



# Research on Income and Expenditure Based on Multiple Linear Regression: A Case of Filipinos

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**Abstract.** The currency system in modern society requires people to work for incomes and purchase what they demand. Accordingly, economists are working hard to find out exact patterns in which human-beings earn and spend their money. This paper aims at looking for and describing such a pattern. Through simple charts and model-creation, it turns out that people in Philippines are inclined to spend more to improve their living standards as their incomes rise gradually and the most important factor which affects people's disposed incomes is how much they will have to spend on food. Although food takes the highest percentage in total spending, it is more important to focus on others, including entertainment and life-based expenditures. Improving living standards involves increasing the quality of medical care, renting better apartments, and paying more for entertainment such as traveling. This pattern obviously provides retailers and financial investors in the financial market with ideas what their customers are demanding from them and stimulation to improve their products, by which the whole commercial section in the Philippines will get improved as a whole.

**Keywords:** Spending Pattern · Improvement in Living Quality · Income Status

## 1 Introduction

Consumers' spending habits are always important for the retailing market because they assist retailers to determine which products to invest in and how they conduct their retailing activities such as arranging advertisement and making understandable, beneficial discounts. Economists have always paid massive attention in this field and completed studies trying to look for distinct patterns for different categories of consumers or in different time periods. These patterns may vary according to the backgrounds of the customers including their living standards and time periods. To figure out this issue, the foremost thing is to do surveys related to necessary parameters such as total consumer spending and total income. Therefore, the U.S. Bureau of Labor Statistics has conducted

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nationwide surveys to find out how Americans spend their money [10]. Using the results of these surveys, analysis of how people spend can be done. According to G. Dautovic, American consumers has increased their total annual spending 2.5% each year and housing have cost them the most with a percentage of 33.2%. Besides, the Americans are usually spending over 60% of their total earnings. This result, for instance, are helping both individuals and larger institutes to make finer decisions while investing in the future [10]. Furthermore, as stated by Steve Reed and Malik Crawford, Americans' purchasing behavior change during economic activities including boom, recession and recovery. Their study focused mainly on food, travelling and renting, which will also be ours. During the analysis, they found that the food section has followed their hypothesis that people purchase less in poverty and more with wealth. However, the results for travelling and renting have been compelling [3]. Based on Rituajay Ghosh, U.S. consumer spending has jumped after Covid-19 in August 2021, which means they are taking confidence back towards the reopening economy. Moreover, people's income has also increased simultaneously as they consume more, showing a recovering trend from the pandemic [9]. According to Kimberly Amadeo, products and services that consumers buy every day keep companies profitable and they are the driving force of the U.S. economy. Five determinants including disposable income, income per capita, income inequality, household debt and consumer expectation influence the total amount of consumer spending [7]. In the survey done by Greg Robb, as economists have estimated, U.S. consumer spending has declined in November just after the gain in the prior month, while the overall income decreased as government loan programs ended and other social programs expired [6]. Anneken Tappe said in her article that while both incomes and spending rise in June 2021, the savings rate has declined, showing that people are spending more rather than saving. That's an overall good thing for the recovery of the economy [4]. As stated in the letter by Stephen Byrne, Andrew Hopkins, Tara McIndoe-Calder and Martina Sherman, the combination of demand and supply pressures from Covid-19 has resulted in the spending impact of the virus being unlike that in previous recessions [1]. Based on these comprehensive studies, economists are looking for specific patterns in how human beings are collecting wealth and where they are willing to spend their money the most depending on the distinct situations.

Nevertheless, although such studies have been prevalent long before since commercial market began to exist, most of them are mainly focusing on strong and developed countries, and the most of the ones being mentioned earlier are all about American customers. Admittedly, customers in stronger nations are wealthier to display typical spending habits but focusing only on them might lead to potential bias because poverty is an intense factor which would influence people when they are considering what to purchase. As a result, this paper chooses to shift the audience's eyesight from common targets to one of the unusual choice—Philippines, which is a typical developing country. It is formed by islands located in the Pacific Ocean. Customers on the islands represent common ones in developing countries whose average income is not so high as theirs in developed countries such as United States. Studies of this field are uncommon probably because the Republic of the Philippines is not a common target for economists. Specifically, large data-collecting institutes may not be that willing to do surveys in these nations because it is probably hard to conduct on those separated islands. Moreover, although

there already exist datasets, researchers might not notice them because the results of the analysis may not be as utilitarian as those gained from larger nations. However, this topic is specifically important for finance because a typical pattern of people's consumption in relatively smaller countries can be derived and it can serve as an essential model in business analytics, in which what customers are pursuing and what are the differences between the demands of people with different social status are pivotal for both causation and prediction model-building.

In general, adopting data visualization as the main method of research, this paper is based on graphical demonstration. In detailed explanation, to embody how Philippine customers are arranging their incomes, expenditures are separated into categories with exact amounts. These amounts are introduced into charts in the forms of amount together with their percentages of the total. Such clear expressions help the audience to view where the income finally achieved and closer, more intensive analysis will be conducted based on them. What's more, visualizing the relationship between variables is very significant. Demographical information including age, marital status and number of family members are connected to the income and expenditures to find out particular causation. Finally, by building a regression model, concrete causal relationships will be found through the coefficients contained in the model, and it also serves as an estimator of the total income. With these graphical or numerical results, formal analysis can be carried out and both causal facts and factually grounded speculations will be stated in this paper. In general, the result of the study has shown that improving life quality is the main purpose for people who would like to earn more. While customers have spent the most on food, others related to life quality tell the audience more about the story in which people are paying more for comfort such as traveling, dormitory and medicine.

The paper is constructed as follows. Section 2 shows the data and methods; Sect. 3 presents the results and Sect. 4 concludes the paper.

## 2 Data

The data set about households of Philippines is found on Kaggle (<https://www.kaggle.com/>). The reason why we choose it is that the data set includes 60 columns from which we can explore various dimension of Philippines' households, so we can make extensive research.

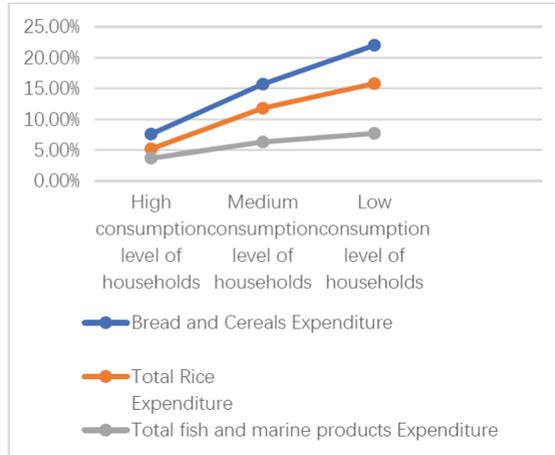
All Filipino families were divided by income with 0–10000, 10000–30000, 30000–100000000 the upper one is for low level whose average income is 9372; the one in the middle is for medium level whose average income is 9974; and the lower one is for high level whose average income is 22198. Some basic information of households is shown in Table 1 (Figs. 1 and 2).

Bread and Cereals Expenditure, Total Rice Expenditure, Meat Expenditure, Total fish and marine products Expenditure, Fruit Expenditure, Vegetables Expenditure, Restaurant and hotels Expenditure, Alcoholic Beverages Expenditure, Tobacco Expenditure, Clothing, footwear and Other wear Expenditure, Medical care Expenditure, Transportation Expenditure, Communication Expenditure, Education Expenditure, Miscellaneous Goods and services Expenditure, Special Occasions Expenditure, Imputed House Rental Vale, Housing and water Expenditure are the factors that have the strongest correlation

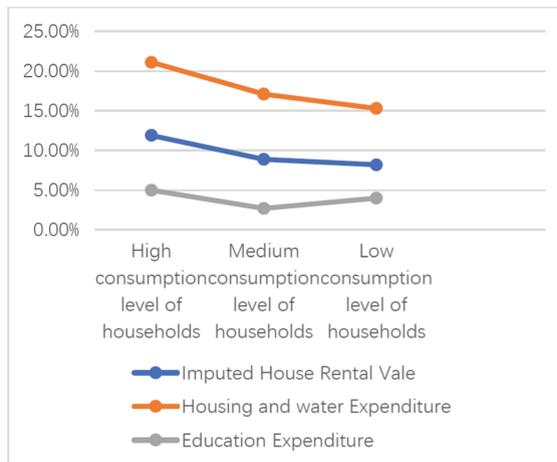
**Table 1.** Basic information of individuals

	High consumption level of households	Medium consumption level of households	Low consumption level of households
Bread and Cereals Expenditure	7.6%	15.7%	22.0%
Total Rice Expenditure	5.2%	11.8%	15.8%
Meat Expenditure	5.1%	5.5%	4.0%
Total fish and marine products Expenditure	3.7%	6.3%	7.7%
Fruit Expenditure	1.1%	1.3%	1.6%
Vegetables Expenditure	1.7%	3.0%	4.1%
Restaurant and hotels Expenditure	8.5%	7.2%	4.5%
Alcoholic Beverages Expenditure	0.4%	0.6%	0.7%
Tobacco Expenditure	0.7%	1.5%	1.7%
Clothing, footwear and other wear Expenditure	2.8%	3.2%	1.9%
Medical care Expenditure	4.6%	2.7%	1.8%
Transportation Expenditure	7.0%	5.0%	3.3%
Communication Expenditure	2.8%	1.4%	0.7%
Education Expenditure	5.0%	2.7%	1.2%
Miscellaneous Goods and services Expenditure	7.4%	5.2%	4.1%
Special Occasions Expenditure	3.2%	2.1%	1.3%
Imputed House Rental Vale	11.9%	8.9%	8.2%
Housing and water Expenditure	21.1%	17.1%	15.3%

with Philippine household income through the analysis of Pearson coefficient. Besides, it shows that as the income rises, the percentage of bread and cereals expenditure decreases, which means that the amount of money spent in this field remains approximately the same because the total amount of money also rises. This also occurs for the total rice



**Fig. 1.** Statistical chart of several important information changing with consumption level of households



**Fig. 2.** Statistical chart of several important information changing with consumption level of households

expenditure and total fish and marine products expenditure. However, imputed house rental value and housing and water expenditure are consuming larger percentages, representing incredible increases in these two fields. Moreover, meat expenditure, restaurant and hotels expenditure, transportation expenditure and medical care expenditure are all taking larger roles in the households' lives. This means that the family members are more willing to pay for better living standards when they are affordable to them.

### 3 Methods

Additionally, we use multiple linear regression model to measure which of the factors are most important. Multi-linear regression is the generalization of simple linear regression, which studies the quantitative dependence between one dependent variable and multiple arguments. The general expression of a multiple linear regression model:

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k + \xi \quad (1)$$

where  $x_k$  is an argument,  $y$  is dependent variable,  $\beta_k$  is a regression factor and  $\xi$  is the random error term.

Multiple linear regression is widely used [5]. Guan Yongqian, a scholar from China, wants to find out the main factors affecting the GDP of Henan Province. She takes the basic data that can reflect the economic development of Henan Province for 20 years from 1998 to 2017 as the basis of data analysis, and uses the method of multiple linear regression to conduct multiple linear regression analysis on various factors that can affect the GDP growth of Henan Province. Finally, she concludes that the development of the primary industry, the secondary industry and the tertiary industry are the main factors to promote the rapid growth of GDP in Henan Province. This result plays an important role in promoting the development of the province [11]. The same method is also applied by some economists who want to explore the influencing factors of Beijing residents' consumption level. They take Beijing residents' information consumption level as dependent variables and consumer cognition level, income level, education level and Beijing population age structure as independent variables. Then they use multiple linear regression to analyze and get the contribution of each influencing factor to the information consumption gap.

### 4 Results

The estimation results for the multi-regression are shown in the following Table 2.

According to the estimation results, the most important factor is total food expenditure, which is the main body of the total expenditure. Moreover, other relatively significant ones are number of refrigerator/freezer, number of cellular phones and total income from entrepreneurial activities.

Accordingly, as the income of the households of Philippines rises, their main focus of expenditure shifts from food to other fields including housing, medical care and even travels. This represents their main thought that once they are able to earn more, they will spend more in order to improve their living standards. They will choose to have medical care with higher prices, housing with higher prices, going to restaurants and hotels more and purchasing more meat for meals. Besides, the total incomes of the families are also complicated because there are totally 23 variables contained in the linear regression model, but it seems that the most important factor must be total food expenditure because it is the most important expenditure for a household. The reason for this phenomenon depends on the distribution of population and wealth in the Philippines. The economy of the Philippines grew fastest in East Asia. In the first quarter of 2013, the GDP of the Philippines increased by 7.8%. The country's stock market is in full swing, the currency

**Table 2.** Estimations results of certain parameters

Variable	Coefficient	stand error	P-value
Constant	12.088	-	-
Total Food Expenditure	0.298	0.093	0.001
Total Income from Entrepreneurial Activities	0.085	0.065	0.195
Household Head Age	-0.024	0.068	0.729
Total Number of Family members	0.032	0.130	0.808
Members with age less than 5 year old	-0.029	0.080	0.720
Members with age 5 - 17 years old	-0.037	0.100	0.707
Total number of family members employed	0.070	0.073	0.341
House Floor Area	0.036	0.068	0.597
House Age	0.021	0.063	0.744
Number of bedrooms	0.052	0.073	0.475
Number of Television	0.061	0.080	0.447
Number of CD/VCD/DVD	0.017	0.072	0.817
Number of Component/Stereo set	0.007	0.067	0.920
Number of Refrigerator/Freezer	0.094	0.081	0.249
Number of Washing Machine	0.084	0.077	0.277
Number of Air conditioner	0.020	0.080	0.802
Number of Car, Jeep, Van	0.008	0.076	0.920
Number of Landline/wireless telephones	0.017	0.066	0.802
Number of Cellular phone	0.085	0.086	0.323
Number of Personal Computer	0.031	0.080	0.701
Number of Stove with Oven/Gas Range	0.033	0.069	0.636
Number of Motorized Banca	0.006	0.060	0.919
Number of Motorcycle/Tricycle	0.022	0.064	0.730

trend is strong, the country is praised by international rating agencies, and the rating of the Philippines is constantly improving. However, judging from the government's latest poverty and employment data, many Filipinos are lagging behind the country's emerging prosperity. In the Philippines, the top 10% of the rich have 33% of the country's wealth, and two-thirds of the population work in agriculture to make a living; Nearly one third of the population lives below the poverty line, and there are more than 2.1 million child workers between the ages of 5 and 17. According to government estimates, more than 9 million extremely poor Filipino families cannot earn 5460 pesos (about 827 yuan) per month. The money is about the same as a back seat ticket for a concert. In Manila, you will see many rich people having parties all night. Poverty is particularly serious in rural areas. In recent years, despite the rapid expansion of the national economy and urban

areas, economic growth in rural areas has been stagnant. Therefore, if a poor family wants to make a living, they have to spend a large part of their income on food, which leads to most important factor is total food expenditure.

## 5 Conclusion

Since human behavior is a micro manifestation of macro economy, exploring the income and expenditure of Filipinos can well show some special economic models of the Philippines. This paper uses multiple linear regression model which contains 23 variables, including Total Food Expenditure, Total Income from Entrepreneurial Activities and so on, this paper finds out what is the most important factor of the total expenditure and people's consumption tendency with the change of income. These results will deepen people's understanding of the Philippine economy, thus promote the economic development of the Philippines. This paper combines many factors and aims to show some of the characteristics of the Philippines from the perspective of household expenditure, it does find out the relationship between people's consumption focus and income and the most important factor which affects people's disposed incomes.

However, the paper only uses one data set, which may lack the universality, so we should find more data sets to test our findings. Besides, when we divide Filipino families by income, the classification criteria do not go through a very rigorous analysis.

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