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Consumption-Driven Growth in India: An Empirical Analysis of the Post-Reform Period

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Abstract:

Consumption captures about 60 percent share of India's GDP in the form of Private Final Consumption Expenditure. All economic activity depends upon consumption. Without it, there would be no production in an economy and therefore no investment. Thus, a consumption-driven growth makes way for an investment-driven growth. The 1991 Economic Reforms have brought about a wide change in the percapita income and has affected consumption expenditure to a greater extent. So, it is important to study consumption behaviour as it measures society's political, social, and economic condition. Therefore, this paper attempts to investigate the effect of consumption expenditure on the economic growth of India from 1990-1991 to 2020-2021 by studying the relationship between Private Final Consumption expenditure (PFCE) and GDP at constant prices. Several econometric tools have been employed, such as Granger Causality Test which showed that there is a unidirectional causality running from Private Final Consumption Expenditure to Economic Growth (GDP); ARDL model shows that there is a positive relationship between consumption expenditure and economic growth; ARDL bounds testing method shows that in the long run, there is a significant impact of PFCE on GDP.

Keywords: Economic Growth, Consumption Expenditure, Economic Reforms, GDP, Granger Causality

1. Introduction

Consumption is an integral part of economic activity which motivates society's efforts to achieve the highest level of happiness, standard of living and satisfying the physical and psychological requirements. A society which is driven by consumption is where'a large part of people's sense of identity and meaning is achieved through the purchase and use of consumer goods and services' (Roach, et.al., 2019). This points out the fact that the centre of all economic activity is consumption and therefore, consumer is the king. Also, without consumption there can be no production as it creates the requirement to produce new goods and services. Thus, the traditional definition of economic growth says, 'Economic growth describes an increase in the quantity and quality of the economic goods and services that a society produces and consumes' (Roser, 2013).

Gross Domestic Product, (a proxy of economic growth) depends upon consumption expenditure, investment expenditure, government expenditure and net exports, i.e., Y=C+I+G+NX, where C=Consumption Expenditure, I=Investment Expenditure, G=Government Expenditure and NX=Net Exports. This also points out that when consumption expenditure of a country increases, there is economic growth, other things remaining unchanged. Supply-side economics tells that with an increase in investment, consumers get a large variety of goods and services at the lowest prices because costs are reduced, which eventually leads to an increase in employment and increase in consumer spending (Kim, 2017). In developing countries, economists observe consumption level as one of the most important indicators of economic performance as it constitutes Gross Domestic Product (Mishra, 2011). As in

developing countries like India, there is a shortage of capital for investment, so it must rely on consumption expenditure for its economic growth.

Looking at the trends of consumption pattern in India, the country has been a closed economy for several years. It was in 1991, when the country opened itself for business, trade, bilateral agreements, etc. India's economy grew more rapidly, increasing per capita income (expenditure) and altering the country's food consumption pattern. Private final consumption expenditure (at constant prices) increased during the post-reform period, rising from 2.15 per cent in 1991–1992 to 6.87 per cent in 2021–2022. (Economy Survey, 2021-22). The country became more liberalised. The sectors changed dramatically, as did the consumption patterns of income group.

The 'Lockdown' of March 2020, created an insecurity amongst masses. Since 92 per cent of India's food consumption is sourced predominantly from the private sector. Covid-19 has increased transaction costs and uncertainty in the country's newly changed food supply chains, endangering food security (Reardon et.al., 2020). However, researches by Laatoet.al., 2020 and Pantanoet.al., 2020, revealed that the pandemic causedpeople to spend less on discretionary products and more on essentials.

Considering this, this paper aims to accomplish the objective of exploring all three possibilities: unidirectional link, bidirectional or no causal link in India for the period from 1990–1991 to 2020–2021, using time series data framework. This paper is designed as follows: The following section reviews the previous research studies conducted to strengthen our understanding. Section II examines how data is collected and what methodology is used to obtain the desired results. With the help of data and methodology, we discuss our results. Lastly, we end our discussion with conclusions and suggest policy implications.

2. Literature Review

The following literature focuses on the previous research studies undertaken to study the effect of consumption expenditure on economic growth.

Amin (2011) examined the relationship between final consumption expenditure and economic growth in Bangladesh between 1976 to 2009. The empirical results suggested a long-run cointegrating relationship between final consumption expenditure and economic growth in Bangladesh based on the Johansen and ARDL cointegration test. Further aGranger-Causality test indicated that there is a unidirectional relationship between economic growth and final consumption expenditure in the long run with the causality running from economic growth to final consumption expenditure.

Mishra (2011) investigates the relationship between consumption expenditure and economic growth by analysing the data on Indian Economy maintained by the Reserve Bank of India from 1950-51 to 2008-09. The author found that the value of Pearson's correlation coefficient was 0.99 between real private consumption expenditure and GDP, showing a positive, unidirectional relationship between them. But the correlation results do not say anything about the relationship holding in the long run. The Augmented Dickey Fuller test show that the time series data on PFCE and GDP is stationary and the Cointegration test show that the relationship holds in the long run as well.

Yu (2011) examined the long-run relationship between household final consumption (a proxy for consumption) and GDP (which has been substituted for income) in China and India for the time period 1978-2006, using the Autoregressive Distributed Lag Model (1,1). The study found that consumption has a positive impact on income but the relation is negative in China.

Sethia (2013) compared the data on the aggregate national income and aggregate consumption expenditure between the pre and post economic reform period which revealed a substantial change. The

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author finds that Private Final Consumption Expenditure on food items declined from 53.7 per cent to 48.4 per cent but increased in the case of non-food items from 46.3 per cent to 51.6 per cent, according to the report (1970-1991). Food expenditure fell from 49.9 per cent to 35.4 per cent in the years after the reform (1991–2004), while non-food expenditure steadily increased from 50.1 per cent to 64.6 per cent. Agrawal (2014) examined the growth of Gross Domestic Product (GDP) and Per Capita- GDP in the long run; whether income growth is followed by a similar pattern in consumption and the trends in income distribution across various income groups using monthly per capita consumption expenditure data from NSS. The study revealed that while India's GDP and PC-GDP both increased during the planning period, PC-GDP increased more slowly than GDP. Besides, there has been a slight rise in income disparities in India. Compared to PC-GDP, monthly per capita expenditure has grown much faster. However, the rate of growth of MPCE at constant price was incredibly low. The lower decile income groups' consumption has only slightly increased in 2009–10 and 2010–11 overall. The income group with the highest income level had witnessed a significant increase in consumption. The study revealed that non-spending is flexible in relation to overall spending, and that spending on health and education is flexible in relation to spending on non-food items. Non-food spending was impacted when the monthly per capita expenditure decreased.

Ghosal (2014) study the effect of economic growth, inequality and the extent of urbanisation on the consumption pattern of Indian consumers by utilising data from 1972-73 to 2009-10 of NSSO's quinquennialsurvey. Individual research was carried out for rural and urban areas. Real per capita income and real monthly per capita spending growth rates was found to be rising in all states (MPCE). The study also found a significant correlation between real monthly per-capita consumption spending across states and Net State Domestic Product (NSDP) growth rates. Both in urban and rural areas of the states, a considerable diversification in consumption patterns favouring non-cereal foods and non-food components was also found.

Aslam (2017) studied the relationship between consumer expenditure and economic growth in Sri Lanka from 1975 to 2014, using GDP as a proxy for economic growth, exports, consumer spending, money supply, and official development assistance among other variables. Based on the two approaches, the author used: multiple regression and the Johansen and Juselius co-integration technique, he found that household expenditure had a positive relationship with GDP for the sample period and that consumer expenditure had a long-run relationship on the GDP, respectively. The authors' analyses of both methods led to the conclusion that Sri Lanka's expenditure leads to economic growth.

Kim (2017) studied the effect of consumption expenditure on economic growth based on 52 countries of Asia for the time period 2012-16 and analysed 18 different variables (while maintaining investment, export, trade, defense spending as a control variable) by conducting a multi-variate analysis found that consumer spending and economic growth are highly correlated with each other and there is a positive relationship between them. Also, among the variables studied urbanization, FDI inflows, globalisation was found to be positively correlated with consumption expenditure whereas corruption, taxation was found to be negative related to consumption expenditure.

Thakur (2017) found that there was a decline of 3.3 per cent in the food expenditure and non-food expenditure increased to 51.6 per cent in 1990-91 i.e., during the pre-reform period. After the post-reform period, the food expenditure declined even further to 35.4 per cent and the expenditure on non-food items increased to 64.6 per cent. The author also finds that the expenses were shifted towards transport and communication.

Sharma, et.al. (2018) study the effect of government consumption expenditure on India's GDP (a proxy for economic growth) by using the yearly data for the time period 1971-2016. The authors use the Autoregressive Distributed Lag Model to study the effect of government final consumption expenditure

which is a proxy for 'government size and quality of expenditure' (Alfonso, et.al., 2011). The model suggests that government consumption expenditure affects economic growth positively.

Hong et.al. (2019) study the relationship between private final consumption expenditure and gross domestic product in the Malaysian economy during the colonial era (1900-39) and post-independence (1970-2009). The authors use a panel cointegration approach and found that there exists a relationship between PFCE and GDP between the time series data in the long run. The panel error correction regression was also used and it was found that between PFCE and GDP, there exists a bi-directional Granger- causality.

We can see from the above literature review that many studies have been conducted to understand the causal relationship between consumption expenditure (PFCE) and economic growth (GDP) but few in the context of India. So, this paper attempts to study the causal relationship between PFCE and GDP in the Indian context for the post reform period i.e., 1990-91 to 2020-21.

3. Data and Methodology

This study makes use of secondary data collected from the Economic Survey of 2021-22. The study focuses mainly on two variables, private final consumption expenditure (PFCE) and GDP for the period 1990-91 to 2021-22. Since we have used timeseries data, it is important for us to check for stationarity in the series, for this purpose we will be using Augmented Dickey Fuller test. Further, the Granger Causality test was performed to determine the cause-and-effect relationship between PFCE and GDP. In addition, for variables with different order of integration from the ADF test, the ARDL model is employed to determine how the variables are related. Lastly, the ARDL bounds test is employed to examine the long run relationship between the endogenous (GDP) and exogenous variable (PFCE).

4. Unit Root Test

Unit root in a time-series analysis indicates the characteristics of the roots in an auto regressive or moving average model. If in the autoregressive model the root is 1, then it indicates that we should take the difference of the data before using it for the estimation. We can identify whether a series is stationary, based on absence (or presence) of a unit root. A stationary series has constant variance which further diminishes the effect of shocks on the series. While a series with unit root has a time variance which is time dependent and increases over time.

5. Augmented Dickey-Fuller Test

Dickey and Fuller (1979) introduced a method of testing the presence of unit root in a time series. This test has a null hypothesis (H_o) stating the presence of unit root in the series while the alternative hypothesis states the presence of stationarity in the series. Dickey Fuller test estimates the model of the following form:

 $\Delta y_t = \rho y_{t-1} + \varepsilon_t \tag{1}$

Although it was not real to use AR (1) model (equ.1) to explain the stochastic behaviour of time series variables. And to solve this, ADF was developed which could include AR (2) models. If y_t follows AR(p) then (p-1) augmented term needs to be included in the model to make it AR (1). ADF model can of the following forms:

$$\begin{split} \Delta y_t &= \alpha y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-1} + \epsilon_t \\ \Delta y_t &= \alpha_{\circ} + \alpha y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-1} + \epsilon_t \end{split} \tag{2}$$

6. The Granger-Causality Test

The simple regression analysis that we are aware of helps us analyse whether the dependent and independent variables are related but it does not talk about the causal relationship between the two variables. Granger (1969) provided a test to study whether any causality exists between variables which is known as the Granger-Causality test. For this we consider the following pair of equations:

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$$\begin{split} y_t &= \sum_{i=1}^n \alpha_i \, x_{t-i} + \sum_{j=1}^n \beta_j \, y_{t-j} + u_{1t} \\ x_t &= \sum_{i=1}^n \gamma_i \, x_{t-i} + \sum_{j=1}^n \delta_j \, y_{t-j} + u_{2t}(5) \end{split}$$

In the above example, as we have chosen two variables to check for causality, we are dealing with a bilateral causality. Therefore, we can say 'if x granger causes y, then changes in x should precede changes in y'(Gujarati, et.al., 2003). Similarly, we say, if y granger causes x, then changes in x should precede changes in x.

(4)

7. ARDL Bounds testing

Pesaranet.al (2001) developed this cointegration method to check for the presence of a long- run relationship between the independent and dependent variables. This method can be used irrespective of the order of integration of the variables.

8. Auto-regressive Distributed-lag Model (ARDL)

The models that include lagged values of both dependent and independent variables are called ARDL models. This can be represented as follows:

 $y_t = \alpha + \beta_1 x_{t-1} + \beta_2 x_{t-2} + \gamma_1 y_{t-1} + \gamma_2 y_{t-2}$ (6) Here, GDP is taken as the dependent variable and PFCE as the independent variable. The ARDL model

in this case is depicted in the following equation:

 $\ln (gdp)_t = \alpha + \beta_1 \ln (gdp)_{t-1} + \beta_2 \ln (pfce)_t + \mu_t$ (7)

9. Results and Findings

Table1 shows the following results from ADF test. Here,

 H_{\circ} = variables have a unit root (non-stationary series). We reject the null hypothesis when the p-value of the respective variable is less than 0.05(i.e., at 5 per cent level of significance). When the variables are non-stationary at level, we take the first difference in order to make the series stationary. The last column of table 1 indicates the order of integration, from which we infer what type of model is to be adopted for testing the relationship between the variables. For example, when we have mixed order of integration, it is advisable to adopt the ARDL modelling.

Table 1: ADF test results

Variables	Level		1 st difference			Order of Integrati on	
	Intercep t	trend and intercept	None	intercept	trend and intercept	None	
GDP	0.30065 2	-3.06762	2.125099	- 8.646016 **	- 8.71152 **	- 7.76867 **	I(1)
GDP Growth Rate	- 6.00206 **	- 5.89337 **	- 5.847414 **				I(0)
In GDP	- 2.46018 *	- 5.42441 **	0.82612				I(0)
PFCE	1.52266	-1.66214	5.155188	- 5.193379 **	- 5.8026* *	- 1.31682 7	I(1)

Dr. Gajendra Sahu et al. [Subject: Economics] [I.F. 5.91] International Journal of Research in Humanities & Social Sciences				ences ISS	Vol. 12, Issu SN(P) 2347-5	ue 12, Decer 404 ISSN(O)	nber: 2024 2320 771X
In PFCE	-0.0162	-2.60495	8.946255	- 5.525987 **	- 5.42762 **	- 0.93568 3	I(1)
PFCE as per cent of GDP	- 5.59213 **	- 5.51267 **	- 3.677998 **				I(0)
PFCE Growth Rate	- 5.5126* *	- 5.41151 **	- 0.918893				I(0)

Note: * and ** denotes rejection of null hypothesis (H_{\circ}) at 1 per cent and 5 per cent level of significance respectively.

Therefore, to check the relationship between GDP and PFCE, we use ARDL method. We adopt Granger Causality when the order of integration is 1 for both GDP and PFCE.

Table-2: Granger Causality Test results

Null Hypothesis:	Obs.	F-Statistic	Prob.
PFCE does not Granger Cause GDP	30	6.45645	0.0055
GDP does not Granger Cause PFCE		0.1302	0.8785

To examine the causal relationship between GDP and PFCE, we perform the Granger-causality test whose results are tabulated in table2. The results shows that there is a unidirectional relationship between PFCE and GDP, i.e., PFCE does cause GDP but GDP does not cause PFCE.

Table-3: ARDL Bounds Test

Null hypothesis: no level relationship						
dependent variable	F-stats.			T-stats.		
		I(0)	I(1)		I(0)	I(1)
ln (GDP)	Value	lower bound	upper bound	Value	lower bound	upper bound
	15.55719	6.84	7.84	-5.57737	-3.43	-3.82

In Table 3, results from ARDL bound test are depicted. F-stats value is greater than its lower and upper bound at 1 per cent level of significance, so we reject the null hypothesis implying that there is no cointegration between GDP and PFCE. Therefore, we conclude that GDP and PFCE are cointegrated and have a long run relationship, which means PFCE has an impact on GDP in the long run.

variable	Coefficien	SE	T-Stat	Prob.		F-Stat	Prob.(F)	DW-
	t				AD.R ²			Stat
С	-1.723258	2.33892	-0.73678	0.467	0.6394	27.6077	0	2.0265
				4	9	6		34
In GDP (-1)	-0.052761	0.18875	-0.27952	0.781				
		6		9				
In PFCE	1.197568	0.26191	4.57243	0.000				
		1	2	1				

In table 4, the results from ARDL model are depicted. We got a positive coefficient associated with the independent variable PFCE, which means that GDP and PFCE are positively related at 1 per cent level of significance i.e., when there is 1 per cent increase in PFCE, GDP increases by approximately 1.19 per cent, also the t-stats value corresponding to PFCE reveals that the results are significant. While GDP has a negative relation with its lagged values, adjusted R² value signifies that 63.94 per cent of the variation in GDP is explained by PFCE and the lagged values of GDP. DW-Stat. value of 2.026534 tells that there is no significant evidence of autocorrelation in the model.

Variables	Coefficients	SE	T-stat	prob.
С	-1.723258	2.33892	-0.73678	0.4674
ln (GDP)(-1)	-1.052761	0.188756	-5.57737	0
ln (PFCE)	1.197568	0.261911	4.572432	0.0001

Table-5:ARDL Long Run Form results

In Table 5, coefficient values in the long run are depicted, we infer that in long run the lagged values of GDP have a negative impact on GDP but this impact is significant since the p-value of lagged GDP is significant at 5 per cent level of significance.

Table-0; AKDL Error Correction Regression results							
Variable	coefficient	SE	t-stats	prob.			
С	-1.723258	0.322430	-5.344594	0			
CointEq (-1)	-0.952761	0.185451	-5.67676	0			

Table-6: ARDL Error Correction Regression results

Table 6 shows the coefficients and statistics values corresponding to the cointegration equation. CointEq (-1) has a negative coefficient of -0.952761. This means the speed of adjustment towards long run equilibrium is around 95 per cent, in other words the system corrects its previous periods disequilibrium at a speed of about 95 per cent within a period. Also, PFCE (1.13755002) has a positive impact on GDP in the long run (as seen in equation 8).

 $d(\ln \text{GDP}) = -1.72325 - 0.952(\ln \text{GDP})(-1) - 1.13755(\ln \text{PFCE})$ (8)

10. Conclusion

In this paper, the relationship between consumption expenditure and economic growth in the case of India has been studied extensively. Economic growth has been measured in terms of GDP at constant prices and consumption expenditure has been measured in terms of private final consumption expenditure. Stationarity of the time series has been checked using the unit root test. The Granger causality test showed that there is a unidirectional relationship between PFCE and GDP with the causality running from PFCE to GDP. According to the ARDL model about 63.94 per cent of the variation in GDP is due to PFCE. It is found that there exists a long-run relationship between GDP and PFCE and this relationship is positive i.e., PFCE effects GDP positively in long run. The system corrects its previous period's disequilibrium with a speed of about 95 per cent in a period. This can be because consumption is the most important factor which drives the production and production in turn drives economic growth. Therefore, behind the scenes, a cycle is operating, wherein unless one is willing to pay sellers or producers, they (producers) are unable to make profits and factors of production will earn less thereby, hampering economic growth. As a result, the government should spend to increase the consumer expenditure but in a sustainable manner. By sustainable we mean meeting our nutritional requirements without compromising the needs of the future generations. Lastly it would be correct stating that, rising consumer spending would boost economic activity, investments taking place with rising consumer demands leads to economic growth.

References

1.Afonso, A., &Jalles, J. T. (2011), Economic performance and government size.(Working Paper Series No. 1399). European Central Bank, pp. 1-42

- 2.Agrawal, S. (2014), Economic Growth and Consumption in Urban India, Indian Journal of Applied Research, Vol. 4, No. 5, pp. 137-140.
- 3.Alper, A. (2018), The Relationship of Economic Growth with Consumption, Investment, Unemployment Rates, Saving Rates and Portfolio Investments in The Developing Countries, Gaziantep University Journal of Social Sciences, pp. 980-987.
- 4.Amin, S. (2011). Causal Relationship between Consumption Expenditure and Economic Growth in Bangladesh. World Journal of Social Sciences. 1, pp.158-169.
- 5.Aslam, A.L. (2017), Does consumption expenditure induce the economic growth? Empirical evidence from Sri Lanka, World Scientific News. 82.14, pp. 216-229.
- 6.Dickey, D., and W. Fuller (1979), Distribution of the Estimators for Autoregressive Time Series with a Unit Root, Journal of the American Statistical Association, Vol. 74, No. 366, pp. 427–431.
- 7.Ghosal, R. K., & Commerce, D. O. (2014, August). Growth, inequality, and diversification in consumption pattern in India—an empirical analysis. In Int. Assoc. for Research in Income and Wealth 33rd General Conf. (24–30 August, 2014 Rotterdam, the Netherlands).
- 8.Goklany, I.M. (2007), The Improving State of the World: Why We're Living Longer, Healthier, More Comfortable Lives on a Cleaner Plane, Cato Institute, pp: 1-516.
- 9.Goodwin, N., Harris, J., Nelson, J., Joshi, R. P., & Roach, B., Torras, M. (2019). Consumption and the Consumer Society. 10.4324/9780429438752-10, pp. 1-42.
- Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. Econometrica, 37(3), pp. 424–438
- 11. Gujarati, D. N. Basic Econometrics, Fourth Edition, McGraw-Hill Higher Education.
- 12. Tan, J.H., & Lim Choon Seng, V. (2019). The Dynamic Relationship between Private Final Consumption Expenditure and Gross Domestic Product: Evidence from Colonial Malaya and Post-independence Malaysia, Journal of Southeast Asian Economies (JSEAE) 36(1), pp. 112-129.
- 13. Kim H (2017), The Effect of Consumption on Economic Growth in Asia, Journal of Global Economics, Vol. 5, No. 3, pp. 1-8.
- Laato, S., Islam, A.N., Farooq, A., &Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. Journal of Retailing and Consumer Services, 57, 102224 – 102224, pp. 1-12
- 15. Mishra, P. K. Dynamics of the relationship between real consumption expenditure and economic growth in India. Indian Journal of economics & Business 10.4 (2011): pp. 553-563.
- 16. Pantano, E., Pizzi, G., Scarpi, D., & Dennis, C. (2020). Competing during a pandemic? Retailers' ups and downs during the COVID-19 outbreak. Journal of business research, 116, pp. 209–213.
- 17. Pesaran, M. H., Y. Shin, and R. Smith, 2001, Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, pp. 289-326.
- Reardon, T., Mishra, A., Nuthalapati, C. S. R., Bellemare, M. F., &Zilberman, D. (2020). Covid-19's disruption of India's transformed food supply chains. Economic and Political Weekly, 55(18), pp. 18-22.
- 19. Roser, M., (2013). Economic Growth. Published online at OurWorldInData.org. Retrieved from: [Online Resource]
- 20. Sethia, S. (2013). India's Changing Consumption Pattern. Gyanpratha-Accman Journal of Management, 5(2).
- Thakur, M. (2017) An Analysis of Changing Consumption Pattern in India: Pre and Post Reforms Period. International Journal of Engineering Science and Computing. Vol. 5, No. 12, pp. 15729-15732.
- 22. Yu, Shengjin 2011. The Relationship between Incomes and Consumptions for China and India: An ARDL Bound Test Approach, Master Thesis Södertörnshögskola, Sodertorn University, Stockholm, Sweden. ISSN: 0971-1023, Vol. 36, No. 4.

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