Original Research Paper

Effect of Domestic Consumption on GDP of Pakistan from 1981-2014

[1]Rabia Shaheen, [2]Javeria Shabbir, [1]He Shuquan and [3]Khalid Mahmood Mughal

[1]*Department of Economics, Shanghai University, Shanghai, China*
[2]*Department of Business Administration, School of Management, National University of Modern Languages, Islamabad, Pakistan*
[3]*Department of Economics, School of Social Sciences, Preston University, Kohat, Pakistan*

Abstract: The purpose of the study was to study the impact of domestic consumption (electricity consumption, food, and natural gas) on the Economic Growth of Pakistan. Time series data is used for analysis from 1981 to 2014 taken from the World Governance Indicators Index. Pakistan's GDP is used as a dependent variable and household consumption includes consumption of electricity, food, and natural gas used as independent variables. Multiple regression analysis is used to determine the relationship between different variables. The OLS method is used in study analysis. After checking stationarity and applying the OLS technique, we found that there is a negative correlation between electricity consumption and economic growth. The results of the study revealed that the different consumption patterns of consumers negatively impact the economic growth of the country so the study suggests that there should be power-saving techniques that only can improve the natural resources and conserve resources. The study also found that the impact of independent variable has a positive impact on economic growth and insignificant results of food consumption show that households may spend less on food consumption when their disposable income is less and they increase their consumption whenever income increases which affect the economy mostly. As collected data shows that the consumption patterns change every year and upsurge, so the economic production grows and impacts positively. The third independent variable is natural gas consumption that is also shown a positive and significant impact on the economy of Pakistan.

Keywords: Economic Growth (GDP), Electricity Consumption, Food Consumption, Natural Gas Consumption

Introduction

Consumption is an economic concept that studies how consumption correlates with net income. In general, the consumption of goods increases as income rises, with consumption exceeding income and leading to debt. When calculating a country's Gross Domestic Product (GDP for short), there are two main types of consumption, private consumption, and government consumption. Personal consumption refers to the use of a person's income to consume perishable and perishable goods and also to pay for services. Government consumption refers to government spending on running the nation.

This research focuses on electricity and natural gas consumption and its effects on the economic growth of Pakistan. Energy plays an important role in the development of Pakistan. To meet the needs of our country energy production is considered an important factor. In Pakistan, most people especially in rural areas are unable to enjoy life because of a lack of necessities. Pakistan is facing an electricity and natural gas shortage for many past years.

An important variable discussed through analysis is food consumption, as the total population of the country is increasing day by day the demand for food for individuals is also increasing. As Pakistan is an agricultural country and most of the portion of food ingredients are available so it is manageable. The main agricultural products are cotton, wheat, rice, sugar cane, fruits, and vegetables, in addition to milk, beef, sheep, and eggs. Wheat production in our country is 75%. Wheat is a staple food for the population, as it accounts for 60% of the daily diet of the average Pakistani and the average consumption per capita is about 125 kg which is essential for this. Government agricultural policy the government announced the price of

a subsidy for wheat 1,200, which aroused the interest of the agricultural community. Pakistan has a population of over 190 million (the world's 6th-largest), giving it a nominal GDP per capita of $1,427, which ranks 133rd in the world. Food safety is also considered an important factor due to which the health of people can be badly affected. For this purpose, many institutions are working and implementing food safety rules and regulations across the world. Many policymakers suggest following these food safety rules like HACCP which prevents food from chemicals, and biological and chemical hazards during the food production process and safe it from risk.

In this study, energy consumption and its impacts are clearly shown in the results as energy is the most discussed subject and has become a basic necessity for societies. It is an essential factor on which economies depend and prevail. In this study, we will focus on households and industrial consumption of electricity and gas. Malik (2015) reported that policymakers should design different policies for energy conservation in a way that does not affect the GDP. Adnan *et al*. (2011) conclude that there exists bi-directional causality between GDP and energy consumption in the short run whereas uni-directional causality in the long run. He suggests that Pakistan should continue investing in the energy sector, especially in alternative methods of energy conservation like wind, hydroelectricity, and nuclear power because it will help our country to reduce the import burden.

The third important variable discussed is natural gas. Our country is facing a shortage of natural gas as many parts of the country is still far away from the benefits of this natural resource. According to the Energy Information Administration (EIA), Pakistan can store up to 9 billion barrels of oil, and 105 trillion cubic feet of shale oil and natural gas. Russia, Iran, and Qatar have some of the world's largest oil reserves. Natural gas reserves are estimated to be 29,671 trillion cubic feet (January 1, 2009). During the last decades, there have been several papers dealing with the causality between energy and food consumption and other domestic consumption with economic growth. The purpose of the study is, to investigate the existence and direction of causality between economic growth and other domestic consumption of households. The paper will also examine the causal relationship between economic growth and net energy imports and primary energy production in Pakistan. The focus is on providing a suitable result to the policymakers and decision-makers to work towards a better direction after the declaration of the results of this research.

Objectives of the Study

The basic objective of this study is:

- To identify the difference between the production and consumption of households toward economic growth

- What are the causes of the difference between the production and consumption of electricity and natural gas
- How domestic consumption will impact the balance of payments
- What steps should be taken to fill this gap

Lack of electricity and natural gas has been a serious problem facing our country for the last few decades. By some estimation, it is estimated that households waste 25% of their power because of inefficient appliances in the country and a lack of "mindfulness" when using electricity. The total power generation capacity of Pakistan is 21,143 MW and the electricity demand (as of April 2010) is 14,500 MW and PEPCO is merely generating 10,000 MW. During the past decade (2007-2017), indigenous oil production has been at a level of about 64 000–95 000 barrels per day (equivalent to about 17-21% of the country's oil consumption). Pakistan's natural gas production in the fiscal year 2016-17(1) was 4 032 million cubic feet per day.

In 2016-2017, coal production was 4.2 million t, while 7 million t of coal was imported to meet the industrial requirements of the country. The development of the coal mining industry in Pakistan, particularly for power generation, is hampered by constraints relating to the quality of coal, mining difficulties, and other organizational constraints.

Research Hypothesis

H0: There exists no relation between domestic consumption and the GDP of Pakistan

H1: There exists a positive relationship between domestic consumption and the GDP of Pakistan

Literature Review

Iram and Butt (2004) and Khushi *et al*. (2020) discussed the urban and rural composition of food in Pakistan. Further discussion is also done in estimating food demand in Pakistan. The need for prospects to reduce food exports and eliminate inequalities in consumption and production is important for a densely populated country. The research was conducted by Imran and Siddiqui (2010) during which they Compared the energy prices, shrinking existing recourses and therefore the look for alternative sources of energy in SAARC countries, according to the research conclusion, Energy is a decisive component of economic growth and plays a vital role in economic development. Meanwhile, Siddiqui (2004) explained the difficulty of causality between energy usage and economic growth. She found that an increase in the supply of energy at affordable prices is vital for economic growth because it affects the demand and consequently the economic growth. Thus the pricing policies should absorb

to account the impact of economic growth also. According to Naheed and Kausar (2014), the Food consumption pattern of households living in Pakistan has attained great importance the researchers. As far as the supply of the foodstuff cares, they suggest that the Government of Pakistan makes a variety of selections about the availability of essential food items and sometimes intervenes within the market to manage the costs of such food items. In addition, the government can generate more revisions by levying taxes on goods with volatile demand. However, these considerations are often reassuring and brooding over food consumption patterns from different angles that are left for further analysis by the opposite researchers. Hussain and Hussain (2016) explain the "impact of natural gas consumption on economic growth" in Pakistan. He used data from various consumption patterns of gas in all provinces. The government has now been considering phasing out CNG gradually and therefore the policy options, banning CNG use in private cars, availability of CNG just for 1000cc vehicles, etc. are considered research conducted by Odularu and Okonkwo (2009) on "Does energy consumption contributes to economic growth". The authors develop a model to elucidate the difference between the energy consumption of the Nigerian economy from the period of 1970 to 2005. They conclude that there exists a negative relationship between energy consumption and therefore economic growth. Thus, this sector must incline more relevance even by exploiting the opportunities laden within the sector to increase economic growth.

Chai *et al.* (2012) research on the petroleum and gas importance and their impacts define that in any economy the consumption of petroleum and diesel is extremely large for transportation purposes. In their research, they use five different variables within the model. They conclude that 45% of the consumption of petroleum has been made by the country yearly.

Naheed and Hussain (2014) Considering the average relative share and the equivalent method of each adult, the different consumption patterns of the family are discussed. For this 13 food items were selected and after analysis, they conclude that Milk is the most preferred food item consumed by 75 percent of households in Pakistanis. The research was conducted by Hussain and Hussain (2016) on Natural Gas Allocation and Management in Pakistan in 2014. The two major resources Oil and natural gas production and consumption are treated as independent while GDP is the independent variable. At the end of 2012, Pakistan's proven natural gas reserves stood at 22.7 trillion cubic feet. and the reserve-to-production ratio is 15.5 (R/P ratio). 28 indicates that if current reserves are used, reserves will remain at current production rates for approximately 16 years. Natural gas supply is expected to decline from the current 4 bcfd to less than 1 bcfd by 2025-26.

Ashraf and Khan (2016) have examined the relationship between the production of electricity from different available resources and installed capacity from different power sources. After applying different techniques, they conclude that proper planning is needed as our country relies more on Renewable resources instead of non-renewable resources. Pakistan is producing the highest percentage (61%) of electricity from thermal resources, which require oil and gas and are mostly imported from other countries. Solarina and Shahbaz (2015) also discuss the link between natural gas consumption and economic growth in Malaysia, including foreign direct investment, and capital and trade transparency for the period 1971-2012. The hypothesis results that Natural gas consumption, foreign direct investment, capital formation, and trade openness have positive impudence on economic growth in Malaysia.

Materials and Methods

This study examines the impact of domestic consumption on the economic growth of Pakistan. The study specifically explores which variable is most effective in the process of economic growth. As three independent variables were used and on each data stationary and impacts on GDP were shown and discussed. It is based on secondary data for a specific period. A quantitative approach has been followed in the study to discover the association between these variables. For this purpose, correlation and regression analyses were conducted.

Sample and Sampling

Sample data for the last 33 years is used. Time series data is used to correlate the impact of domestic consumption on economic growth. The sample for this study has been made for the period 1981-2014.

Collection of Data

All data is taken from WDI (World development indicator), World Bank, and Economic survey.

Research Models

SPSS/E-views software is used to discover the data stationary and apply the unit root test.

A time series data is used in this study for the OLS model. To find out the positive or negative relationship between economic development and domestic consumption OLS model has been conducted:

$$GDP = \alpha + \beta t\ (EC)t + \beta_2(FC)t + \beta_3(GC)t + \mu$$

EC = Electricity Consumption
FC = Food Consumption
GC = Gas Consumption

Results

Dependent Variable: GDP

For Least Square Method the data must be stationary. To make it worth it, first of all, I check the data that whether it is stationary or non-stationary. The data on food consumption was found stationary while the electricity and natural gas were not stationary. After converting data into stationary I applied the OLS model. The above results show that electricity and natural gas consumption has an insignificant impact on GDP which means that a one-unit increase in electricity and gas consumption will increase GDP. The value of p for electricity is 0.0887 and for natural gas, consumption is 0.0851, while food consumption has the least significant negative impact on GDP.

Stationarity of GDP

Null Hypothesis: GOP has a unit root
Exogenous: Constant, Linear Trend
Leg Length: 0 (Automatic - based on SIC, maxlag = 8)

		t- Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.754659	0.0323
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

*MacKinnon (1996) one-sided p-values
Augmented Dickey-Fuller Test Equation
Dependent Variable: O(GOP)
Method: Least Squares

Variable	Coefficient	Std. Error	I-Statistic	Prob.
GDP(-1)	-0.645827	0.172007	-3.754659	0.000700
C	4.079859	1.263091	3.230059	0.003000
@TREND(1980)	-0.063861	0.035751	-1.786258	0.084200
R-squared	0.319841	Mean dependent Var		-0.033333
Adjusted R-squared	0.274497	S.D. dependent Var		1.990080
S.E. of regression	1.695080	Akaike info criterion		3.979845
Sum squared resid	86.198870	Schwarz criterion		4.115891
Log-likelihood	-62.667440	Hannan-Quinn criter.		4.025620
F-statistic	7.053654	Durbin-Watson stat		1.928993
Prob(F-statistic)	0.003084			

Data is stationary because ADF t-statistics are more negative than the critical value. Its Adjusted R-square is 0.2744. Durbin-Watson stat is 1.9289.

Stationarity of EC

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLX1)
Method: Least Squares

Variable	Coefficient	Std. Error	t- Statistic	Prob.
DLX1 (-1)	-1.044830	0.188100	-5.554644	0.0000
C	0.129822	0.035450	3.662127	0.0010
@TREND (1980)	-0.003656	0.001483	-2.465460	0.0198
R-squared	0.515753	Mean dependent var	0.000738	
Adjusted R-squared	0.482356	S.D. dependent var	0.094875	
S.E. of regression	0.068260	Akalke info criterion	-2.441929	
Sum squared resid	0.135123	Schwarz criterion	-2.304516	
Log-likelihood	42.070870	Hannan-Quinn criter	-2.396381	
F-statistic	15.443370	Durbin-Watson stat	1.619611	
Prob(F-statistic)	0.000027			

ADF t-statistics show that data is stationary after 1st difference. The value of ADF t-statistics is -5.55. Its Adjusted R-square is 0.4823. Durbin-Watson's stat shows that there is an auto-correlation.

Stationarity of FC

Null Hypothesis: X2 has a unit Root
Exogenous Constant Linear Trend
 Null Hypothesis: X2 has a unit Root
Exogenous Constant Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag =8)

	t- Statistic	Prob.*
Augmented dickey -fuller test statistic	-5.996512	0.0001
Test critical values:	1% level	-4.262735
	5% level	-3.552973
	10% level	-3.209642

*MacKinnon (1996) one-sided p-values

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X2(-1)	-1.093403	0.182340	-5.996512	0.000000
C	216.471100	35.276430	6.136421	0.000000
@TREND(1980)	9.761221	1.677189	5.819988	0.000000
R-squared	0.545271	Mean dependent Var		8.666667
Adjusted R-squared	0.514955	S.D. dependent Var		29.203670
S.E. of regression	20.338930	Akaike info criterion		8.949459
Sum squared resid	12410.17000	Schwarz criterion		9.085505
Log-likelihood	-144.666100	Hannan-Quinn criter.		8.995235
F-statistic	17.986660	Durbin-Watson stat		1.959647

Value of ADF t-statistics which is-5.99 shows that data is stationary. Its Durbin-Watson stat shows that there is no auto-correlation. Durbin-Watson stat is 1.9596.

Stationarity of GC

Null Hypothesis: DLX3 has a unit root
Exogenous Constant Linear Trend
Lag Length: 0 (Automatic-based on SIC, maxlag = 8)

	t- Statistic	Prob.*
Augmented Dickey -Fuller test statistic	-5.171124	0.0011
Test critical values:	1% level	-4.273277
	5% level	-3.557759
	10% level	-3.212361

*MacKinnon (1996) one-sided p-values

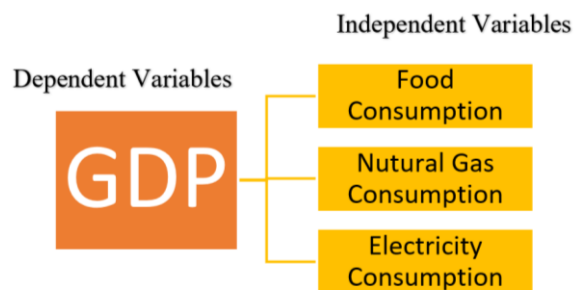| Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLX3(-1)	-0.993816	0.192186	-5.171124	0.0000
C	0.586340	0.023308	2.515590	0.0177

Fig. 1: (Dependent and Independent Variables)

ADF t-statistics show that data is stationary after 1st difference. The value of ADF t-statistics is-5.17. Its Adjusted R-square is 0.444. Durbin-Watson is 1.9375.

Discussion

In Fig.1, it is shown that the dependent variable GDP is depending on independent variables. These three major consumption have a direct impact on the Economic growth of Pakistan. This research focused on food, electricity, and natural gas consumption and its effects on the economic growth of Pakistan. Energy plays an important role in the development of Pakistan.

Pakistan is facing a shortage of food and energy for the last few years. As Pakistan is an agricultural country and filled with natural resources but the utilization of these resources was inappropriate. The sources of agriculture and food production are inefficient for the whole population. The government should spend more and develop new plans for the development of the agriculture sector. With the help of batter economic policy maker's government can easily overcome these challenges. By working on different projects of electricity with china and other countries. The alternative methods of energy conservation like wind, hydro and coal, and more importantly Solar energy can increase the capacity of our energy resources. Government should subsidize the agricultural commodities so that the adequate food need can be accomplished within the country.

Conclusion

The research has focused on the impact of major domestic consumption on the economic growth of Pakistan. For this purpose, 33 years of data on Pakistan's GDP, electricity, food, and natural gas consumption have been used. By applying OLS techniques I found that the impact of independent variables has a positive impact on economic growth. The insignificant results of food consumption show that households may spend less on food consumption when their disposable income is less and they increase their consumption whenever income increases which affects the economy mostly. As data collected shows that every year the consumption patterns changes and increase due to which economic production expands and impacts positively. On the other hand, electricity consumption has a significant and positive impact on GDP. The third independent variable was natural gas consumption which will also show a positive and significant impact on the economy of Pakistan.

Acknowledgment

Author's Contributions

Rabia Shaheen: Participated in all experiments, coordinated the data analysis, and contributed to the writing of the manuscript.

Javeria Shabbir: Coordinated the mouse work.

He Shuquan: Supervision.

Khalid Mahmood Mughal: Designed a research plan and organized the study.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and that no ethical issues are involved.

References

Adnan, M. A., Htay, S. N. N., Rashid, H. M. A., & Meera, A. K. M. (2011). A panel data analysis on the relationship between corporate governance and bank efficiency. *Journal of Accounting*, 1(1), 1-15.

Ashraf, H. F., & Khan, S. (2016). Analysis of Pakistan's Electric Power Sector. https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A917526&dswid=7988

Chai, J., Wang, S., Wang, S., & Guo, J. E. (2012). Demand forecast of petroleum product consumption in the Chinese transportation industry. *Energies*, 5(3), 577-598. DOI.org/10.3390/en5030577

Hussain, F., & Hussain, S. (2016). Determinants of Foreign Direct Investment (FDI) in Pakistan: Is China Crowding Out FDI Inflows in Pakistan? *The Pakistan Development Review*, 121-140. https://www.jstor.org/stable/44986479

Imran, K., & Siddiqui, M. M. (2010). Energy consumption and economic growth: A case study of three SAARC countries. *European Journal of Social Sciences*, 16(2), 206-213.

Iram, U., & Butt, M. S. (2004). Determinants of household food security: An empirical analysis for Pakistan. *International Journal of Social Economics*. DOI.org/10.1108/03068290410546011

Khushi, S., Ahmad, S. R., Ashraf, A., & Imran, M. (2020). Spatially analyzing food consumption inequalities using GIS with disaggregated data from Punjab, Pakistan. *Food Security*, 12(6), 1283-1298. DOI.org/10.1007/s12571-020-01057-4

Malik, K. (2015). Impact of foreign direct investment on the economic growth of Pakistan. *American Journal of Business and Management*, 4(4), 190-202. DOI.org/10.11634/216796061706624

Naheed, K., & Hussain, I. (2014). Food consumption pattern in Pakistan: Recent interprovincial empirical evidence. *Gomal University Journal of Research*, 30(1), 38-43. http://www.gujr.com.pk/index.php/GUJR/article/view/362

Odularu, O., & Okonkwo, C. (2009). Does energy consumption contribute to economic performance? Empirical evidence from Nigeria. *Journal of Economics and International Finance*, 1(2), 044-058. DOI.org/10.5897/JEIF.9000033

Shahbaz, M., Loganathan, N., Zeshan, M., & Zaman, K. (2015). Does renewable energy consumption add to economic growth? An application of the auto-regressive distributed lag model in Pakistan. *Renewable and Sustainable Energy Reviews*, 44, 576-585. DOI.org/10.1016/j.rser.2015.01.017

Siddiqui, R. (2004). Energy and economic growth in Pakistan. *The Pakistan Development Review*, 175-200. https://www.jstor.org/stable/41260618