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Financial Behavior Analyses: Engel's Law in the Modern Domestic Economy of the City of Goma

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Summary

This research examines the financial behavior of households in Goma, applying Engel's Law. This states that the share of income dedicated to food decreases as income increases, thus freeing resources for other expenses. The results show that, in Goma, households follow this dynamic. As income increases, the proportion of the budget for food decreases, allowing for increased spending on education and other priorities. Notably, education spending often increases at the expense of housing spending, indicating a priority for education over immediate material comfort. Household size also influences housing expenditure per person, illustrating economies of scale where costs are spread across more members. This observation is consistent with Engel's Law, which explores the relationship between household size and individual spending. The results also show a positive coefficient between income and savings, suggesting that higher-income households save more, which is consistent with Engel's Law. In contrast, a negative coefficient between consumption and saving indicates that increased consumer spending reduces saving capacity, aligned with Engel's principles.

Key-words: Finance, Financial behavior, DR-Congo, domestic economy, household revenue

1. Introduction

Rational households mainly use their disposable income for consumption or savings. When its income is insufficient to finance an investment, a household can resort to its savings and/or loans from a bank. Each household can alternate between periods of need and financial capacity [1], [2]. This financial behavior can be modified from one household to another following several economic levers linked to current realities, etc.

This is for example, on the financial behavior of households in the face of climate change [3]. From an economic point of view, the best way for a household to respond to climate change is to change its financial behavior [4], [5]. It is households that suffer the brunt of climate impacts in their daily lives [6], [7], [8]. And finance not only contributes to improving the standard of living (and therefore the resilience) of households, but can also contribute to the fight against climate change. The behavioral change is mainly linked to savings and credit. The mobilization of savings in rural areas, whether by Tontine, by microfinance institutions or more recently by VOAMAMI, makes it possible to obtain loan capital. This fund represents the prerequisite for

credit which allows households to make investments. Thanks to this mobilization of savings, households can generate IGA (Income Generating Activities) and thus better cope with climate change [9]. Amina Merah directs financial behavior towards household expenses with the objective of econometric analysis of the evolution of Algerian household budgets, on cross-sections [10]. The results show a modification of Engel's laws for the Algerian case. Applying these laws to households, the study reveals changes in Engel's classification, particularly regarding housing and medical expenses.

The model of financial behavior suggested by [11], [12], presents two advances compared to the macroeconomic models already developed in France. It breaks down the financial assets of households into two poles: yield assets, specific to wealthy categories and, second pole, currency and savings account books, universally distributed regardless of social categories [8], [13], [14], [15], [16]. The presence of this duality makes it possible to underline the impact on the overall consumption function as well as on the annual creation of yield assets of an indicator of income distribution between more or less fortunate groups.

In the context of financial behavior, bad example comes from the top when it comes to affecting the flow of household savings [17], [18], [19], [20]. Keynes places great emphasis on financial activities such as money, deposits and securities in his 1935 General Theory. The majority of investments come from businesses, while household acquisitions of housing are only briefly mentioned. This reduction of household savings to their financial savings alone is obviously abusive at a time when ongoing urbanization should already lead to significant investment spending on housing on the part of individuals [21], [22], [23], [24], [25].

Even if poor management of household finances, income and job losses are expected to have detrimental effects on the social aspect of the household, Jensen and Smith (1990); Weiss and Willis (1997); Charles and Stephens (2004); Doiron and Mendolia (2012) cited by EL AZZABI M (2021) [26].

This work has a useful role, to kindly clarify the behavior not only economic but also financial of the household of a province like that of North Kivu in general, the city of Gomma in particular, seen, over decades of insecurity affects its economic aspect, whatever its economic and financial opportunities. The big questions that run through the researcher's brain are to identify the important sources of this household's wealth, of course to cover all of its household consumption expenses and to guarantee future investments via its marginal propensity to save which is significant. In other words, how does Engel's law apply to the financial behavior of modern households in the city of Goma? In other words: What are the main expenditure items for modern households in Goma and how does their distribution change with income? How do income levels influence the consumption choices of households in Goma, particularly regarding food versus non-food spending? Are there significant differences in financial behaviors between different segments of the population (e.g., by income class, household size, etc.) in Goma?

In this part of the work, we will try to explain the different theories on how Engel's law influences household finance (the function of a household's income, expenditure and consumption and especially the savings function of a household), the financial behavior of households and finally the savings and investments of households.

Engel's law is an empirical law proposed by Ernst Engel, a German statistician, in 1857. According to this law, even if food expenditure in absolute value increases, the share of income allocated to food expenditure decreases. In other words, the proportion of income allocated to food expenditure [1]is lowered the higher the income [27].

Since the end of the 18th century, a large number of studies have been carried out in this area, and they have succeeded in highlighting the role of income, an economic factor long neglected or considered secondary by political economy theorists [2], [28], [29], [30]. Stigler (x) notes that, by examining the relationships between the empirical approach to consumer behavior e.g. through direct observation of income and the theoretical approach by the theory of utility maximization: quantitative analysis of the effects of income on consumer behavior was developed largely seventy years before income became an important variable in formal theory, while formal theory of demand was developed forty years before empirical work on demand curves has only begun in earnest[31].

The study of Coline Ferrant and Marie Plessz provides a description of purchases and the amounts of household expenditure [32] or consumption [9], [33], [34], socio-demographic data and adjusted data on household income. In accordance with Engel's law, which predicts a decrease in the share of food as income rises, this budgetary coefficient is the lowest among executives4 (18.7%). However, it is higher among craftsmen and business leaders (19.4%). The budgetary coefficient of workers and employees is very close (20.2% and 19.8%), lower than that of retirees (22.9%) or farmers (23.7%). Engel's law is difficult to account for such variations, although they are moderate. On the other hand, people living in wealthier households consume greater quantities of all food products at home, the level being almost proportional to income [35].

Contemporary research has revealed controversial laws about Engel's law. According to Engel, the proportion of total food expenditure decreases as income increases. However, there are delays and sudden changes in this decline first. Maurice Halbwachs, in a more in-depth study of food expenditure, notes that not only (as Engel said) does the absolute figure of this expenditure increase, but that the nature of the foods consumed (the proportion of different foods) changes, and in what direction [36]. Those to whom public opinion grants greater value replace others. The diets of upper and lower workers differ considerably. It is possible to demonstrate, by comparing different menus, that while the diet of the poorest workers is monotonous and irregular, that of the better-situated workers shows more and more concern for variety and “ordering” meals. However, the expenditure figures do not show the progress made, because the same sum is used with economy and intelligence to offer satisfactions both more numerous and more varied,[37], [38].

Disposable income adds several types of income (earned income, benefits, property income) [39], from which taxes and contributions are deducted. In total, the account decomposition method distinguishes 33 components of income (excluding private transfers between households, considered below). The weight of the different components in total income varies

[1] Here Income is used in the sense of the overall household budget and finally to cover the latter's expenses. It is the sum of the income of all the occupants of the same dwelling, without these people necessarily being linked by family ties. Salaries received, property income (interest, dividends, land income, etc.), income from market production and social benefits constitute the majority of household resources.

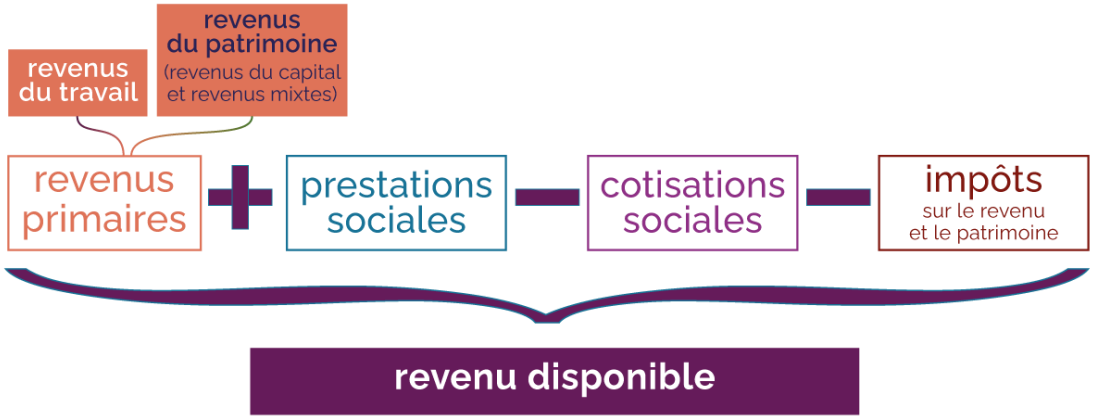
depending on the category considered. For greater readability, the analysis will distinguish three main components of income:

- Net income from activity includes net salaries (gross salaries less all employee contributions, including those paid to supplementary health insurance) and net income from individual entrepreneurship. They represent 60% of disposable income, with 54% for net salaries [40].
- Income from assets which includes on the one hand financial income [41], which include net interest received, distributed income from companies (including dividends), other investment income and income from land and deposits, and on the other hand real estate income, which includes land income received by landlords and the income attributed to owners' rents. 21% of disposable income comes from property income, with 7% for financial income and 14% for real estate income.
- Net transfers received which within it include benefits [42]in cash in positive and current taxes on income and wealth in negative, as well as the rest of other current transfers.2e. 32% of disposable income is allocated to social benefits. Old-age and unemployment benefits, daily allowances for illness, maternity, paternity, disability and death, family benefits and social minima are all included in this category. Current taxes (income tax, wealth solidarity tax, housing tax, etc.) represent 14% of disposable income. Thus, 18% of net transfers are received.

Income from assets and transfers received [41], [42] are the most unevenly distributed components. The wealthier a household is, the greater the weight of income from assets and the less that of net transfers. For the wealthiest, those in the fifth quintile, wealth income represents a third of disposable income and net transfers received 5%. For the most modest, those in the first quintile, the weight of net transfers received (46%) is high, it is even slightly higher than that of net income from activity (45%). It is on the one hand family benefits and social minimums concentrated on the most modest, and on the other hand the progressive nature of taxes (notably the income tax scale), which explain these differences.

The share of income from assets also increases with age (it exceeds 30% for those over 60). They are mainly composed of imputed rents4 for the most modest categories, such as retired employees and workers, more financial income for retired executives and self-employed people. Among assets, net transfers received by workers and employees contribute a little more than 10% to their disposable income. On the other hand, executives receive fewer benefits than they pay in taxes, and the net transfers received therefore contribute negatively to their disposable income (–9%).

In a few words Disposable income is defined as the share of income that remains available to households once they have received social benefits and paid direct taxes and social contributions. It can be formulated as follows [43]:



Here we are concerned with the change in household demand driven by a change in income, otherwise known as the income elasticity of demand. Income elasticity of demand [40], [44] evaluates the relationship between the evolution of consumers' real income and the evolution of the quantity of products demanded. It indicates how much the number of products demanded depends on the change in consumers' income, while all other parameters remain constant. The percentage change in quantity demanded [44], [45] compared to the percentage change in income is shown below, which means that it is the ratio between these two percentage changes.

We will use the demand functions defined in the Choice of resource consumer. When income increases from R0 to R1, the demand for good

$$\varepsilon_R^X = \frac{\frac{\Delta x}{x_0}}{\frac{\Delta R}{R_0}} \quad \text{Or } \Delta x = x_1 - x_0 \text{ And } \Delta R = R_1 - R_0$$

To avoid making the elasticity depend on R1, we consider infinitesimal variations in income, in other words $\Delta x \approx 0$

$$\varepsilon_R^X = \frac{\frac{\Delta x}{x_0}}{\frac{\Delta R}{R_0}} = \frac{\partial x}{\partial R}\frac{R}{x} \quad \text{Or } \frac{\partial x}{\partial R} \text{ is the derivative of the demand function with respect to income.}$$

A. THEORY OF HOUSEHOLD FINANCIAL BEHAVIOR

This will involve breaking down the financial assets of households, and consequently their financial savings, into two poles: yield assets, specific to wealthy categories and, second pole, currency and savings account books, widespread universally. Whatever the social categories. This duality makes it possible to highlight the influence on the overall consumption function and on the annual constitution of return assets of an indicator of income sharing between more or less well-off categories. The results obtained in certain studies [12], [46], show that a higher level of inflation with unchanged purchasing power of income does not cause, in the short term, a shift in the sharing between consumption and savings, it only induces a substitution, within financial savings, between yield assets and money. In other words, we find here effects close to Keynesian theses [47].

Financial assets [3], such as deposits, bonds, shares or shares of investment funds represent a significant part of the total wealth of households and, are a substantial source of income, either through the sale of these financial assets, or thanks to the accumulation of property income (interest and dividends). Pension rights are only included if they are fully funded and employment-related schemes, which can significantly affect comparability between countries. Short-term developments can generate more or less significant levels of risk (depending on the type of assets in the portfolio), and lead to a positive or negative variation in the financial wealth of households. The value of stocks, for example, may have greater volatility over the years. This indicator presents total household financial assets per capita, expressed in current US dollars and PPP (for GDP).[26].

The wealth of households and non-profit institutions serving households is calculated by dividing the total value of their assets (financial and non-financial) by the total value of their outstanding debts. Please note that the indicator presented here only takes into account the value of housing as non-financial assets. The assets and liabilities of this household net wealth include deposits, debt securities, loans, shares and units of investment funds, rights to insurance, pension and standardized guarantee schemes, financial derivative products, options on employee securities and other accounts payable and receivable. Total household net wealth is calculated as a percentage of their net disposable income [47].

However, financial investments cannot be financed by prior savings, because it arises from their assets. The new credits that are being examined are partly new "fake" credits from them which are used to finance repayments, as in the case of renegotiations.

The assumption is that durable goods that can be considered investments will be mainly affected by new consumer credits [21], [40]. However, consumption (durable and fungible goods) appears in jobs, a more complete version of this model involves the resource, not current savings, but RDB. This presentation then allows the breakdown of new credits between consumption and investment and the allocation of new consumer credits to the consumption aggregate itself.

2. Methodology

Research methodology refers to all of the approaches, techniques and tools used to conduct an investigation or study in a particular field, whether in the social sciences, natural sciences, human sciences, or others, academic or professional fields. It constitutes the methodological framework which guides the research process from the formulation of the problem to the analysis of the results and the drafting of conclusions.[10], [48]. Cluster sampling was useful in this research by subdividing the population of the city of Goma into groups or clusters (18 districts or clusters in total) and snowball sampling cluster by cluster in recruiting participants and identification of households using social networks to facilitate the data collection technique, namely Kobocollect. Once initial participants were recruited, they were asked to identify additional target households that met the study criteria. These new participants were recruited to join the study and then proceed to recruit others as well.

2.1. Data: nature and source

The data which is the subject of our study is purely primary, in other words, here from the direct population, collected using a Kobocollect research tool and the table below provides information on the variables used which were of interest to this research.

Table 1: Study variables

Model variables	Nature in the model	Wording	Expected consequences
Consumption	DV	Household consumption	
DepLog	DV	Household housing expenditure	
Epa	DV	Household savings	
Taille	IV	Household size	+
RevTot	IV	Total household income here from salary plus income here from other household activities	+
DepEdu	IV	Education expenditure of household members	-
DepSoci	IV	Household social expenditure	-
Age	IV	Age of household manager	+

Sources: Author's collection

It is important to emphasize that we used the Stata 18 software for the analysis and processing of the data, and to carry out the various model tests. We recall here that this study has to do with models such as:

$$Conso = f(\mathrm{Re}vTot, Epa, DepEdu, Teille, Age) = \alpha + \varpi_i \sum_{i=1}^{n} x_i + \varepsilon \quad (1)$$

This function represents the first Engel curve where consumption apart from the prices of goods on the market, it is a function of several other determinants which explain its variability for households in the city of Goma. Here Xi represents all the explanatory variables of the model as reported.

$$DepLog = f(\mathrm{Re}vTot, Conso, DepEdu, Teille, DepSoci, Age) = \alpha + \varpi_i \sum x_i + \varepsilon \quad (2)$$

While this first represents the first Engel curve, the second represents the second Engel curve where housing expenses apart from household income, it is a function of several other indicators which explain its variability for households in the city of Goma. Here Xi represent all the explanatory variables of this model as reported. And then the function of household savings in the city of Goma which, in one way or another explains the non-compliance with Engl's law for economic causes of households in the city of Goma and explained by a set of variables as below in function (3).

$$Epa = f(\mathrm{Re}vTot, Conso, DepEdu, Teille,) = \alpha + \varpi_i \sum_{i=1}^{n} x_i + \varepsilon \quad (3)$$

3. Results

In this sub-point, it is a question of analyzing financial behavior case of application of Engel's law in the economic life of the modern household in the city of Goma. The behavior of variable household differences in the face of any movement in household income such as household consumption, expenses related to housing and other inferior goods in the city of Goma.

3.1. Overall characteristics of the distribution

Descriptive statistics will give us a range of tools to summarize, analyze and interpret data. As part of our study, below is valuable information on the distribution, central tendency, dispersion of the variables as follows:

Table 2: General characteristics of our distribution

Variable	Obs	Mean	Std. Dev.	Min	Max
TailMe	988	7.159919	3.90629	1	74
Conso	1,031	260.0679	395.1113	5	3000
DepLog	977	888.958	6308.029	0	56000
Epa	932	807.2114	3923.218	0	25000
DepEdu	974	445.2423	2373.381	0	20000
DépenSoci	900	196.7844	1191.296	0	10000
RevTot	1,036	1594.873	5247.602	0	35000
Age	945	40.22222	11.32912	21	71

Source: author (our estimates under stata 18)

According to the table above, it is notable that all variables display general volatility, as evidenced by the standard deviation (SD). The results of the table reveal an inequitable distribution of income within the population of the city of Goma, illustrated by an extremely significant level of dispersion. Some households survive on zero income, while others can receive amounts exceeding $35,000 per month. Consequently, the ways in which they use their income also vary substantially.

3.2. Study of correlation coefficients and test of multicollinearity

The simple correlation matrix between the variables below reveals a close link between the dependent variable (household consumption) and the explanatory variables, given their significant degree of association, particularly with the level of income, reaching up to at 65.83% with a correlation coefficient of 0.8114, which is significant.

Table 3: Correlation matrix with significance coefficients

	TailMe	Conso	DepLog	Epa	DepEdu	DépenS~i	RevTot
TailMe	1.0000						
Conso	0.0320 0.3149	1.0000					
DepLog	-0.1327 0.0000	0.2601 0.0000	1.0000				
Epa	-0.0372 0.2675	0.7213 0.0000	0.3805 0.0000	1.0000			
DepEdu	0.1575 0.0000	0.4013 0.0000	0.5522 0.0000	0.1437 0.0000	1.0000		
DépenSoci	-0.1174 0.0006	0.2839 0.0000	0.9968 0.0000	0.4097 0.0000	0.5705 0.0000	1.0000	
RevTot	0.0032 0.9200	0.8114 0.0000	0.2148 0.0000	0.9222 0.0000	0.2469 0.0000	0.2387 0.0000	1.0000
Age	0.0032 0.9243	-0.0119 0.7153	0.0372 0.2680	0.0361 0.2926	-0.0104 0.7561	0.0398 0.2551	0.0226 0.4869

Source: author (our estimates on stata 18)[2]

[2] An age coefficient of -1.209, significant at 10%, suggests that in Goma, as individuals age, their consumption decreases significantly. Although this relationship is significant, it is important to consider that the 10% significance level indicates moderate evidence for this relationship.

[3]A savings coefficient equal to -0.017 means that, in Goma, an increase in savings leads to a slight decrease in household consumption, and this inverse relationship is significant and therefore likely real.The coefficient of -0.017 suggests that for each additional monetary unit saved, household consumption decreases by 0.017 monetary units. In other words, there is a relatively small reduction in consumption for each increase in one unit of savings.

On the other hand, we note a probable multicollinearity between certain variables which sanctions the omission of certain variables in the models as you will see in table 4 below.

3.3. Model estimation corrected

For a comprehensive evaluation of Engel curves, the rigorous application of the Ordinary Least Squares Method (OLMS) proved crucial for minimizing errors in the proposed models. It should be remembered that the least squares method (LSM) is a sophisticated statistical technique used to accurately estimate the coefficients of a linear regression model. The fundamental objective of this method is to minimize the sum of the squares of the residuals, that is to say the differences between the observed values and those predicted by the model. The detailed results of the model estimation using the ordinary least squares method are presented below in Table 4.

Table 4: Estimated models

VARIABLES	(1) Consumption	(3) Epa	(4) DepLog	(5) DepLog
RevTot	0.066***	0.686***	-0.056***	-0.056***
	(0.004)	(0.014)	(0.006)	(0.006)
Consumption		-0.345*	0.365***	0.365***
		(0.197)	(0.087)	(0.087)
Epa	-0.017***			
	(0.006)			
DepEdu	0.036***	-0.138***	-0.054***	-0.054***
	(0.004)	(0.021)	(0.010)	(0.010)
TailMe	0.136	-43.247***	-8.275*	-8.275*
	(2.515)	(14.041)	(4.601)	(4.601)
DepenSoci			5,561***	5,561***
			(0.020)	(0.020)
Age	-1.209*		-1.019	-1.019
	(0.716)		(1,662)	(1,662)
Constant	203,511***	73.061	-48.333	-48.333
	(34,650)	(111,654)	(78,293)	(78,293)
Comments	772	844	737	737
R-squared	0.705	0.893	0.994	0.994

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

The analysis of the Snedecor test (or F test), with a value extremely close to zero (0.0000), reveals that the model establishing the relationship between household consumption in the city of Goma and the different explanatory variables, such as total income and many others, as presented in Table 1, is statistically and globally significant. That is, there is very convincing evidence refuting the null hypothesis that all coefficients in the model are zero. This undoubtedly indicates that our explanatory variables (income, savings, etc.) have a significant effect on household consumption. In addition, 70.53% of the variance in household consumption is explained by the explanatory variables of our model (income, savings, education expenditure, household size and age). This result is promising because it means that

our model explains a large part of the variation observed in consumption, although 29.47% of the variance remains unexplained, probably due to other factors not included in the model or to random errors.

For a more scholarly exegesis of our model, it is wise to examine the singular coefficients of each explanatory variable, their respective p-values, as well as the residuals of the model, in order to verify the postulates of linear regression (such as the normality of the residuals, homoscedasticity, etc.). The student's t test is used to assess the significance of individual coefficients, and, in the context of our study, it reveals that the p-value associated with the t test, around 0.0000 (or very close to zero), for all variables explanatory explanations mentioned above, indicates that the coefficients are statistically significant at traditionally used confidence levels (such as 0.05 or 0.01). However, the influence of household size seems to be neglected due to the collinearity present between this variable and the age of the household head. Except age and level of savings which have a negative impact on household consumption in the city, the remaining variables are positively correlated with household consumption in the city of Goma.

As part of our housing expenditure model, the coefficients reveal complex and fascinating dynamics of economic behavior. Consider, for example, the coefficient of -0.056 associated with total income, a significant value that illuminates a paradoxical reality: the increase in total income seems to lead to a proportional decrease in housing expenses. This observation invites us to reflect on the very nature of prosperity: is it a reduction in essential material needs in favor of an expansion of economic and cultural horizons? In contrast, the increase in overall consumption, with its coefficient of 0.365, suggests a different logic: those who spend more to satisfy their current needs also tend to invest more in the living environment, perhaps in search of security or of social status. Thus, these coefficients are not only economic indicators, but revealers of profound social and existential choices, questioning the complex relationship between material comfort and human aspirations.

In the study of domestic expenses in Goma, eloquent observations reveal complex dynamics between educational choices, family structures and social commitments. An increase in educational investment, for example, is accompanied by a reduction in resources allocated to housing, suggesting a dilemma between education and material comfort. Similarly, larger households in Goma have lower housing expenditures per person, raising questions about economies of scale or divergent budgetary priorities. Furthermore, increased spending on social activities or social services seems to correlate with higher housing costs, potentially linked to a more expensive lifestyle. These findings thus reveal profound family choices, shedding light on the tension between individual aspirations and economic realities within the city.

The behavior of household savings in the city of Goma is based on a linear regression where different coefficients are assigned to various explanatory variables. A positive coefficient of total household income is noted, suggesting that household savings increase proportionally with their total income. This indicates that, all things being equal, a household with a higher income will tend to save more, which is consistent with classical economic intuition where increased financial capacity allows a portion of income to be set aside.

This negative coefficient of household consumption implies that when households spend more on immediate consumption, they have fewer resources available for saving, similarly a negative coefficient of household education spending indicates that an increase in spending on education

is linked to a reduction in household savings. This could be interpreted as prioritizing investment in the education of family members, often at the expense of short-term savings.

3.4. Other tests of the model

Tests for heteroscedasticity, normality, and kurtosis in an MMC model are essential to assess how well the model fits the data and to verify whether the underlying statistical assumptions are met. These tests help identify potential problems in the model specification, thereby improving the reliability of the econometric results obtained from the MMC model.

Table 5: Other model tests

Model	Hypothesis to test	Hypothesis testing	Test value (Chi2)	Probability
(1) Consumption	Heteroskedasticity	Breusch-Pagan-Godfrey	614.68	0.0000
	Normality	Skewness/ Kurtosis	30.57	0.0000
		Doornik Hansen	50442.226	0.0000
	Kurtosis	White	4.08	0.0433
(3) Epa	Heteroskedasticity	Breusch-Pagan-Godfrey	674.92	0.0000
	Normality	Skewness/ Kurtosis	29.71	0.0000
		Doornik Hansen	51413.76	0.0000
	Kurtosis	White	18.48	0.0000
(4) DepLog	Heteroskedasticity	Breusch-Pagan-Godfrey	682.5	0.0000
	Normality	Skewness/ Kurtosis	91.03	0.0000
		Doornik Hansen	57984.63	0.0000
	Kurtosis	White	8.21	0.0042

Source: Author (our estimates on stata 18)

The test for heteroskedasticity, normality of errors and kurtosis in these models is to ensure that the underlying assumptions of linear regression are met. These assumptions are crucial to the validity of the statistical inferences drawn from the model. The heteroscedasticity analysis of our model system accepts the hypothesis that the variance of model errors is heterogeneous for all models under experiment. The heteroskedasticity of the errors between household consumption and total income associated with other explanatory variables is explained by several factors, namely:

- Households with higher income (see Table 2) lead to greater variability in their consumption, because they have more possibilities of choice (leisure, luxury, savings, etc.). Thus, the variance in consumption increases with income for households in the city of Goma.
- Households in the city of Goma have very different consumption behaviors depending on their preferences, total income, household sizes, etc.
- Variables such as household size as it is in the models, education etc, influence consumption differently at different income levels.

The Skewness/Kurtosis error normality test and Doornik Hansen also accept the alternative hypothesis that the model residuals do not follow a normal distribution. In other words, the system of models above presents a significant level of asymmetry. When we say that the residuals of the model do not follow a normal law" in a model where housing expenses are the explained variable and income (associated with other explanatory variables) is one of the explanatory variables, this means that the prediction errors (residuals) of the model are not normally distributed. In more technical terms, this means that the distribution of residuals has characteristics that differ from those of the normal distribution.

4. Discussion

To contextualize these results in the light of Engel's laws, it is relevant to emphasize that the latter postulate a reduction in the share of income devoted to food as total income increases (See Tab.1), thus making it possible to free up resources for d other types of expenditure such as education, leisure or housing and these results are not far from those of [38]. In our analysis of household housing spending in Goma, we observe similar dynamics: an increase in education spending is accompanied by a decrease in housing spending, suggesting a deliberate decision to prioritize education over material comfort immediate, in accordance with the principles of Engel's laws [49].

Furthermore, household size appears to influence housing expenditure per person, a phenomenon that can be interpreted through the prism of economies of scale, where larger households spread housing costs across a larger number of members (Tab.2). This observation also aligns with the postulates of Engel's laws, which analyze the relationship between household size and spending per individual. The positive coefficient observed between household income and the level of savings indicates that households with higher income tend to save more (See Tab.3). This observation is consistent with Engel's Law, which posits that as income increases, the proportion of income devoted to savings may also increase [27], thus making it possible to plan for the future rather than spending immediately. The negative coefficient of consumption in explaining household saving suggests that an increase in consumption expenditure is associated with a decrease in saving (See Tab.4). This finding is consistent with the principles of Engel's Laws, where increased consumption can restrict households' ability to save, particularly when immediate needs take precedence over long-term financial planning.

Likewise, the negative coefficient indicating a decrease in savings when education expenditure increases can be interpreted in light of family choices. Families may prioritize their children's education, thereby investing in future human capital at the expense of immediate savings. This decision also reflects an adaptation to growing education needs, which can be a beneficial long-term investment despite a temporary reduction in savings.

In short, increased social spending appears to lead to higher housing costs, which could reflect a more complex or socially engaged lifestyle. This correlation highlights the economic and social choices of households in Goma, illustrating how the model's explanatory variables, such as income, savings, and specific expenditures, significantly influence consumption decisions.

5. Conclusion

The results of this study obtained from our system of linear regression models, with significant validation by the Snedecor test, demonstrate that explanatory variables such as income,

savings, education expenditure and others influence substantially the consumption choices of households in Goma for example. These results, corroborated by an explanation of 70.53% of the variance in household consumption, underline the importance of these factors in determining local economic behavior.

Putting these conclusions into perspective with Engel's law allows us to better understand these dynamics. Indeed, increased social spending seems to lead to higher housing costs, thus revealing complex economic and social choices within households. For example, the observation that education spending is correlated with lower savings reflects a trade-off between investing in future human capital and building immediate savings, a typical dynamic in developing economies development as in Goma.

These results highlight the challenges and priorities of households regarding educational and social aspirations, as well as the adaptations necessary to achieve a balance between financial security and personal development.

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