement) and dependent variable (economic growth) is calculated and linier regression analysis is used in order to verify the correlation. In this research, Pearson's Product Moment of Coefficient Correlation, and simple correlation are applied to examine correlation and predict degree of integration in logistic sector and economic growth. The value of  $r$  should range between  $-1.0$  and  $1.0$  and determines the extent and type of correlation between the variable. A value close to extremities indicates a high correlation and indicates whether the correlation is negative or positive. A close to zero value indicates no correlation and a value in between indicate the existence of correlation to some moderate degree depending on the value.

Table 3 showed the correlation between independent variables (integration in logistics sector (infrastructure, productivity, competitiveness and technology advancement) and moderating variable (government policies) was positive. infrastructure had a correlation of 0.752,  $p < 0.01$  with economic growth, productivity had a correlation of 0.638,  $p < 0.01$  with economic growth, competitiveness had a correlation of 0.753,  $p < 0.01$  with economic growth, technology advancement had a correlation of 0.753,  $p < 0.01$  with economic growth.

The correlation got higher with economic growth when the moderator variables (government policies) interact with the independent variables (infrastructure, productivity, competitiveness and technology advancement). The interaction of infrastructure and government policies (Inf X GP) scored the correlation of 0.796,  $p < 0.01$ . The interaction of productivity and government policies (Prod X GP) scored the correlation of 0.771,  $p < 0.01$ . The interaction of competitiveness and government polices (Comp X GP) scored the correlation of 0.782,  $p < 0.01$ . The interaction of technology advancement and government policies (TA X GP) scored the correlation of 0.791,  $p < 0.01$ .

These correlations mean that the moderating variable played significant role in the relationship between independent variables (infrastructure, productivity, competitiveness and technology advancement) and dependent variables (economic growth)

Table 3. The correlation between IV and DV

	Correlation									
	1	2	3	4	5	6	7	8	9	10
<b>Infrastructure (Inf)</b>	1									
<b>Productivity (Prod)</b>	0.853**	1								
<b>Competiveness (Comp)</b>	0.853**	0.864**	1							
<b>Technology advancement (TA)</b>	0.801**	0.809**	0.715**	1						
<b>Government policies (GP)</b>	0.875**	0.870**	0.936**	0.903**	1					
<b>Inf X GP</b>	0.947**	0.878**	0.909**	0.867**	0.960**	1				
<b>Prod X GP</b>	0.887**	0.959**	0.930**	0.860**	0.942**	0.962**	1			
<b>Comp X GP</b>	0.875**	0.866**	0.970**	0.904**	0.970**	0.967**	0.951**	1		
<b>TA X GP</b>	0.856**	0.848**	0.928**	0.961**	0.964**	0.953**	0.937**	0.970**	1	
<b>Economic growth (EG)</b>	0.752**	0.638**	0.753**	0.753**	0.769**	0.796**	0.771**	0.782**	0.791**	1

P\* $<0.1$ , p\*\* $<0.05$ , p\*\*\* $<0.001$

#### 4.2 Hypotheses Testing

##### ***H<sub>1</sub>: There is positive effect of Infrastructure on economic growth***

To test the (H<sub>1</sub>), the regression analysis for infrastructure was conducted to determine the proportion of economic growth (dependent variable) which would be predicted by infrastructure (independent variable). The model seems to be reliable (p-value for F<0.01 and adjusted R-square of 0.560. The Model showed that 56% of economic growth is related to infrastructure. Therefore, infrastructure is a significant predictor of economic growth as shown in table 4. Results in model Table 4 appear to confirm H<sub>1</sub>.

Table 4. Regression results of Infrastructure and Economic Growth

Model	R	R Square	Adjusted R Square			Std. Error of the estimate
<b>1</b>	0.752 <sup>a</sup>	0.565	0.560			7.792
<b>ANOVA</b>		Sum of square	df	Mean square	F	Sig.
	Regression	7327.240	1	7327.240	120.694	0.00 <sup>b</sup>
	Residual	5645.960	93	60.709		
	Total	12973.200	94			
<b>Coefficients</b>		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	4.829	5.733		0.842	0.402
	Infrastructure	0.619	0.056	0.752	10.986	0.000

a. DV: Economic growth

b. Predictors: (Constant) Infrastructure

##### ***H<sub>5</sub>: Moderating effect of government policies on infrastructure and economic growth.***

This study identified government polices use as the moderator variable affecting the relationship between infrastructure (independent variable) and economic growth (dependent variable) among the logistic service firms in Oman. Using the moderated multiple regression (MMR) analysis in this study, the moderating effect of the variable (interaction term) was analyzed by interpreting the R<sup>2</sup> change in the models obtained from the model summaries and by interpreting the regression coefficients for the interaction term obtained from the coefficient tables. Regression analysis was performed in this study to test the moderating effect of government policies on the relationship between infrastructure and economic growth.

Table 5 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between infrastructure and government policies on economic growth. The adjusted coefficient of determination of the model is R<sup>2</sup> 0.630 with p-value <0.01. As a result, the interaction term (Inf X GP) was significantly related to economic growth. The Model showed that 63% of economic growth is related to independent variables (infrastructure and interaction with government polices). Results in model Table 5 appear to confirm H<sub>5</sub>.

Table 5. The moderating effect of government policies on infrastructure and Economic growth

Model	R	R Square	Adjusted R Square			Std. Error of the estimate
<b>1 ANOVA</b>	0.796 <sup>a</sup>	0.634	0.630			7.144
		Sum of square	df	Mean square	F	Sig.
	Regression	8227.361	1	8227.361	161.224	0.00 <sup>b</sup>
	Residual	4745.839	93	51.031		
	Total	12973.200	94			
<b>Coefficients</b>		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	29.261	3.076		9.511	0.000
	Infrastructure	0.004	0.000	0.796	12.297	0.000

a. DV: Economic growth

b. Predictors: (Constant) InfxGP

**H<sub>2</sub>: There is positive effect of productivity on economic growth**

To test the (H<sub>2</sub>), the regression analysis for productivity was conducted to determine the proportion of economic growth (dependent variable) which would be predicted by productivity (independent variable). The model seems to be reliable (p-value for F<0.01 and adjusted R-square of 0.407. The Model showed that 40.1% of economic growth is related to productivity. Therefore, productivity is a predictor of economic growth as shown in table 6. Results in model Table 6 appear to confirm H<sub>2</sub>.

Table 6. Regression results of productivity and Economic Growth

Model	R	R Square	Adjusted R Square			Std. Error of the estimate
<b>1 ANOVA</b>	0.638 <sup>a</sup>	0.407	0.401			9.093
		Sum of square	df	Mean square	F	Sig.
	Regression	5283.942	1	5283.942	63.908	0.00 <sup>b</sup>
	Residual	7689.258	93	8.0260		
	Total	12973.200	94			
<b>Coefficients</b>		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	36.331	5.197		5.067	0.000
	Infrastructure	2.356	0.170	0.638	7.994	0.000

a. DV: Economic growth

b. Predictors: (Constant) productivity

**H<sub>6</sub>: The Relationship between productivity and economic growth moderated by government policies.**

This study identified government polices use as the moderator variable affecting the relationship between productivity (independent variable) and economic growth (dependent variable) among the logistic service firms in Oman. Using the moderated multiple regression (MMR) analysis in this study, the moderating effect of the variable (interaction term) was analyzed by interpreting the R<sup>2</sup> change in the models obtained from the model summaries and by interpreting the regression coefficients for the interaction term obtained from the coefficient tables. Regression analysis was performed in this study to test the moderating effect of government policies on the relationship between productivity and economic growth.

Table 7 shows the regression between all integrated variable (independent and interaction) to examine the

moderation effect on the relationship between productivity and government policies on economic growth. The adjusted coefficient of determination of the model is  $R^2$  0.560 with p-value <0.01. As a result, the interaction term (Prod X GP) was significantly related to economic growth. The Model showed that 56% of economic growth is related to independent variables (productivity and interaction with government polices). Results in model Table 7 appear to confirm  $H_6$ .

Table 7. The moderating effect of government policies on productivity and Economic growth

Model	R	R Square	Adjusted R Square			Std. Error of the estimate
<b>1 ANOVA</b>	0.751 <sup>a</sup>	0.564				74.795
		Sum of square	df	Mean square	F	Sig.
	Regression	7322.607	1	7322.607	120.519	0.00 <sup>b</sup>
	Residual	5650.593	93	60.759		
	Total	12973.200	94			
<b>Coefficients</b>		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	34.378	3.095		11.108	0.000
	Infrastructure	0.004	0.001	0.751	10.978	0.000

a. DV: Economic growth

b. Predictors: (Constant) ProdxGP

***H<sub>3</sub>: There is positive effect of competitiveness on economic growth***

To test the ( $H_3$ ), the regression analysis for competitiveness was conducted to determine the proportion of economic growth (dependent variable) which would be predicted by competitiveness (independent variable). The model seems to be reliable (p-value for  $F < 0.01$  and adjusted R-square of 0.532. The Model showed that 53.2% of economic growth is related to competitiveness. Therefore, competitiveness is a predictor of economic growth as shown in table 8. Results in model Table 8 appear to confirm  $H_3$ .

Table 8. Regression results of competitiveness and Economic Growth

Model	R	R Square	Adjusted R Square			Std. Error of the estimate
<b>1 ANOVA</b>	0.733 <sup>a</sup>	0.537				8.038
		Sum of square	df	Mean square	F	Sig.
	Regression	6964.376	1	6964.376	207.789	0.00 <sup>b</sup>
	Residual	6008.824	93	64.611		
	Total	12973.200	94			
<b>Coefficients</b>		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	18.774	4.737		9.964	0.000
	Infrastructure	1.005	0.097	0.733	10.382	0.000

a. DV: Economic growth

b. Predictors: (Constant) Competiveness

***H<sub>7</sub>: The Relationship between Competiveness and economic growth moderated by government policies.***

This study identified government polices use as the moderator variable affecting the relationship between competitiveness (independent variable) and economic growth (dependent variable) among the logistic service firms in Oman. Using the moderated multiple regression (MMR) analysis in this study, the moderating effect of

the variable (interaction term) was analyzed by interpreting the  $R^2$  change in the models obtained from the model summaries and by interpreting the regression coefficients for the interaction term obtained from the coefficient tables. Regression analysis was performed in this study to test the moderating effect of government policies on the relationship between competitiveness and economic growth.

Table 9 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between competitiveness and government policies on economic growth. The adjusted coefficient of determination of the model is  $R^2$  0.607 with p-value <0.01. As a result, the interaction term (Compt X GP) was significantly related to economic growth. The Model showed that 60.7% of economic growth is related to independent variables (competitiveness and interaction with government polices). Results in model Table 9 appear to confirm  $H_7$ .

Table 9. The moderating effect of government policies on competitiveness and Economic growth

Model	R	R Square	Adjusted R Square		Std. Error of the estimate	
1 ANOVA	0.782 <sup>a</sup>	0.612	0.607		7.363	
		Sum of square	df	Mean square	F	
	Regression	7933.369	1	7933.369	146.394	
	Residual	5039.831	93	54.192		
	Total	12973.200	94			
Coefficients		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	32.448	2.970		10.926	0.000
	Infrastructure	0.008	0.001	0.782	12.099	0.000

a. DV: Economic growth

b. Predictors: (Constant) ComptxGP

***H<sub>4</sub>: There is positive effect of Technological Advancement on economic growth***

To test the ( $H_4$ ), the regression analysis for technological advancement was conducted to determine the proportion of economic growth (dependent variable) which would be predicted by technological advancement (independent variable). The model seems to be reliable (p-value for  $F < 0.01$  and adjusted R-square of 0.563. The Model showed that 56.3% of economic growth is related to technological advancement. Therefore, technological advancement is a predictor of economic growth as shown in table 10. Results in model Table 10 appear to confirm  $H_4$ .

Table 10. Regression results of technology advancement and Economic Growth

Model	R	R Square	Adjusted R Square		Std. Error of the estimate	
1 ANOVA	0.753 <sup>a</sup>	0.568	0.563		7.766	
		Sum of square	df	Mean square	F	
	Regression	7364.251	1	7.364.251	122.104	
	Residual	5608.949	93	60.311		
	Total	12973.200	94			
Coefficients		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	11.244	5.126		2.193	0.031
	Infrastructure	1.811	0.164	0.753	11.050	0.000

a. DV: Economic growth

b. Predictors: (Constant) Technology advancement

***H<sub>8</sub>: The Relationship between technological advancement and economic growth moderated by government policies.***

This study identified government policies use as the moderator variable affecting the relationship between technological advancement (independent variable) and economic growth (dependent variable) among the logistic service firms in Oman. Using the moderated multiple regression (MMR) analysis in this study, the moderating effect of the variable (interaction term) was analyzed by interpreting the R<sup>2</sup> change in the models obtained from the model summaries and by interpreting the regression coefficients for the interaction term obtained from the coefficient tables. Regression analysis was performed in this study to test the moderating effect of government policies on the relationship between technological advancement and economic growth.

Table 11 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between technological advancement and government policies on economic growth. The adjusted coefficient of determination of the model is R<sup>2</sup> 0.622 with p-value <0.01. As a result, the interaction term (TechAdvxGP) was significantly related to economic growth. The Model showed that 62.2% of economic growth is related to independent variables (technological advancement and interaction with government policies). Results in model Table 11 appear to confirm H<sub>8</sub>.

Table 11. The moderating effect of government policies on technology advancement and Economic growth

Model	R	R Square	Adjusted R Square			Std. Error of the estimate
<b>1</b>	0.791 <sup>a</sup>	0.626	0.622			7.224
<b>ANOVA</b>		Sum of square	df	Mean square	F	Sig.
	Regression	8119.614	1	8119.614	155.581	0.00 <sup>b</sup>
	Residual	4853.586	93	52.189		
	Total	12973.200	94			
<b>Coefficients</b>		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
	Constant)	30.490	3.035		10.046	0.000
	Infrastructure	0.014	0.001	0.791	12.473	0.000

a. DV: Economic growth

b. Predictors: (Constant) TechAdvxGP

## 5. Discussion

### 5.1 Infrastructure and Economic Growth

The first objective of this research was to evaluate the relationship between infrastructure and the economic growth of Oman. In general, infrastructure problems research is considering only a narrow part of the infrastructure capital that is in public ownership. This research focus on 5 key logistic service sectors which include: (1) air transport service, (2) marine transport service, (3) shipping and port agent, (4) Land transport, (5) transport agent. The research finding show that the correlation of infrastructure and the economic growth of Oman was significant enough to show the correlation of two variables. The finding of research is in line with research conducted by Jin Zhoua et al., (2021). They argued that Infrastructure investment is a typical fiscal tool to stimulate economic growth and economic counter-cyclical adjustments, well developed infrastructure reduces regional distances, integrates national markets, and enhances connectivity with other economies. It is considered that infrastructure development impacts economic activities in three ways (Sahoo and Dash 2009 cited in Jin Zhoua et al (2021); Saygılı and Özdemir 2020) *firstly*, it directly contributes to production and employment through the increase of physical intermediates, such as transport and communication. *Secondly*, it increases human capital and improves people's social lives by providing better facilities such as education and health. *Thirdly*, it improves financial facilities such as monetary transactions, loans, and other services. Improvement in one type of infrastructure complements developing other forms of economic infrastructure (Jin Zhoua et al (2021). Moreover, considerable literature indicates that continuous large scale infrastructure investment has softened the proportion of capital-output. It reduced investment efficiency and economic resource depletion

(Banerjee, Duflo, and Qian 2020; Cai and Ru 2016; Ouattara and Zhang 2019).

Some studies (Jin Zhou et al (2021) discussed the solitary role of infrastructure in terms of growth efficiency, or sustainability, there is currently limited literature available that systematically attempts to evaluate infrastructure's role from the perspective of growth quality. To measure the economic growth quality, a comprehensive index is constructed by considering the efficiency, stability, and sustainability of economic growth. An objective and rigorous examination of growth quality using historical data can provide useful references and policymaking judgements.

This research result also supported by Tatyana Palei (2014) Assessing the impact of infrastructure on economic growth and global competitiveness. She argued the impact of infrastructure on economic growth and the competitiveness of domestic producers can be concluded that the impact of infrastructure is expressed as follows: (1) Infrastructure enables businesses to generate additional production capacity, reduce the cost of inputs in the production and transaction costs. This is called a direct impact performance; (2) Infrastructure increases the productivity of workers, and this effect is known as an indirect effect; (3) The impact of infrastructure on economic growth achieves in the initial period of construction work: creating jobs in construction and related industries. Investments in infrastructure require maintenance; it further increases the number of created jobs; (4) The infrastructure also has a positive impact on education and health: good health and a high level of education of labour causes economic growth; (5) Infrastructure contributes to the accession of the poor and undeveloped areas to the core business activities, public communications, which can raise the value of their assets, and increase human capital.

Infrastructure in Oman considers Transport and Communications sector as an essential building block for the country's basic infrastructure. The road network links extensively to all parts of the sultanate (MoTC 2009. Plans are underway to upgrade the country's airports and ports, and to augment the over-ground transport network with the development of a national and regional rail network (Oman Infrastructure Report Q2 2009). The telecom sector has witnessed a good growth, with penetration of mobile phones reaching almost 100% (Belwal and Belwal 2009). The government has taken initiatives to break its monopoly in this sector (ITU 2009).

### *5.2 Productivity and Economic Growth*

The second objective of this research was to evaluate the relationship between productivity and the economic growth of Oman. The research findings show that the correlation of productivity and the economic growth of Oman was significant to show the correlation of two variables. According to research finding carried out by Surya, et al., (2021) economic growth have significant impact on productivity. They argue that economic growth strategy based on technological innovation is recommended for government decision making as an effort to increase the productivity (Surya et al., (2021). However, this research investigates the linkage between productivity as independent variable and economic growth as dependent variable.

Robert F. DeLucia (2021) described that Strong growth in labour productivity enhances the potential growth rate of an economy. It also increases the potential duration of an expansion cycle by enabling aggregate demand to increase without physical limitations from supply bottlenecks. The ultimate source of rising per capita real wages is rapid growth in productivity. Workers enjoy rising real wage increases as compensation for their contribution to faster growth in aggregate output.

The synchronized nature of the productivity slowdown after the global financial crisis (GFC) raises questions about the role of common factors or spill overs, and the extent to which they will again operate during the pandemic-driven recession in 2020. The nature of the post-global financial crisis (GFC) slowdown and its drivers has proved controversial. Some have attributed the weakness in productivity growth to waning technological progress as innovations regarded as "low-hanging fruit" have already been developed, leaving only innovations with lower marginal gains (Gordon 2012; Gordon and Sayed 2019). Others regard the slowdown in productivity growth as a "pause," given the time delay between radical new digital technologies being developed and then incorporated into production processes (Brynjolfsson, E., D. Rock, and C. Syverson. 2020).

The COVID-19 pandemic threatens to weigh on longer-run trends that could impede productivity growth in emerging market and developing economies (EMDEs). Over the past decade, the prospects for further trade integration have diminished, and the expansion of global value chains has lost momentum. Sharp declines in global trade and investment, amid the pandemic, could accelerate these trends. For many countries, they will mean subdued activity, instability, and new pressures on governments (World Bank Group (2021)

The finding of this research also related with research finding from Suna Korkmaz & Oya Korkmaz, (2017). They conducted the research on the Relationship between Labour Productivity and Economic Growth in OECD Countries.

The finding of this research also supported by (Koji Nakamura, Sohei Kaihatsu, Tomoyuki Yagi (2018). They found that Labour productivity in major advanced countries has been experiencing a slowdown in recent years. This is mainly affected by the slowdown of Total Factor Productivity (TFP). In Japan, there are two reasons behind the slowdown: first, technology and ideas accumulated by research and development (R&D) and management resources such as capital and labour are not utilized efficiently; and second, these resources are not efficiently reallocated among corporations.

### *5.3 Competitiveness and Economic Growth*

The third objective of this research was to investigate the relationship between competitiveness and the economic growth of Oman. The research findings show that the correlation of competitiveness and the economic growth of Oman were significant to show the correlation of two variables. This finding supported by previous study for instance, research conducted by Aleksandra Kordalska and Magdalena Olczyk (2015). They argue that global competitiveness is a reliable predictor of economic growth or whether the growth rate can be believed to predict the global competitiveness of a country. However, other researcher (Zagorsekova, et al (2018) investigates the Competitiveness and Economic Growth in the European Union. The paper focuses on competitiveness at the national level and on the impact of competitiveness on economic growth. They look at the relationship between competitiveness and economic growth based on the data from the European Union member states. The competitiveness of the economies is measured by the Global Competitiveness Index, which is published by the World Economic Forum. The European Union member states show significant differences in competitiveness. In the sample examined, the positive relationship between the level of competitiveness and economic growth was not confirmed.

This research is in line with research carried out by Romana Korez-Vide and Polona Tominc (2016). They investigated the competitiveness, entrepreneurship and economic growth. They concluded that a country's economic growth and consequently the standard of living of its population are related to many factors that are inside or outside the control of policymakers, institutions, companies and individuals. Although variously conceptualized and measured, a country's competitiveness comprises endogenous and exogenous variables of economic growth. The key goal of their study was to find out if a country's competitiveness and its economic growth is related. As a measure of competitiveness, they used the World Economic Forum's Global Competitiveness Index, as a measure of economic growth, however, GDP per capita was used.

### *5.4 Technology Advancement and Economic Growth*

The fourth objective of this research was to assess the relationship between technological advancement and the economic growth of Oman. The research finding show that the correlation of competitiveness and the economic growth of Oman was significant to show the correlation of two variables. This finding is related with previous research for instance, research conducted by James Broughel and Adam Thierer (2019). They argued that Technological advancement is a fundamental driver of economic growth and human progress.

The finding of this research is related with research conducted by Krume Nikoloski (2016). He found that there was a significant linkage between technology and economic growth. Gurgul, Henry and Lach, Łukasz (2012) also investigate the technological progress and economic growth: evidence from Poland. The main goal of their research was the examination of causal interdependencies between different measures of technological progress and GDP in Poland on the basis of quarterly data for the period Q1 2000 – Q4 2009. They performed the research on the number of patents registered in The Patent Office of Poland as well as on R&D expenditures. The empirical research was performed in a three-dimensional framework with employment chosen as an additional variable, since a two-dimensional approach involving only GDP and one of the measures of technological progress may be seriously biased due to the omission of important variables. In order to conduct a comprehensive causality analysis, they applied both traditional methods as well as some recently developed econometric tools.

### *5.5 The Moderating Effect*

The moderated multiple regression test was conducted to determine the regression on government policies by integration in logistic sector (infrastructure, productivity, competitiveness and technological advancement) and the interaction of moderating variables with independent variable individually (Inf X GP, Prod X GP, Comp X GP and TA X GP). The results show that, there are significances of the government policies as moderators of the

relationship between infrastructure, productivity, competitiveness and technological advancement. The highest moderating role of government policies on the relationship between infrastructure, productivity, competitiveness and technological advancement on economic growth is infrastructure with  $R^2$  0.630, followed by technology advancement  $R^2$  0.622, competitiveness  $R^2$  0.607 competitiveness and productivity  $R^2$  0.560 respectively.

This finding supported by previous study for example research conducted by Desy Tri Anggarini & Ani Rakhmanita (2020). Their finding showed the government policies has a significant role for supporting National Economic Recovery Program in the Context of Supporting State Financial Policy for Handling Corona Virus Disease 2019 (Covid-19). Fitriani et al (2021) investigated the Government Policy Strategies in Sustaining Economic Growth in the Covid-19 Pandemic Era. They argued that to keep the economy growing positively, the government issued several stimuli both in the form of direct cash assistance and various programs to alleviate the costs of business actors (such as rescheduling bank installments), exemption from paying taxes, electricity subsidies, pulse subsidies, and others. Fiscal, monetary, and financial stimulus policies will work effectively if carried out simultaneously and in a coordinated manner. The spread of the Covid-19 pandemic has been minimized if the community complies and implements health protocols recommended by the government. Economic activities are closely related to the development conditions of the Covid-19 virus.

## 6. Conclusion

This study investigates the linkage of various factors of integration in logistic sector on economic growth. The study is also examining the role of government policy on the relationship between the factors of integration and the economic growth.

The results show that statistically significant positive relationship between infrastructure, productivity, competitiveness and technology advancement on economic growth. These results appear to confirm ( $H_1, H_2, H_3$  and  $H_4$ ).  $H_1$ : There is positive effect of Infrastructure on economic growth,  $H_2$ : There is positive effect of productivity on economic growth,  $H_3$ : There is positive effect of competitiveness on economic growth,  $H_4$ : There is positive effect of Technological Advancement on economic growth. These results suggest that infrastructure, productivity, competitiveness, technological advancement has the ability to increase the economic growth.

This research also finds that moderating effect of government policies on relationship between infrastructure, productivity, competitiveness and technology advancement on economic growth. These results appear to confirm ( $H_5, H_6, H_7$  and  $H_8$ ).  $H_5$ : The Relationship between infrastructure and economic growth moderated by government policies,  $H_6$ : The Relationship between productivity and economic growth moderated by government policies,  $H_7$ : The Relationship between Competitiveness and economic growth moderated by government policies,  $H_8$ : The Relationship between technological advancement and economic growth moderated by government policies. These results suggest that government polices has significant role on the relationship between infrastructure, productivity, competitiveness, technological advancement on economic growth.

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