

# Analysis of Income Classification and Expenditure Patterns among Filipino Households Using Data Mining Applications

Lumer Jude P. DOCE <sup>a,d</sup>, Rozanne Tuesday G. FLORES <sup>b,d\*</sup>, Vicente A. PITOGO <sup>c,d</sup> & Ma. Rowena R. CAGUIAT<sup>d</sup>

<sup>a</sup>*Mindanao State University – General Santos City, Philippines*

<sup>b</sup>*Bukidnon State University, Philippines*

<sup>c</sup>*Caraga State University, Philippines*

<sup>d</sup>*De La Salle University, Philippines*

\**rozanne\_flores@dlsu.edu.ph*

**Abstract:** Data Mining is a knowledge discovery process that includes extracting hidden, previously unknown, and potentially useful information from datasets. The analysis of its outcomes can be used for future planning and development perspectives. This paper explores the income and expenditure behavior to determine patterns and associations that describe Filipino households. Drawing from the Family Income and Expenditure Survey of 2015 (FIES 2015) by the Philippine Statistics Authority, a descriptive profile of income and expenditure, a predictive model of income from household characteristics and prescription of important aspects which can be considered by the government in developing policies that may elevate the quality of life of Filipino families, were done. Results showed that the majority of Filipino households are in the first two lower-income brackets and generate negative to no savings at all. For expenditures, majority of the groups spend on Food and Resto. Moreover, the most significant variables that drive the capacity to generate income are education and employment. It is suggested that the government should strengthen its programs in the following areas.

**Keywords:** Data Mining, Income Determinants, Expenditure Behavior, Weka, FIES 2015

## 1. Introduction

The Philippine government aims to join other developing countries in increasing income groups from lower-middle income to upper-middle income status. This goal is reflected in its long-term goal dubbed as “AmBisyon Natin 2040” which aspires a stable and comfortable life for Filipinos (NEDA, 2016). One way to achieve these targets is understanding the trajectory of income versus expenditures. While income is a representation of a quality life since it capacitates people to avail basic needs (Villejo, Enriquez, Melendres, Tan, & Cayton, 2014), consumer expenditure patterns depict economic trends in the household sector (Leonard, 2018). As such, income units and spending patterns has become vital that it is routinely tracked by the government through a nationwide household survey called the Family Income and Spending Survey or FIES (Cruz, 2013).

FIES aims to provide necessary information to the government policymakers on family income and expenditures in the Philippines. Since spending pattern changes through time, expenditure components of the FIES are also revised to include new items commonly consumed by Filipinos during the period covered (Erica & Fabian, 2009). While purchasing decisions are made at the household level and are particularly behavior-driven, appropriate interventions require an understanding of the dynamics of household activities and their associated economic impacts (Froemelt, Dürrenmatt, & Hellweg, 2018). Along this line, households are able to make better decisions in their resource allocation by understanding their patterns of consumption hence, becoming better consumers (Babin & Harris, 2016). This study aims to explore the FIES 2015 data set by applying data mining techniques using Weka in order to analyze factors driving income from household characteristics and expenditure patterns of Filipino households thereby understanding significant variability of their spending behavior

within investigated household types (Hsieh & Chu, 2009). Through data analytics perspective, this study aims to contribute to the investigation of relationships and associations among different variables provided in the FIES 2015 and to provide valuable insights for policymakers when enacting and improving policies related to poverty alleviation.

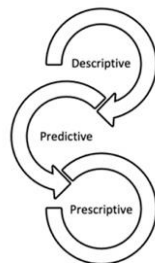
## 2. Overview of Related Literature

### 2.1 Consumer Behavior Pattern

Consumer behavior in its holistic form is a fascinating phenomenon, and it is more so when perceived from the viewpoint of the associated heterogeneity among the consumer group (Gbadamosi, 2018). These groups are often segmented according to demography such as age, race, religion, gender, family size, ethnicity, income, and education (Gbadamosi, 2018; Hsieh & Chu, 2009). Each group have different consumer behavior that often consists mainly of consumption-relevant sequences. Their decisions are sometimes straightforward, involving few resources, and occasionally dynamic, involving large amounts of resources (Babin & Harris, 2016; Maison, 2019). As consumers make decisions, they set up a chain of consequences that change their lives, the lives of those around them, and the lives of people they do not even know (Babin & Harris, 2016). The individual household determines the optimum distribution of its income, physical, and time resources. This allocation can be based on whether the household jointly produces income, the number of household members, and their lifestyle (HOA, 2005). Consumers who understand their patterns of consumption can make better decisions concerning how they allocate resources to become better consumers (Agag & El-masry, 2016; Babin & Harris, 2016). When the allocation of resources is improved, it is considered smart spending. Spending smart is a specific philosophy for achieving financial security without depriving oneself (Karp, 2008). Smart spending is the overall strategy and specific ways to reduce spending without deprivation thus, achieving financial security in the long run (Karp, 2008, 2009).

## 3. Methodology

The study employed the concepts of analytic techniques outlined by Gartner (Gartner, 2016) to create the operational framework, as shown in Figure 1. Data preparation is done before the actual analysis of data. Descriptive analytics phase examines data or content to determine what has happened or what is happening in the context where the data belongs. In this paper, it is done by descriptively identifying different patterns and association from the data in relation to family income and its expenditures. Predictive analytics phase examines the data or content to know what is going to or likely to happen. In this paper, regression analysis is performed in order to forecast income and expenses. The last phase is prescriptive analytics where it examines data or content to determine what should be done or what can be done to make something happen. In this paper, prescription is done to recommend a course of action related to the analysis made on the data.



*Figure 1. Operational Framework*

The primary data source used in the study is the Family Income and Expenditure Survey (FIES) in

2015. According to the Philippine Statistics Authority (PSA), the data includes level of consumption by item of expenditure and its sources. It also presents spending patterns of families and other related information such as number of family member, occupation, age, educational attainment of household head and other family and housing characteristics. In line with the objective of this paper, data associated with income and expenses is given attention. Since family income is of numeric data type by nature, a multiple linear regression is deemed fit to determine significant variables that drive family income using more than one other variables. These attributes were considered because they represent the household characteristics through the household heads' descriptions and family compositions.

The classification of income classes of Filipino households was adopted from Albert et al. (2018) which outlines the indicative range of family monthly incomes, for the a family of five, based on 2017 prices. The income clusters are shown in table 1.

Table 1. *Indicative range of monthly family incomes (Albert et al., 2018)*

<b>Income Cluster</b>	<b>Indicative Range of Monthly Family Incomes</b>
Poor	Less than PHP 9,520
Low income but not poor	Between PHP 9,520 to PHP 19,040
Lower middle income	Between PHP 19,040 to PHP 38,080
Middle middle income	Between PHP 38,080 to PHP 66,640
Upper middle income	Between PHP 66,640 to PHP 114,240
Upper income but not rich	Between PHP 114,240 to PHP 190,400
Rich	At least PHP 190,400

Moreover, the software Microsoft Excel was used for data cleaning and formatting instances of the data. The file was converted to comma separated values (.csv) format and was loaded to Sublime Text Editor to be converted to an attribute relation file format (.arff). The ARFF file is then loaded to Weka for data analysis.

## 4. Results and Discussions

### 4.1 Descriptive

#### 4.1.1 Profile of Income Classes

The data from the FIES 2015 survey (Philippine Statistics Authority, 2015) was analyzed using descriptive analytical techniques to show the income and expenditure patterns of Filipinos households. There is a total of 41,544 respondents; most of which belong to Cluster 2 bracket. The minimum, maximum, and mean income for each cluster is presented in Table 2.

Table 2. *Income Clusters generated for Average Annual of Households*

<b>Cluster</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>N</b>
1	11285	114240	80131.74	12255
2	114242	228478	161498.80	15017
3	228493	456842	317933.20	9306
4	456972	799391	585997.40	3508
5	800214	1366996	1001564	1100
6	1370984	2275298	1688504	272
7	2292000	11815988	3509863	86

For the type of household among Filipinos, majority of the families across all clusters belong to a single family depicted in Table 3, which consists of more than 50% across each cluster's total population. There are almost none or no percentage of families composed of 2 or more non-relative members in the

household.

Table 3. *Distribution of Household Types*

Cluster	Single Family		Extended Family		Has 2 or more nonrelated members		Total	
	No.	%	No.	%	No.	%	No.	%
1	9827	80.19	2393	19.53	35	0.29	12255	29.50
2	10596	70.56	4379	29.16	42	0.28	15017	36.15
3	5391	57.93	3868	41.56	47	0.51	9306	22.40
4	1865	53.16	1614	46.01	29	0.83	3508	8.44
5	573	52.09	518	47.09	9	0.82	1100	2.65
6	146	53.68	121	44.49	5	1.84	272	0.65
7	47	54.65	39	45.35	0	0.00	86	0.21
Total	28445	68.47	12932	31.13	167	0.40	41544	100.00

It is also worth reflecting that most of the Filipino households' sources of income came from salaries and wages among clusters 1 to 6. As seen also in table 4, the secondary source of income for all clusters except cluster 2 is from other sources of earnings, while cluster 2 is from entrepreneurial activities. For the rich group bracket, their primary source of income came first on entrepreneurial activity (44.19%), followed by other sources of revenue (34.88%). This is because families belonging to this group are entrepreneurs and business-oriented (Ulep & Dela Cruz, 2015).

Table 4. *Sources of Income across income clusters*

Cluster	Entrepreneurial Activities		Salaries/Wages		Other Sources		Total	
	No.	%	No.	%	No.	%	No.	%
1	3827	31.23	4562	37.23	3866	31.55	12255	29.50
2	4087	27.22	7671	51.08	3259	21.70	15017	36.15
3	1613	17.33	5282	56.76	2411	25.91	9306	22.40
4	510	14.54	2095	59.72	903	25.74	3508	8.44
5	179	16.27	628	57.09	293	26.64	1100	2.65
6	66	24.26	132	48.53	74	27.21	272	0.65
7	38	44.19	18	20.93	30	34.88	86	0.21
Total	10320	24.84	20388	49.08	10836	26.08	41544	100.00

#### 4.1.2 Profile of Expenses

For the average income and expenditure styles, Table 5 showed the Filipino's earning and spending pattern across income clusters. Based on the identified and accumulated expenditures, most Filipinos in the Cluster 1 and 2 depict a negative savings amount.

Table 5. *Average Annual Family Income, Expenditure, and Savings*

Cluster	Average Income	Average Expenditure	Savings
1	80132	97034	(16902)
2	161499	172711	(11212)
3	317933	300417	17516
4	585997	492898	93099
5	1001564	750478	251086
6	1688504	1050374	638130
7	3509863	1734197	1775666

Savings are computed from the average income deducted by average expenditure. This relationship is known as the consumption schedule (Leonard, 2018). Interestingly, the first two clusters' savings values are negative. This is attributed to Filipinos on these clusters having no proper financial

management skills where they may not know how to handle a hard-earned money and just spend it spontaneously (Hunter & Adal, 2017; Te, Japson, & Velecina, 2017). In effect, money is spent even when there is not enough income to cover it. Spending among Filipinos falls on the aggregated expenditures. From Table 6, it is worth noting that Clusters 1, 2, and 3 spent most on Food & Resto followed by expenses on House, rent and utilities including water and electricity. This means that food occupies almost half of the total income of households belonging to these clusters.

Table 6. *Distribution of Expenditures Across Income Clusters*

Cluster	Food & Resto	House, Water & Rental Values	Clothing & Footwear	Education	Transportation & Communication	Miscellaneous Goods & Services	Tobacco & Alcohol
1	52%	21%	02%	01%	04%	18%	02%
2	48%	23%	02%	02%	06%	17%	02%
3	40%	28%	02%	03%	08%	17%	02%
4	32%	31%	03%	05%	09%	19%	01%
5	25%	35%	03%	06%	10%	20%	01%
6	22%	37%	03%	07%	12%	19%	00%
7	16%	45%	03%	05%	11%	20%	00%

For Clusters 5, 6 and 7 they spent inversely from the previous clusters where House, Water and rental values come first before Food and Resto. In comparison, for a developed country such as Singapore, majority of their income is also spent on housing and housing related expenditures accounting for 28.9% of their monthly expense (Singapore, 2019). Interestingly, Cluster 7 spent second-most of their income to miscellaneous goods and services which consists of medical care, special occasion expenses and even crop farming spending while Cluster 6 spent the most on transportation and communication.

#### 4.1.3 Associations

The amenities inside every household were also determined from appliances, transportation medium and personal devices. These data points were extracted in order to present additional household characteristic patterns that may have an influence on family's expenses and convenience brought by their income. To reveal possible interesting relationships, an association rule mining was done through Apriori algorithm in Weka.

Apriori algorithm is a widely used and important algorithm for association rule mining. The two major steps executed by Apriori algorithm include frequent itemset generation to find all itemset that satisfies the minimum support (minSup) threshold and association rule generation to extract all high confidence rules from the generated frequent itemset. Setting the minimum metric (minMetric) to 0.90 and number of rules to 10 (numRules), the following rules and associations with the corresponding confidence level are shown in Table 7.

Table 7. *Top 10 Best Rules using Apriori Algorithm in Weka*

Best Rules Found (number of instances)	Confidence Level
washing machine (13,060) → television (12,739)	0.98
refrigerator & cellphone (14,815) → television (14,427)	0.97
CD/VCD/DVD & cellphone (15,988) → television (15,537)	0.97
refrigerator (15,554) → television (15,109)	0.97
CD/VCD/DVD (16,923) → television (16,401)	0.97
washing machine (13,060) → cellphone (12,559)	0.96
television & refrigerator (15,109) → cellphone (14,472)	0.95
refrigerator (15,554) → cellphone (14,815)	0.95
television & CD/VCD/DVD (16,401) → cellphone (15,537)	0.95
CD/VCD/DVD (16,923) → cellphone (15,988)	0.94

It can be gleaned from Table 7 that, with 98% confidence level, most households who own washing machine also own television. The following associations were also towards ownership of television and cellular phones. The association rules generated were reflective of the top five most visible household convenience in Filipino homes. Based on the data, cellular phones dominate Filipino homes with maximum of 10 units in a household. Television comes in second with a maximum of 6 units in a household. It is then followed by CD/VCD/DVD players and refrigerator or freezer with maximum of 5 units per every household. Lastly, washing machine comes in with a maximum of 3 units in a given household. Other convenience considered from the data include personal computers, motorcycle or tricycle, stereo set, stove with oven or gas range and air conditioning units. The bottom three, considered as the least visible among all households across income brackets include car, jeep or van, landline or wireless telephones and motorized banca.

#### 4.2 Predictive

##### 4.2.1 Income and Expense Projection

The prediction of an unconditional welfare distribution, such as income and expenditure is deemed important particularly for inequality, development studies and poverty (Dai, Sperlich, & Zucchini, 2012). Both income and expense data were forecasted using time series and linear regression as the base learner configuration in Weka. The historical data from year 2000 up to year 2012 for income and expenditures were culled out from reports in the Philippine Statistics Authority website as the working data set is only for year 2015. Not considering other economic factors that may affect income and expenses such as inflation and prices, the time series projected the next five units and a yearly periodicity and timestamp. Taken together, the estimated annual amounts of income and expenses are presented in Table 8.

Table 8. *Projected Annual Income and Expenditure*

Year	Projected Average Annual Income	Projected Average Annual Expenditure
2000	144,039	118,002
2003	148,000	124,000
2006	173,000	147,000
2009	206,000	176,000
2012	235,000	193,000
2015	267,000	215,000
2018*	297,607.2924*	239,327.9861*
2021*	328000.0505*	262741.5342*
2024*	358494.4463*	285953.8305*
2027*	389088.4699*	309121.8347*
2030*	419743.3629*	332280.0911*

From Table 8, it can be deduced that there is a direct relationship where income increases, expenditure is expected to increase as well. This consumption schedule suggests that where there is more money or hopes of income, the more goods are purchased by consumers (Leonard, 2018). However, as this projection results represent data across multiple income brackets, those belonging to lower clusters may experience having to spend on expenditures even when there is not enough income to cover them. This relationship between expenditures and savings which may stem from behavioral and structural reasons may also be explored in further studies.

##### 4.2.2 Determinants of Income Using Multiple Regression Analysis.

A multiple regression analysis is performed to variables used for income predictor modelling using Weka. The analysis relates to household characteristics including family size, number of household non-relatives, number of households with members below 5 years old, number of households with members ages 5 to 17, number of employed household members, household head age, household head

sex (coded as 1= male, 0= female), two (2) dummy or indicator variables reflecting household type (reference group: single family), three (3) for household highest educational level (reference group: none to elementary undergraduate) and four (4) for household marital status (reference group: single) while five (5) for household head employment status. In multiple regression, the regression coefficients associated with the dummy variables are interpreted as expected difference in the mean of that particular outcome variable as compared to the reference group, while holding all other predictors as constant.

By default, Weka sets eliminateColinearAttributes and attributeSelectionMethod settings to true to remove highly correlated input attributes and perform feature selection to only select those relevant attributes as attributes that are unrelated to the output variable can negatively impact performance. In addition, while classification results from Weka may yield a model for every cluster, a more robust model that applies to all clusters is deemed more relevant to assess income as income is distributed as a whole and not per cluster. The results are summarized in Table 9.

It can be gleaned from Table 9 that with  $\alpha = 0.05$ , many of the predictor variables associated with income are statistically significant. Age, for example, has a significant effect on income. As household head ages, the income may also significantly increase, as observed in salary schemes. As for marital status, a married household head is more likely to earn more among all marital status groups and as compared to being single. The significance of having more family members may be related to having more employed family members as having non-earning members such as those with ages below five years or from five to 17 years old are deemed to affect income negatively. Also, having more non-relatives in a household resulted to a positive effect as compared to having a single or extended family type. More likely, these results are also attributed to having more members who are capable to earn. In addition, it can be inferred that educational levels of household heads and employment status are highly significant predictors of income. However, household sex, although significant at  $\alpha = 0.05$ , is not suggestive of income as it negatively influences it.

Table 9. Multiple Regression Summary

Independent Variable	Regression Coefficient	Alpha:	0.05
		t stat	p-value
Intercept	58022.24381	6.368302837	1.93125E-10
HouseHold Head Sex	-34512.92271	-8.378510202	5.52606E-17
Household Head Age	272.749464	2.367074312	0.017933892
Household Marital Status Married	48787.04835	7.771704559	7.9212E-15
Household Marital Status Widowed	7904.230257	1.133249017	0.257116239
Household Marital Status Divorced/Separated	22631.11719	2.574605742	0.010038871
Household Marital Status Annulled	150779.6473	1.99460795	0.046092182
Household Head Elem Grad- HS Undergrad	-24267.3744	-7.203878224	5.95164E-13
Household Head HS Grad- College Undergrad	44470.09401	13.95115866	3.89469E-44
Household Head College Grad- Above	277989.4313	69.21605395	0.000
Government	44437.43385	7.445715477	9.82847E-14
Worked for Private or Household	-58952.56419	-13.53804698	1.14317E-41
Self-employed	-43168.14748	-11.07148861	1.89089E-28
Employer in own family business	83565.9888	14.2493136	5.81201E-46
Work without pay in own business	-49185.66466	-3.153298765	0.001615514
Extended Family	12546.37361	4.115176371	3.87629E-05
Has two or more non relatives	32598.04048	1.675045018	0.093932929
Total Number of Family members	41686.21382	36.18086808	3.0269E-282
Members with age less than 5 year old	-54365.46952	-23.4162182	1.7692E-120
Members with age 5 - 17 years old	-46241.55038	-31.98534721	8.697E-222
Total number of family members employed	27886.84979	19.13206114	3.05875E-81

#### 4.3 Prescriptive

From the results of predictive analysis on drivers of income in households, some prescriptive analyses can be derived. Interestingly, in terms of education levels, it is evident that having a college degree and

above will more likely increase one's capacity to earn more income as compared to other reference groups. Similarly, this result is reechoed by studies from other neighboring countries as reported such as Singapore, India, Vietnam and Thailand (Calderone, Sadhu, Fiala, Sarr, & Mulaj, 2018; OECD, 2010; Tran, Tran, Tran, & Nguyen, 2018). As education brings significant influence on income levels, it relates to a lesser probability of belonging to a lower-class income. The model resonates this result and it calls for possible projects relating to it as strengthening our education system and making it more available for the people will positively result to a movement in the capacity for income generation thereby affecting income classification in the future.

In addition, employment status also portrays a significant effect as working in a government and being an employer in a family or own business significantly affect a household heads' income generation as compared to other reference groups, more so with being unemployed. Working for the government has been one of the pressing and demanding levels of employment that may decrease a household's probability to belong to a lower class income (Villejo et al., 2014). Consequently, a significant growth rate of budget for personal services in the government as well as the implementation of salary standardization law is encouraged. Similarly, in Singapore for example, job security has become an important consideration for job seekers where being a civil servant means having a job that is guaranteed to be rather stable (Smith, 2019).

This paper also explored the possibility of a particular household to improve their level of income cluster in relation to expenses thereby moving one step higher, especially the poor bracket to lower middle-income class. We identified the average family income of cluster 1, and 2 as decision variable and the projected income value, respectively for the cluster 1 to move to cluster 2 group. We also identified the top seven (7) variables where Filipino family spends most.

Applying formulas and constraints using MS Excel Solver (Winston, 2011) to possibly generate an effect on the current income value of cluster 1, the solver reported an infeasible result. This means that regardless of lowering the value of the identified constraints on expenditures, it still does not significantly affect the value of the income to go higher (Ismail & Tendot Abu Bakar, 2012). However, solver suggested that for the Cluster 1 to advance in next income ladder, the average income should be increased to a greater value or the other sources of income should also be greater than the current income average. As revealed from literatures, most Filipinos at the lower income bracket spend most of their hard-earned money on food and necessities (Burger Chakraborty, Sahakian, Rani, Shenoy, & Erkman, 2016), and regardless of how small the income they received, the spending behavior have always been higher than current income they have (Ulep & Dela Cruz, 2015). Filipinos also have a behavior to spend on things that are not their immediate need (Schanzenbach, Nunn, Bauer, & Mumford, 2016; Te et al., 2017), and to spend spontaneously thinking that money could be earned in some other way (Pew Research Center, 2016). Consequently, this projects a compelling need for financial management skills that would somehow guide Filipino household on spending smartly (Hunter & Adal, 2017).

In comparison with Singapore, they reported that they exhibit real growth in terms of average household income from work per household member based on cumulative data from 2013 to 2018 (Singapore, 2018). Along this line, their expenditure data also shows an increasing trend as it grows relative to the spurt of income (Singapore, 2019). While income grows, households also tend to alter their spending patterns rapidly (Jappelli & Pistaferri, 2010). Apparently, household spending is considered a core driving force of economic growth as it represents more than half of GDP in most developed economies (Chai, Rohde, & Silber, 2015). In this case, increasing the capacity to generate income should be improved as it gives a long-term benefit as compared to just cutting down expenses. The ability to build wealth is not all about cutting expenses to save money (Loudenback, 2019). Accordingly, cutting on expenses will hurt the economy in the short run due to the decrease in demand and in return, government money to be propelled into the economy will also be less (Romer, 2011). As a result, a focus on increasing income thereby increasing demand should also be considered. As such, this paper is encouraging the government to develop policies that may open opportunities for households to generate income through entrepreneurial, employment and educational opportunities.



## 5. Conclusions & Recommendations

The study was able to present variables that may be considered in the policy development and strengthening of existing government programs by revisiting policies and ensuring its strict compliance, as an intervention to raising the quality of life of Filipinos. Two significant factors based on the predictive model of income emerged: education and employment. As education may increase the likelihood of full-time employment, thereby giving people access to high incomes, low level of education deprives people's capacity to overcome economic challenges (Ross & Mirowsky, 2003). In effect, education should remain a priority of the government by holistically targeting students' and teachers' welfare that shall anchor developments in the system of schools in the country. Moreover, as instinctual as it can be, employment may drive households' quality of life as having a good and decent job capacitate members ability to provide for the household. While government policies are in place for entrepreneurs, it is also worth venturing into new and radical ways for capitalization in order to open an alternative source of financing to combat existing challenges faced by micro, small and medium enterprises (Aldaba, 2012). Moreover, programs that will anchor sufficient available jobs should also be pursued continuously to decrease the rate of unemployment in the country. As households tend to diversify when they become more affluent, policies or programs that shall boost households' capacity to generate more income from different sources is also encouraged.

However, this study is not without limitations. While it provided evidence on variables that may significantly affect the living conditions of Philippine households, this study remains to be exploratory in nature by applying data mining techniques in determining a predictive model for income using household head and individual characteristics and descriptively presenting expenditure patterns of families. It is also the interest of this study that other household variables based on the data be checked as other combination of factors from the FIES data set may yield a better model with higher predictive power towards income. Also, the prediction of income and expenses did not consider any underlying economic factors such change in prices and inflation rates. As such, the prediction may have a significant difference from the actual result. Moreover, the use of historical data of FIES before 2015, if and whenever available, may also be done for comparison and for richer data analysis. Nevertheless, results relating to determinants of income need to be given attention while other factors can be added for further studies to create a more robust model in the future.

## References

- Agag, G., & El-masry, A. A. (2016). Computers in Human Behavior Understanding consumer intention to participate in online travel community and effects on consumer intention to purchase travel online and WOM : An integration of innovation diffusion theory and TAM with trust. *Computers in Human Behavior*, 60, 97–111. <https://doi.org/10.1016/j.chb.2016.02.038>
- Albert, J. R. G., Santos, A. G. F., & Vizmanos, J. F. V. (2018). Profile and Determinants of the Middle-Income Class in the Philippines. *Discussion Papers*. Retrieved from [https://ideas.repec.org/p/phd/dpaper/dp\\_2018-20.html](https://ideas.repec.org/p/phd/dpaper/dp_2018-20.html)
- Aldaba, R. M. (2012). SME Development: Narrowing the Development Gap in the ASEAN Economic Community. *Philippine Journal of Development*, XXXIX(71).
- Babin, B. J., & Harris, E. G. (2016). *Consumer Behavior*. Cengage Learning (7th ed.). Boston, MA 02210.
- Burger Chakraborty, L., Sahakian, M., Rani, U., Shenoy, M., & Erkman, S. (2016). Urban Food Consumption in Metro Manila: Interdisciplinary Approaches Towards Apprehending Practices, Patterns, and Impacts. *Journal of Industrial Ecology*, 20(3), 559–570. <https://doi.org/10.1111/jiec.12402>
- Calderone, M., Sadhu, S., Fiala, N., Sarr, L., & Mulaj, F. (2018). Financial education and savings behavior: Evidence from a randomized experiment among low-income clients of branchless banking in India. *Economic Development and Cultural Change*, 66(4), 793–825. <https://doi.org/10.1086/697413>
- Chai, A., Rohde, N., & Silber, J. (2015). Measuring the diversity of household spending patterns. *Journal of Economic Surveys*, 29(3), 423–440. <https://doi.org/10.1111/joes.12066>
- Cruz, M. G. Dela. (2013). Predictive Models for Household Spending Behavior in Shopping Malls in SOCCSKSARGEN, Philippines. *SOUTHEAST ASIAN INTERDISCIPLINARY RESEARCH JOURNAL*, 2(1), 19–53.

- Dai, J., Sperlich, S., & Zucchini, W. (2012). Estimating and Predicting Household Expenditures and Income Distributions. *SSRN Electronic Journal*, 41(0), 1–26. <https://doi.org/10.2139/ssrn.1965409>
- Erieta, C. N., & Fabian, E. (2009). A Documentation of the Philippines' Family Income and Expenditure Survey. *Philippine Institute for Development Studies (PIDS)*, 39.
- Froemelt, A., Dürrenmatt, D. J., & Hellweg, S. (2018). Using Data Mining to Assess Environmental Impacts of Household Consumption Behaviors. *Environmental Science and Technology*, 52(15), 8467–8478. <https://doi.org/10.1021/acs.est.8b01452>
- Gartner. (2016). *2017 Planning Guide for Data and Analytics*.
- Gbadamosi, A. (2018). *YOUNG CONSUMER BEHAVIOUR A Research Companion*. (A. Gbadamosi, Ed.). 711 Third Avenue, New York, NY 10017.
- HOA, T. VAN. (2005). *ADVANCES IN HOUSEHOLD ECONOMICS, CONSUMER BEHAVIOUR AND ECONOMIC POLICY*. (T. VAN HOA, Ed.), Taylor & Francis. Routledge 2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN.
- Hsieh, N. C., & Chu, K. N. (2009). Enhancing consumer behavior analysis by data mining techniques. *International Journal of Information and Management Sciences*, 20(1), 39–53.
- Hunter, M., & Adal, L. (2017). Follow the money: The Philippines. *Nature Physics*, pp. 69–70. <https://doi.org/10.1038/nphys221>
- Ismail, R., & Tendot Abu Bakar, N. (2012). The relationship between income, expenditure and household savings in Peninsular Malaysia. *Malaysian Journal of Consumer and Family Economics*, 15(1), 168–189.
- Jappelli, T., & Pistaferri, L. (2010). The Consumption Response to Income Changes. *Annual Review of Economics*, 2(1), 479–506. <https://doi.org/10.1146/annurev.economics.050708.142933>
- Karp, G. (2008). *Living Rich by Spending Smart How to Get More of What You Really Want*. New Jersey, USA: FT Press.
- Karp, G. (2009). *The 1-2-3 Money Plan\_ The Three Most Important Steps to Saving and Spending Smart-FT Press (2009)*. United States of America: Pearson Education Limited.
- Leonard, K. (2018). The Relationship Between Income & Expenditure.
- Loudenback, T. (2019). Increasing income, not cutting expenses, is key to building wealth - Business Insider.
- Maison, D. (2019). *Qualitative Marketing Research Understanding Consumer Behaviour*. Taylor & Francis. 711 Third Avenue, New York, NY 10017: Routledge. <https://doi.org/10.1017/CBO9781107415324.004>
- NEDA. (2016). Ambisyon Natin 2040. Retrieved from <http://2040.neda.gov.ph/about-ambisyon-natin-2040/>
- OECD. (2010). Singapore: Rapid Improvement Followed by Strong Performance (pp. 159–176). <https://doi.org/10.1787/9789264096660-8-en>
- Pew Research Center. (2016). Household Expenditures and Income.
- Philippine Statistics Authority. (2015). Final Report of the 2015 Family Income and Expenditure Survey of the Philippines. Retrieved from [https://psa.gov.ph/sites/default/files/FIES\\_2015\\_Final\\_Report.pdf](https://psa.gov.ph/sites/default/files/FIES_2015_Final_Report.pdf)
- Romer, C. (2011). Raising Taxes vs. Cutting Spending - Economic View - The New York Times.
- Ross, C. E., & Mirowsky, J. (2003). Social Structure and Psychological Functioning: Distress, Perceived Control, and Trust. *Handbook of Social Psychology*, 411–447.
- Schanzenbach, D. W., Nunn, R., Bauer, L., & Mumford, M. (2016). Where Does All the Money Go: Shifts in Household Spending Over the Past 30 Years.
- Singapore, D. of S. (2018). *Singapore Key Household Income Trends 2018*.
- Singapore, D. of S. (2019). *Report on the Household Expenditure Survey 2017/18*.
- Smith, L. M. (2019). Singapore workers now prioritise job security over career development - and Gen Zs prefer exciting careers over high pay, Business Insider - Business Insider Singapore.
- Te, S. R., Japson, F. A., & Velecina, A. J. (2017). *Consumer Behavior Among Filipinos : A Quantitative Study About Vanity , Materialism , and Gender Differences*.
- Tran, T. A., Tran, T. Q., Tran, N. T., & Nguyen, H. T. (2018). The role of education in the livelihood of households in the Northwest region, Vietnam. *Educational Research for Policy and Practice*, (November). <https://doi.org/10.1007/s10671-018-9242-6>
- Ulep, V., & Dela Cruz, N. (2015). Analysis of Out-of-Pocket Expenditures in the Philippines. *Philippine Journal of Development*, XL(72).
- Villejo, S. J., Enriquez, M. T., Melendres, M. J., Tan, D. E., & Cayton, P. J. (2014). Determinants of Income Class in Philippine Households : Evidence from the Family Income and Expenditure Survey 2009. *The Philippine Statistician*, 63(2), 87–104.
- Winston, W. L. (2011). *Microsoft Excel 2010 Data Analysis and Business Modeling*. Office. <https://doi.org/10.1007/s00339-004-2994-2>