Macroeconomic Factors Affecting the Household Final Consumption Expenditure in the Philippines Using Two-Stage Least Squares (2SLS)

ROY B. GACUS
Faculty, Department of Agricultural Economics
University of Southern Mindanao, Kabacan, Cotabato, Philippines

Abstract:- **In economic theory, the major factor that influences household consumption is the household disposable income as postulated in the consumption function. This study is aimed to find out whether the theoretical justification in economics that household consumption affects the disposable income is evident or are there any macroeconomic factors that influence the household consumption in the Philippine case using the Two-Stage Least Squares (2SLS). Results of this study proved that based on the economic theory household consumption is affected by the household disposable income in the Philippine case. Moreover, the disposable personal income can be proxied by the macroeconomic variables affecting the household final consumption expenditure such as unemployment rate, population growth, government expenditure rate, interest rate, and inflation rate.**

Keywords:- Disposable Personal Income; Household Final Consumption Expenditure; Macroeconomic Variables; Two-Stage Least Squares (2SLS)

I. INTRODUCTION

Household consumption refers to the expenditures made by the household residents on individual consumption of goods and services. The term is synonymous with the household final consumption expenditure (HFCE) that includes the expenditures made by the residents domestically and abroad (outbound tourist) but excludes those expenditures made by non-residents on the domestic territory (inbound tourists) (Lequiller and Blades, 2014). Household consumption has several factors according to some economic literature since the time of Keynes (1936), Duesenberry (1949), Modigliani and Ando (1957), Friedman (1957), Hall (1978), and Macklem (1994). Despite their differences, this study consolidates those factors mentioned by the researchers. The determinants of household consumption considered in this study are the following: disposable income, number of consumers, government expenditure, interest rate, inflation, and unemployment rate.

Disposable income, as computed by the total personal income minus personal current taxes, has a positive effect on consumption. As disposable income increases, households spend more goods and services for their consumption. Moreover, the number of consumers as a proxy to the population can influence positively the level of consumption. An economy with a greater population contributes greatly to spending on goods and services. Furthermore, government expenditure as measured by Government Final Consumption Expenditure is used for the direct satisfaction of the consumers or collective needs of the society (Lequiller and Blades, 2014). An increase in the aggregate level of government spending has a positive effect on consumption. On the other hand, the interest rate has a negative effect on consumption. As the interest rate increases, consumers spend fewer goods and services since they will save more money but rather they will use Interest-Bearing Assets (IBAs). Also, inflation reduces the level of consumption. As the price level of domestic goods and services increases, consumers tend to keep more money as their precautionary motive which will lead to a reduction in their consumption. As well as, unemployment has a negative effect on consumption. This is due to a reduction in the aggregate income level of the economy since those unemployed persons are not involved in economic activities.

II. SIGNIFICANCE OF THE STUDY

This study is formulated to find out the effect of these macroeconomic variables such as disposable income, population, government final consumption expenditure, inflation, interest rate, and unemployment rate on household final consumption expenditure in the Philippines. Also, the researcher investigated whether the theoretical justification in economics that household consumption influences the disposable income is evident in the Philippine case. Rather than the empirical justifications and evidence claimed by other researchers that there are other macroeconomic variables (aside from the disposable income) that affect household consumption. A sound understanding of the behavior of these relationships is an edge for sound decisions. The results of this study will serve as a guide to the policymakers who make policies for the interest of consumers as well as the business sector to streamline the vivid economy. The picture would be clearer if the involved variables are incorporated into a decision-making process. It is towards this end that the current study was conceptualized.

III. DATA SOURCE

Secondary data on disposable personal income, population, government final consumption expenditure, inflation, lending interest rate, unemployment rate, and household final consumption expenditure for the period 1975 - 2018 were taken from the World Bank (WB) Database – World Development Indicators. The disposable personal income, population, government final consumption expenditure, and household final consumption expenditure were converted into percentage computed by the researcher so that all variables were uniformed. Moreover, the values for household final consumption expenditure, disposable personal income, and government final consumption expenditure were deflated using the Consumers' Price Index (CPI) from 1975 to 2018 using 2010 as the base year. Moreover, the annual growth rate was used for all macroeconomic variables included in this study.

IV. VARIABLES

$cons_t$ = household final consumption expenditure at year t, expressed in percentage

inc_t = disposable personal income at year t, expressed in percentage

pop_t = population growth rate at year t

$govexp_t$ = government final consumption expenditure at year t, expressed in percentage

$inter_t$ = lending interest rate at year t

$unemp_t$ = unemployment rate at year t

$infla_t$ = inflation rate at year t

V. ECONOMETRIC MODEL

Two-Stage least squares (2SLS) analysis is used to identify which among the macroeconomic variables are significantly influenced by the household final consumption expenditure. It is assumed that errors in the dependent variable are uncorrelated with the independent variables. Moreover, 2SLS used instrumental variables that are uncorrelated with error terms to compute estimated values of the problematic predictors (of the first stage) and then uses computed values to estimate a linear regression model of the variable (second stage).

Given the linear regression as:

$$Y_t = \beta_1 + \beta_2 X_t + \beta_3 Z_t + \varepsilon_t$$
$(t = 1, ..., T)$

where:

Y_t = dependent variable at time t

X_t = endogenous variable at time t

Z_t = exogenous variable at time t

ε_t = error term

The endogenous nature of X_t implies that if this equation is estimated by OLS, the point estimates will be biassed and inconsistent since the error term will be correlated to X_t. There is a need for instrument variable/s of X_t that is correlated with X_t but not correlated with the error term, ε_t. If these two conditions are met, that is the instrumental variable/s for X_t. The condition for correlation between instrumental variables and X_t can be tested by regressing the possible instrumental variables on X_t if they are statistically correlated. However, the condition for correlation between instrument variable/s of X_t and error term, ε_t, cannot be directly observed but it can be readily tested the endogeneity later by satisfying the first condition, then predicting the error term and finally regressing the independent variables and predicted error term on the dependent variable. Check whether the error term is statistically significant.

1st Stage: Regress X_t on Z_t to obtain $\hat{X}_t$

$$\hat{X}_t = \gamma_1 + \gamma_2 Z_t + \gamma_3 W_t + v_t$$

where:

W_t = instrumental variables at time t

The predicted values of that regression, $\hat{X}_t$, will serve as the instrument for X_t and this auxiliary regression is the "first stage" of 2SLS.

2nd Stage: Plug in the fitted values of $\hat{X}_t$ derived from the first stage equation into the original linear regression equation as:

$$Y_t = \beta_1 + \beta_2 \hat{X}_t + \beta_3 Z_t + v_t$$

where:

v_t = is a composite error term that is uncorrelated with $\hat{X}_t$ and Z_t

VI. RESULTS AND DISCUSSION

➢ *Trends of Philippine Macroeconomic Variables*

The macroeconomic variables considered in this study are disposable personal income rate, population growth rate, government final consumption expenditure rate, inflation rate, lending interest rate, unemployment rate, and household final consumption expenditure rate. The behaviors of these variables for 44 years are shown in Figures 1-7.
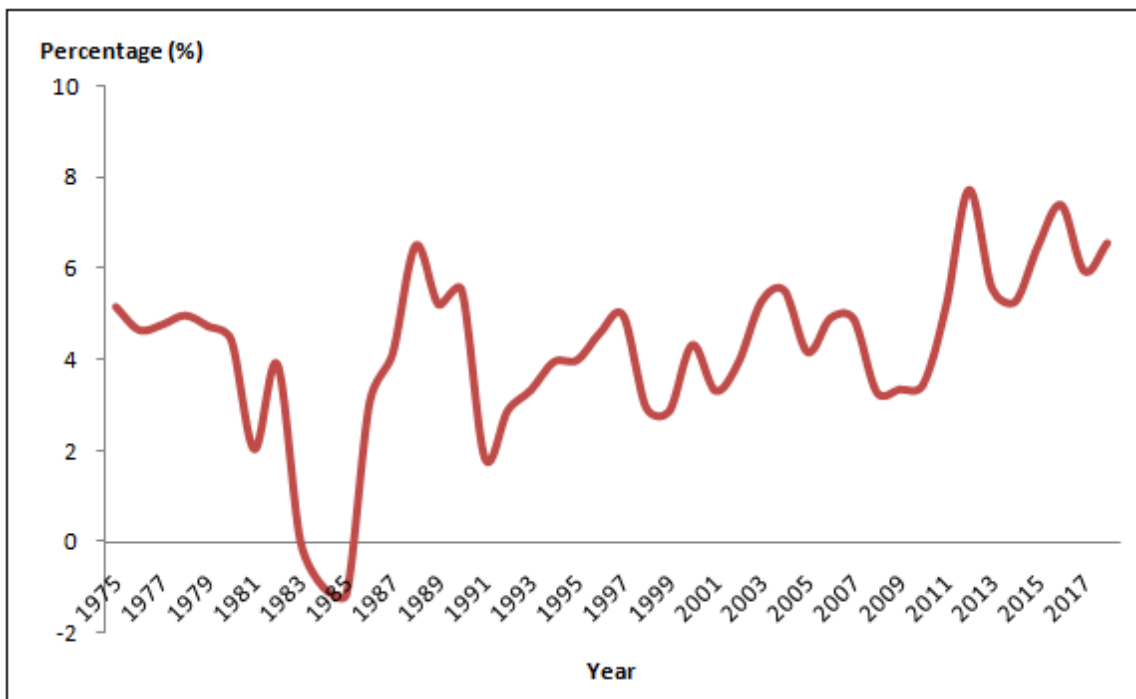
Figure 1. Household Final Consumption Expenditure Rate of the Philippines: 1975-2018.
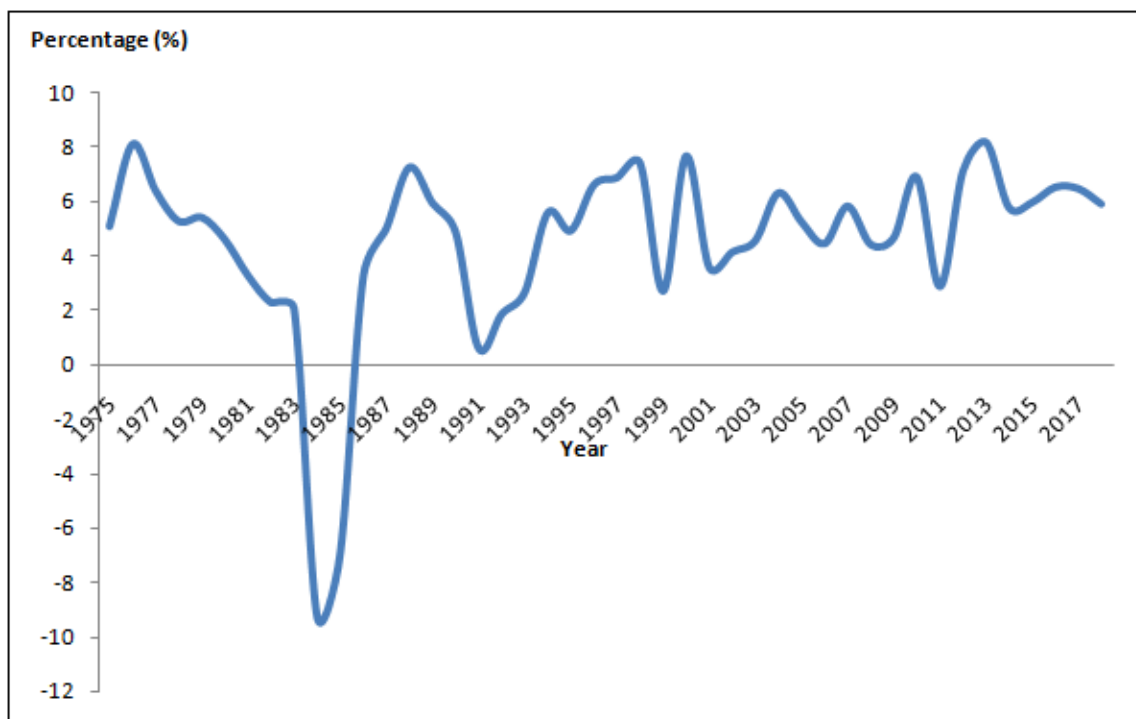Source: World Bank Database (2018)

Figure 2.Disposable Personal Income Rate of the Philippines: 1975-2018.
Source: World Bank Database (2018)

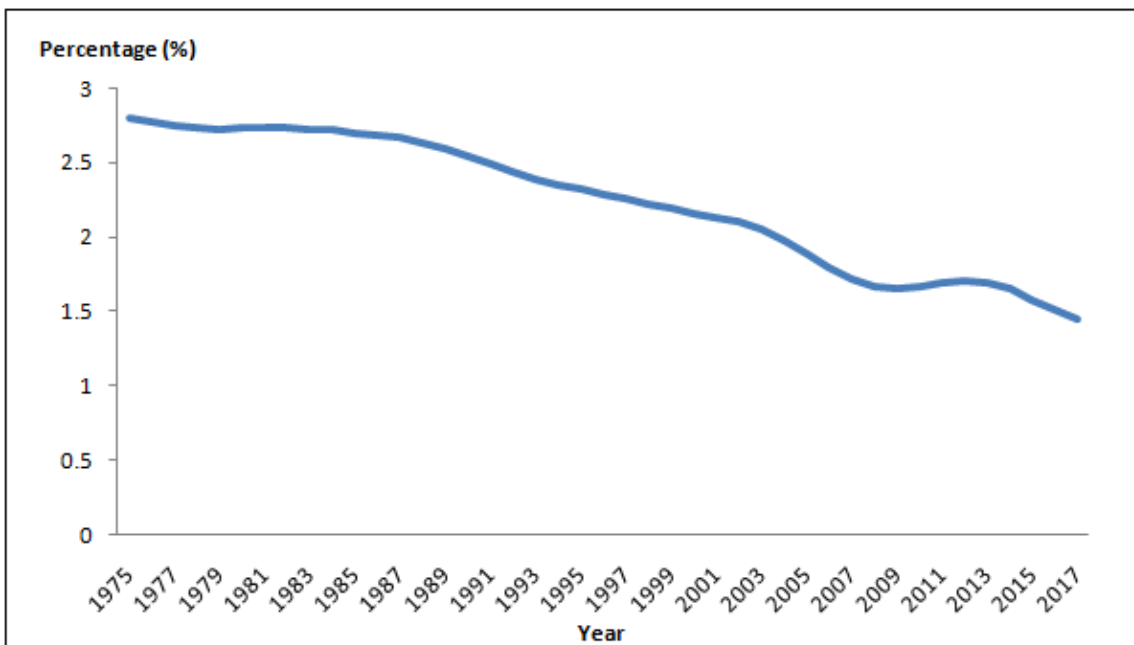Figure 3.Population Growth Rate of the Philippines: 1975-2018.
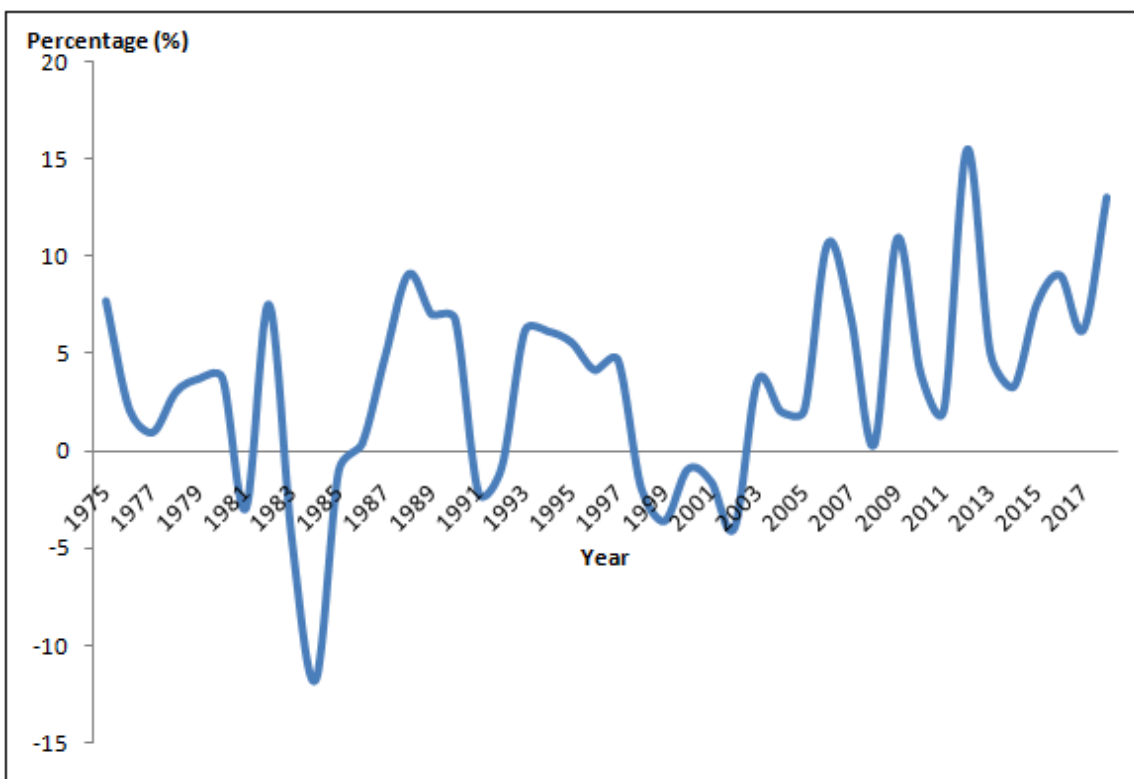Source: World Bank Database (2018)

Figure 4.Government Final Consumption Expenditure Rate of the Philippines: 1975-2018.
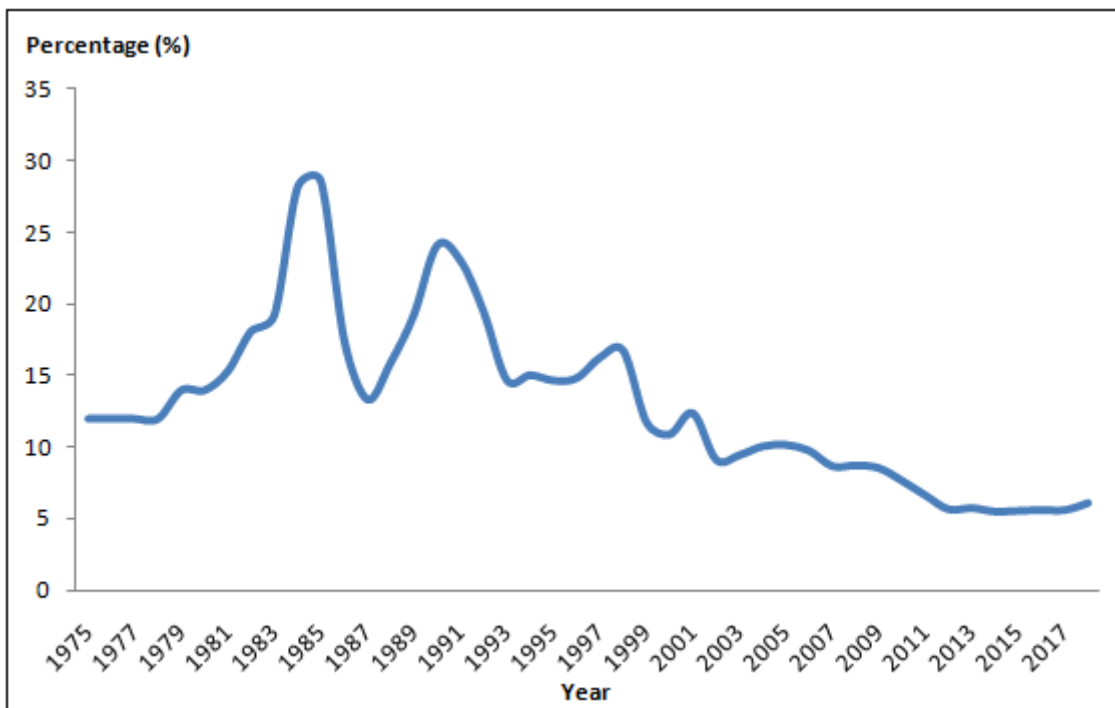Source: World Bank Database (2018)

Figure 5.Lending Interest Rate of the Philippines: 1975-2018.
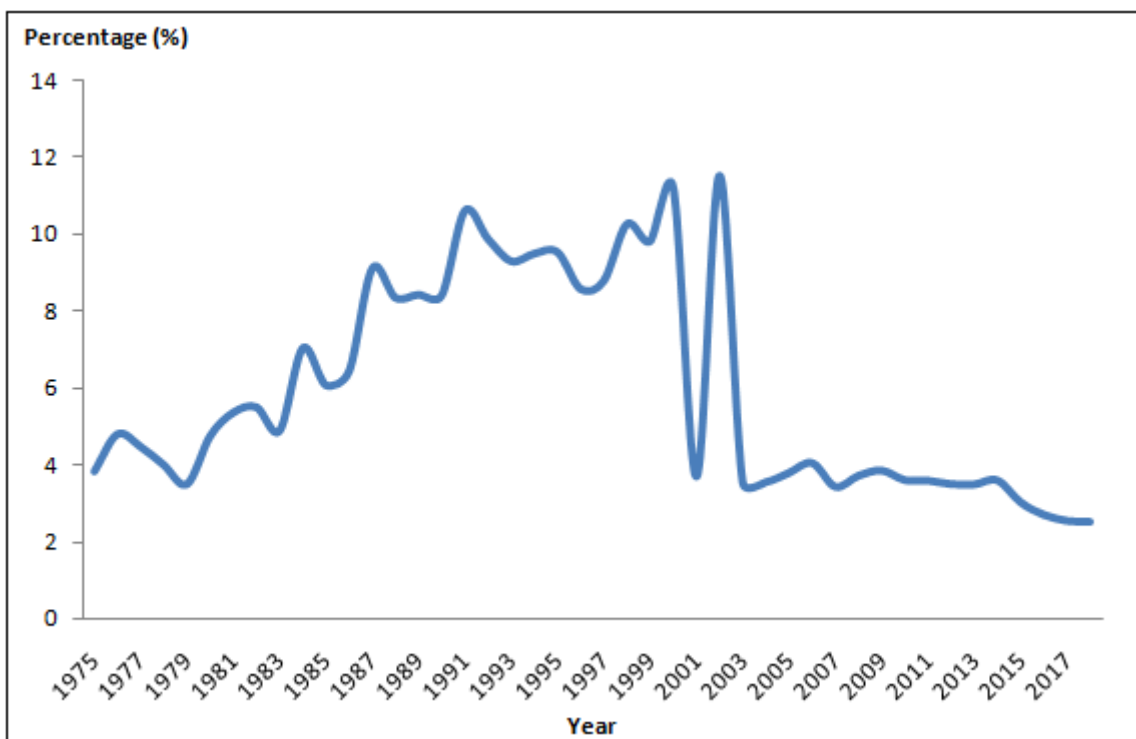Source: World Bank Database (2018)

Figure 6.Unemployment Rate of the Philippines: 1975-2018.
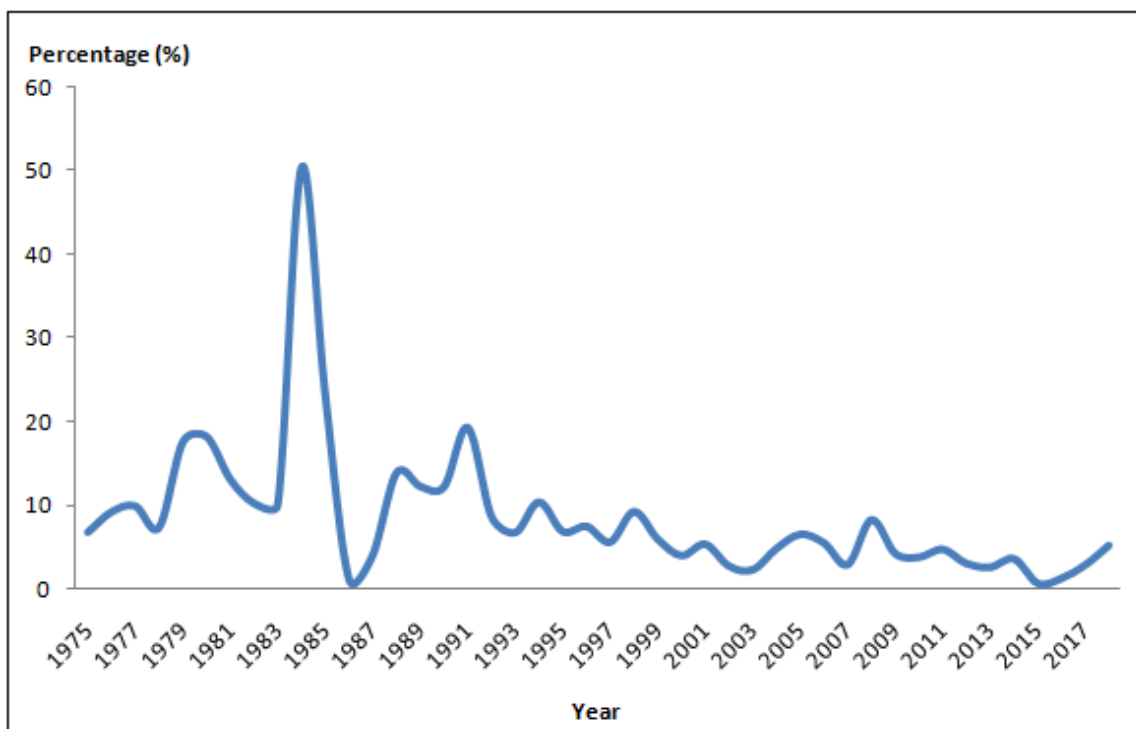Source: World Bank Database (2018)

Figure 7.Inflation Rate of the Philippines: 1975-2018.
Source: World Bank Database (2018)

➤ *Estimates for 2SLS*

The results revealed that all macroeconomic variables such as *unemp, pop, govexp, inter,*and*infla* satisfy the first condition as the instrumental variables for endogenous*inc* since they are significantly correlated at 1% and 5% levels. The researcher did the trial-and-error of selecting all the microeconomic variables as one of the endogenous variables(regressands in the first stage) but all of these failed in the first condition.

Source	SS	df	MS			
				Number of obs	=	44
				F(5, 38)	=	18.92
Model	336.655146	5	67.3310293	Prob > F	=	0.0000
Residual	135.222072	38	3.55847559	R-squared	=	0.7134
				Adj R-squared	=	0.6757
Total	471.877219	43	10.9738888	Root MSE	=	1.8864

inc	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
infla	-.1296219	.0581947	-2.23	0.032	-.2474308	-.0118129
unemp	.2830686	.1325682	2.14	0.039	.0146983	.5514389
pop	2.651211	.9569086	2.77	0.009	.7140507	4.588371
govexp	.1811274	.0672805	2.69	0.011	.0449251	.3173297
inter	-.399591	.1070067	-3.73	0.001	-.6162147	-.1829674
_cons	2.656468	1.724448	1.54	0.132	-.8344952	6.147432

This study used the endogeneity test to confirm if, in the first stage, instrumental variables are valid under endogeneity that is satisfied in the second condition. The results revealed that the error term is significant at the 5% level, this means that a 95% confident rejection of the effect of the error term is zero. Therefore, at least 95% confident that there is endogeneity.

Source	SS	df	MS	Number of obs	=	44
				F(2, 41)	=	40.83
Model	99.0150546	2	49.5075273	Prob > F	=	0.0000
Residual	49.7167734	41	1.21260423	R-squared	=	0.6657
				Adj R-squared	=	0.6494
Total	148.731828	43	3.45887972	Root MSE	=	1.1012

cons	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
inc	.5175903	.060016	8.62	0.000	.3963855	.638795
e	-.2621204	.1121134	-2.34	0.024	-.4885381	-.0357028
_cons	1.846145	.3183927	5.80	0.000	1.203138	2.489152

To apply the second stage, the predicted *inc* derived from the first stage is used and plug-in into the original linear regression. The results revealed that the predicted *inc* is significantly influenced by the *cons* at the 1% level. This means that for every 1% increase in the disposable personal income, on average, the household final consumption expenditure increases by 0.52% (*ceteris paribus*). Although disposable personal income was proxied by the macroeconomic variables affecting the household final consumption expenditure such as unemployment rate, population growth, government expenditure rate, interest rate, and inflation rate, it can be proven that disposable personal income was directly and significantly influenced the household final consumption expenditure based on the economic theory (Friedman, 1957).

Source	SS	df	MS	Number of obs	=	44
				F(1, 42)	=	64.71
Model	90.1898076	1	90.1898076	Prob > F	=	0.0000
Residual	58.5420204	42	1.39385763	R-squared	=	0.6064
				Adj R-squared	=	0.5970
Total	148.731828	43	3.45887972	Root MSE	=	1.1806

cons	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incHat	.5175903	.0643453	8.04	0.000	.3877363	.6474443
_cons	1.846145	.3413601	5.41	0.000	1.157252	2.535037

In the abovementioned results, the standard errors are incorrect by estimating the OLS on *cons* with the predicted *inc*. But this can be corrected by using the IV Estimation without changing the estimated coefficient.

Instrumental variables (2SLS) regression

		Number of obs	=	44
		Wald chi2(1)	=	67.25
		Prob > chi2	=	0.0000
		R-squared	=	0.6033
		Root MSE	=	1.158

cons	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
inc	.5175903	.0631153	8.20	0.000	.3938866	.641294
_cons	1.846145	.3348349	5.51	0.000	1.18988	2.502409

Instrumented: inc
Instruments: pop govexp inter unemp infla

VII. CONCLUSION

Therefore, this study proved that based on the economic theory household final consumption expenditure is affected by the disposable personal income in the Philippine case. Moreover, the household disposable income can be proxied by the macroeconomic variables affecting the household final consumption expenditure such as unemployment rate, population growth, government expenditure rate, interest rate, and inflation rate.

REFERENCES

[1]. **Duesenberry, J.S. (1949).** Income, Saving and the Theory of Consumption Behavior. Cambridge, Mass.: Harvard University Press.
[2]. **Friedman, M. (1957).**A Theory of the Consumption Function/ed. by M. Friedman.Princeton University Press.
[3]. **James, G. Witten, D., Hastie, T. and Tibshirani, R. (2017).** An Introduction to Statistical Learning (8th ed.). Springer Science+Business Media New York. ISBN 978-1-4614-7138-7.
[4]. **Hall, R. E. (1978).** Stochastic Implications of the Life Cycle–Permanent Income Hypothesis: Theory and Evidence. Journal of Political Economy, 86, 971–87
[5]. **Keynes, J. M. (1936).**The General Theory of Employment, Interest and Money. London: Macmillan.
[6]. **Lequiller, F. and Blades, D. (2014).**Understanding National Accounts: Second Edition, OECD Publishing. http://dx.doi.org/10.1787/9789264214637-en
[7]. **Macklem, R. T. (1994).** Wealth, Disposable Income and Consumption: Some evidence for Canada. Available at: http://www.econ2.jhu.edu/people/ccarroll/papers/coswealtheffectsliterature/papers/macklem.pdf
[8]. **Modigliani, F. and Ando, A. (1957).** Tests of the Life Cycle Hypothesis of Savings: Comments and Suggestions. Bulletin of the Oxford University Institute of Statistics.