

# THE PRACTICE OF HOUSEHOLD EXPENDITURE IN UKRAINE: FACTOR ANALYSIS AND ESTIMATE

Anatoliy Sydorchuk<sup>1</sup>

**Abstract.** *The purpose* of the paper is research practice of household expenditure in Ukraine and factor analysis of the impact on ones. The indicators for estimating household expenditure allow finding how their financial stability has changed over ten years (from 2010 to 2020). *Methodology.* The results of the study were obtained after analysing the indicators of household expenditure (from 2010 to 2020). In the course of research, an analysis, synthesis as methods of theoretical knowledge of phenomena has been used. Comparisons and measurements are used as empirical methods for the conducted research. *Results* of the research showed that on average per month per household expenditure increased 3 times for the period 2010–2020. Despite this practice, no significant changes have taken place in their structure – about 90% of ones are spent on the consumption of goods and services. Proposed relative indicators for estimating household expenditure (Food cost ratio coefficient ( $C_{fe}$ ) and Engel's coefficient ( $C_e$ )) showed a decrease in their values in 2020 compared to 2010. Calculated linear functions of the dependence of household expenditure show the amount of their income had a greater impact on expenditure than the change in prices for goods and services. This indicates a deterioration in the financial stability of domestic households. *Practical implications.* For conducting research and substantiation of relevant conclusions, the indicators of household expenditure for ten years have been analyzed (from 2010 to 2020). *Value/originality.* The researched relative coefficients  $C_{fe}$  and  $C_e$  expand the methodological basis for estimating the financial stability of households through the prism of their expenditure.

**Key words:** household, expenditure, household expenditure, indicator, factor analysis.

**JEL Classification:** D14, G59

## 1. Introduction

Analysis of the composition and structure of household expenditure creates the preconditions for estimating their financial stability at the microeconomic level. That is: the financial condition of households improves with the reduction of the share of expenditures on food and non-alcoholic beverages and vice versa – to get worse with the growth of the share of expenditure on this group of goods. This conclusion is based on the regularity described by Ernst Engel (in 1857) and the functions of change in prices for goods, researched by Leo Tornquist (in 1936). In particular, an Engel describes how household expenditure on a good or service varies with household income; Tornquist, developing Engel's idea, proposed functions of dependence of demand for goods on income for three groups

of ones: (1) foodstuffs, (2) industrial products of standard consumer quality and (3) high-quality goods and services.

## 2. Indicators of household expenditure estimate

Analysing the existing approaches of domestic scientists, and methodologies for studying living conditions in households of the State Statistics Service of Ukraine, we conclude that there is almost unanimity in the interpretation of the essence of the concept of "household expenditure". For example, as "cash or other tangible assets (for example, personal subsidiary products) that have already been used by the household to meet personal or collective needs" (Kizyma, 2009); "the total amount of all money and wealth, which were spent in the course

*Corresponding author:*

<sup>1</sup> West Ukrainian National University, Ukraine

E-mail: [a.sydorchuk@tneu.edu.ua](mailto:a.sydorchuk@tneu.edu.ua)

ORCID: <https://orcid.org/0000-0003-0280-1285>

ResearcherID: <https://publons.com/researcher/2112983/anatoliy-a-sydorchuk/>

of households performing their economic functions" (Mocherny, 2002); "consist of money costs ... the value of food consumed by the household and donated by it to relatives and other persons ... the number of benefits and subsidies" (Zamora & Yarema, 2016); close to the positions of the above authors are (Yurchyshena, 2014), the team of authors of the textbook "Theory of Finance" (edited by Fedosov & Yuriy, 2010), defined ones.

These researches are based on the determination of household expenditures by the State Statistics Service of Ukraine, which determines ones as "aggregate household expenditure consist of the sum of consumer and non-consumer aggregate expenditures .... include actual cash expenditure, the number of benefits and non-cash subsidies" (The State Statistics Service of Ukraine, 1998). By sharing the position of the state public authority on the origin and classification of household expenditure, the authors have the opportunity to analyze their composition and structure and assess the dynamics of change over time.

After analysing the existing approaches, under households expenditure, we consider the money used by them to meet their own needs. In fact, it is a set of payments that a household makes to support its living.

Based on the methodology of the State Statistics Service, as part of household expenditure, there are:

(a) *consumer expenditure*: on the purchase of food and non-alcoholic beverages; alcoholic beverages, tobacco products; non-food goods and services (clothing and footwear, housing, water, electricity, gas and other fuels for current housing, health, transport, communications,

recreation and culture, education, restaurants and hotels, various goods and services);

(b) *non-consumer expenditure*: related to personal subsidiary farming, financial assistance to relatives and others, expenditures on real estate, construction, an overhaul of housing and out-buildings, acquisition of shares, certificates, currency, increase in deposits with banking institutions, alimony, taxes (except for personal income tax, fees, contributions, etc.), the amount of non-cash benefits and subsidies for housing and communal services, electricity and fuel, the amount of non-cash benefits for telephone, travel, transport, payment for goods and services on health care, tourist services, vouchers to recreation centres, etc. (The State Statistics Service of Ukraine, 1998).

The study of household expenditure estimates is based on indicators of their formation and structure, namely, the study of the share of expenditures of consumer and *non-consumer* parts. These indicators will be determined according to the State Statistics Service to study the financial stability of households at the microeconomic level per household per month.

Such indicators are given in table 1, in our opinion, are:

1) food expenditure ratio coefficient  $C_{fe}$  – calculation of the share of payments for food and non-alcoholic beverages in the total amount of household expenditure. Characterize the level of food expenditure in the total amount of household expenditure;

2) Engel's coefficient  $C_e$  – calculation of the share of payments for food and non-alcoholic beverages in the total household income. German statistician Ernst Engel theoretically researched changes in the structure of household expenditure depending on its income. Examining

Table 1  
**Indicators for estimating household expenditure**

Indicator	Calculation formula		Economic interpretation
Food cost ratio coefficient ( $C_{fe}$ )	$C_{fe} = Fe / He,$ where $Fe$ – the cost of food and non-alcoholic beverages per household per month, UAH $He$ – the amount of household expenditure per household per month, UAH	Characterize the level of food expenditures in the total amount of household expenditure	The higher indicators, the lower the financial condition of the household and the fewer opportunities it has to conduct its own financial policy
Engel's coefficient ( $C_e$ )	$C_e = Fe / Hi,$ where $Fe$ – the cost of food and non-alcoholic beverages per household per month, UAH $Hi$ – the amount of income per household per month, UAH	Characterize the level of food expenditures in the total amount of household income	

the budgets of 153 Belgian families (Britannica, 2022), the scientist concluded that the lower the household income, the greater the proportion of it spent on food (Chai & Moneta, 2010). This pattern works in the opposite way – the greater the household income, the smaller the proportion of it spent on food.

The dynamic of coefficients ( $C_{fe}$  or  $C_e$ ), in our opinion, characterize the practice of household expenditure through the prism of estimating its financial stability. Engel's law allows us to implement the conclusion in the field of household finance: with increasing household income, the share of its food expenditure should decrease, the share of non-food expenditures within consumer expenditure should change slightly, and the share of non-consumer expenditure (cultural, travel, luxury items, etc.) – to grow. Namely, the smaller part of household income or expenditure is spent on food expenditure, the more financial stability such ones.

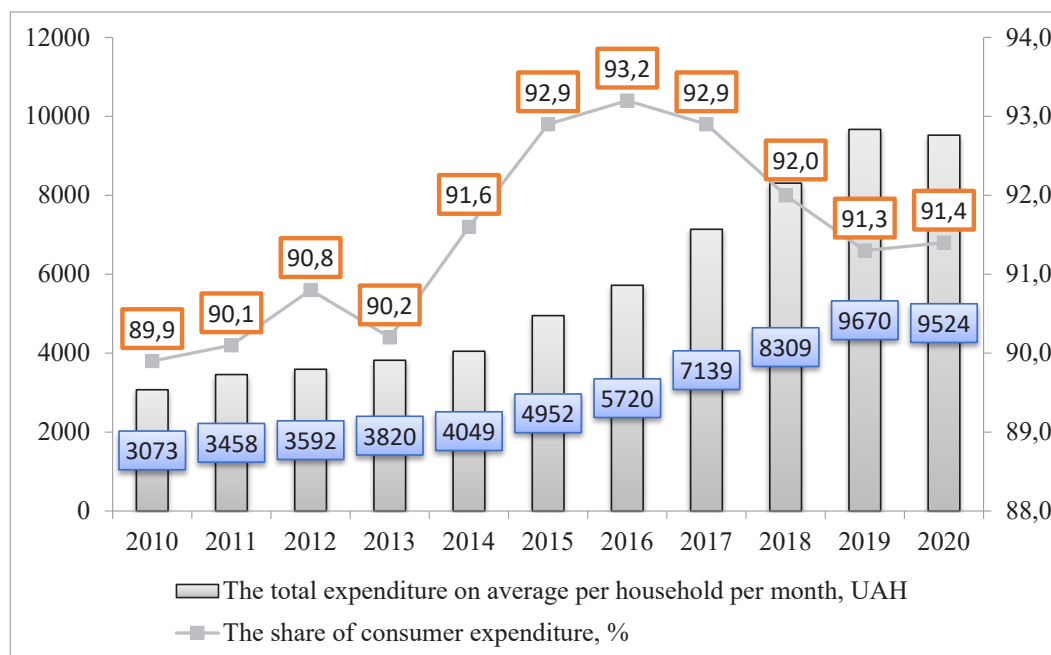
### 3. The practice of household expenditure in Ukraine in 2010–2020

Classification of the total expenditure of households on *consumer* and *non-consumer*, allows us to analyze the practice of their current financial support. Based on the reporting data

of the State Statistics Service of Ukraine, Figure 1 shows the dynamics of total expenditures per month on average per domestic household for 2010–2020. We also calculated the share of consumer expenditures in the structure of total household expenditures.

The data in Figure 1 show that on average per household per month, expenditure for the period 2010–2020 increased 3 times from 3 thousand UAH up to 9,5 thousand UAH. At the same time, no significant changes have taken place in their structure – about 90% of all expenditures of domestic households go to the consumption of goods and services. Moreover, this trend is clearly expressed in the growth of consumer expenditures. Namely, if in 2010 they accounted for 89% of total household expenditure, in 2020 more than 91%. Thus, despite the increase in household expenditure in absolute terms by more than three times, we cannot draw conclusions about the improvement of their financial stability based on the absolute values of indicators.

Since household *consumer expenditure* include the purchase of food and non-alcoholic beverages (based on the methodology of the State Statistics Service), in Table 2 we calculated the food cost ratio coefficient  $C_{fe}$  and Engel's coefficient  $C_e$ .



**Figure 1. Dynamic of the total expenditure on average per household per month and the share of consumer expenditure for 2010–2020**

Source: compiled by the author on the basis of data (The State Statistics Service of Ukraine, 2022)

Table 2

**Dynamic of coefficients  $C_{fe}$  and  $C_e$  on average per household per month for 2010–2020**

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Household expenditure, UAH, $H_e$	3073,3	3458,0	3592,1	3820,3	4048,9	4952,0	5720,4	7139,4	8308,6	9670,2	9523,6
	Annual change of the indicator +12,3%										
	The change in the indicator in 2020 compared to 2010 is 3,1 times										
Household income, UAH, $H_i$	3481,0	3853,9	4144,5	4470,5	4563,3	5231,7	6238,8	8165,2	9904,1	12118,5	12432,3
	Annual change of the indicator +13,9%										
	The change in the indicator in 2020 compared to 2010 is 3,57 times										
The cost of food and non-alcoholic beverages, UAH, $F_e$	1585,8	1774,0	1799,6	1914,0	2101,4	2629,5	2848,7	3419,8	3963,2	4506,3	4580,9
	Annual change of the indicator +11,4%										
	The change in the indicator in 2020 compared to 2010 is 2,89 times										
Food cost ratio coefficient ( $C_{fe}$ )	0,516	0,513	0,501	0,501	0,519	0,531	0,498	0,479	0,477	0,466	0,481
	Annual change of the indicator -0,7%										
	The change in the indicator in 2020 compared to 2010 is 0,93 times										
Engel's coefficient ( $C_e$ )	0,456	0,460	0,434	0,428	0,461	0,503	0,457	0,419	0,400	0,372	0,368
	Annual change of the indicator -1,9%										
	The change in the indicator in 2020 compared to 2010 is 0,81 times										

Source: compiled by the author on the basis of data (The State Statistics Service of Ukraine, 2022)

According to Table 2, for the period 2010–2020 we observe two opposite trends:

- an increase in household income and expenditure (3,57 times and 3,1 times, respectively);
- an annual reduction in the values of the coefficients  $C_{fe}$ , (by 0,7%) and (1,9%) despite the increase in household expenditure on food and non-alcoholic beverages.

Thus, based on the dynamics of the values of the coefficients  $C_{fe}$ ,  $C_e$  and despite the growth of both income and expenditure of domestic households, we conclude that at the microeconomic level, their financial stability in 2020 has deteriorated compared to 2010.

#### 4. Factor analysis of the impact on household expenditure

The estimation of household costs should be supplemented by factor analysis, namely, elements of the theory of correlation-regression analysis (Bahrushyn, 2009; Ryadno, Piskunova, Rybal'chenko, Hrusch, 2011; Andriyenko, 2004). It is the functional type of dependence that will allow us to determine the influence of certain internal or external factors  $x$  on the result indicator  $y$ . In the context of estimating household expenditure, which we define as a result indicator ( $y$ ), the factor indicators ( $x$ ) will be: household income (internal factor) and inflation (external factor).

The linear function of the dependence of household expenditure on the amount of their income is presented in Table 3.

A linear function of the dependence of changes in household expenditure depending on changes in income is as follows:

$$y = 0,74x + 711,46 \quad (1)$$

Thus, with an increase in household income by 1 UAH, expenditure increase by 0,74 UAH. Based on the data in table 3 determine for the period 2010–2020 the coefficient of elasticity ( $\varepsilon$ ) between the studied factors, which is equal to:

$$\varepsilon = a \frac{\bar{x}}{\bar{y}} = 0,74 \frac{6782}{5755} = 0,88 \quad (2)$$

This means that during the analysed period, with an increase in household income by 1%, their expenditures increased by 0,88%.

In our example, the total variance ( $\sigma_y^2$ ) deviation of the re-gression line from the mean ( $y - \bar{y}$ ) is equal to:

$$\sigma_y^2 = \frac{\sum (y - \bar{y})^2}{n} = \frac{62419555}{11} = 5674505 \quad (3)$$

The residual variance ( $\sigma_e^2$ ) which measures the effect of others other than the studied factor ( $x$ ) (household income) is equal to:

$$\sigma_e^2 = \frac{\sum (y - y_x)^2}{n} = \frac{785403}{11} = 71400 \quad (4)$$

Factor variance ( $\sigma_{y_x}^2$ ) is defined as the difference between total and residual variances:

$$\sigma_{y_x}^2 = \sigma_y^2 - \sigma_e^2 = 5674505 - 71400 = 5603105 \quad (5)$$

The coefficient of determination ( $R^2$ ) which characterizes that part of the variation of the resultant indicator ( $y$ ) which depends on the variation of the factorial indicator ( $x$ ) is equal to:

Table 3

**A linear function of the dependence of expenditure on the amount of income on average per household per month for 2010–2020**

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Household expenditure, UAH ( $y$ )	3073	3458	3592	3820	4049	4952	5720	7139	8309	9670	9524
Household income, UAH ( $x$ )	3481	3854	4145	4471	4563	5232	6239	8165	9904	12119	12432
Parameters of a linear function $n = 11; \Sigma x = 74605; \Sigma y = 63306;$ $\Sigma xy = 512239205; \Sigma x^2 = 617442683; (\bullet x)^2 = 5565906025$ $\bar{x} = 6782; \bar{y} = 5755$											
$a = \frac{n \Sigma xy - \Sigma x \Sigma y}{n \Sigma x^2 - (\Sigma x)^2} = \frac{11 * 512239205 - 74605 * 63306}{11 * 617442683 - 617442683} = 0,74$ $b = \frac{\Sigma y}{n} - \frac{a \Sigma x}{n} = \frac{63306 - 0,74 * 74605}{11} = 711,46$ $y = ax + b = 0,74 x + 711,46$											

Source: compiled by the author on the basis of data (The State Statistics Service of Ukraine, 2022)

$$R^2 = \frac{\sigma_{y_x}^2}{\sigma_y^2} = \frac{5603105}{5674505} = 0,987 \quad (6)$$

Thus, from 2010 to 2020, 98,7% of the variation in household expenditure was explained by variation in the level of their income. This means that the relationship between household income and expenditure is strong (close) and direct. The influence of other factors on the analyzed household expenditure is not significant.

When buying goods and services, household members choose a range of prices within which

they can pay. Any price fluctuation affects the consumer's decision to purchase or not to purchase the product. Therefore, we can say that consumer behaviour is influenced not only by his income but also by changes in the price of goods. If the level of income in relation to the household, as a subject of financial relations, is an internal factor that affects the level of current expenditure, the level of retail prices and goods and services – external.

Also, the strength and direction of the interdependence between the consumer price

Table 4

**A linear function of the dependence of the rate of change in household expenditure on changes in prices for goods and services for 2010–2020**

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The rate of change in household expenditure, % ( $y$ )	109	105	100	101	125	143	112	114	110	104	105
The rate of change in prices for goods and services, % ( $x$ )	114	113	105	106	108	124	116	124	115	116	99
Parameters of a linear function $n = 11; \Sigma x = 1240; \Sigma y = 1228; \Sigma xy = 138966; \Sigma x^2 = 140380; (\Sigma x^2) = 1537600$ $\bar{x} = 113; \bar{y} = 112$											
$a = \frac{n \Sigma xy - \Sigma x \Sigma y}{n \Sigma x^2 - (\Sigma x)^2} = \frac{11 * 138966 - 1240 * 1228}{11 * 140380 - 1537600} = 0,898$ $b = \frac{\Sigma y}{n} - \frac{a \Sigma x}{n} = \frac{1228 - 0,898 * 1240}{11} = 10,46$ $y = ax + b = 0,898 x + 10,46$											

Source: compiled by the author on the basis of data (The State Statistics Service of Ukraine, 2022)



index and household consumption expenditure for 2010–2020 will be researched through elements of regression analysis.

The researched linear dependence function is presented in Table 4.

A linear function of the dependence of changes in household expenditure depending on changes in prices for goods and services is as follows:

$$y = 0,898x + 10,46 \quad (7)$$

The coefficient of elasticity ( $\varepsilon$ ) between the studied factors is equal to:

$$\varepsilon = 0,898 \frac{113}{112} = 0,906 \quad (8)$$

This means that with a 1% increase in prices for goods and services, household expenditure increased by 0,906%.

According to formulas (3)–(6) we determine the strength and direction of interaction between the studied variables:

(a) the total variance ( $\sigma_y^2$ ) is equal to:

$$\sigma_y^2 = \frac{\sum(y - \bar{y})^2}{n} = \frac{1573}{11} = 143 \quad (9)$$

(b) the residual variance ( $\sigma_e^2$ ) is equal to:

$$\sigma_e^2 = \frac{\sum(y - y_x)^2}{n} = \frac{1091}{11} = 99 \quad (10)$$

(c) the factor variance ( $\sigma_{y_x}^2$ ) is equal to:

$$\sigma_{y_x}^2 = \sigma_y^2 - \sigma_e^2 = 143 - 99 = 44 \quad (11)$$

(d) the coefficient of determination ( $R^2$ ) is equal to:

$$R^2 = \frac{\sigma_{y_x}^2}{\sigma_y^2} = \frac{44}{143} = 0,306 \quad (12)$$

As we can see, from 2010 to 2020, 30,6% of the variation in household consumption expenditures was explained by the variation in the level of the consumer price index. This means that the link between prices and household spending is direct, but not strong.

Thus, comparing the values of the coefficients of determination, we conclude that the variation in the values of the result indicator – household

expenditure – is determined more by changes in the internal factor of household income (formula 6, +0,987) than changes in external factor of prices for goods and services (formula 12, + 0,306). This indicates that the nominal growth of income of domestic households (in 2020 compared to 2010 more than three times) was offset by the devaluation of the national currency. This is confirmed by the fact that households continue to consume almost 90% of their income and this trend remains unchanged during the analyzed period. Therefore, we have no reason to conclude that the financial stability of Ukrainian households has improved from 2010 to 2020.

## 5. Conclusions

1. Data (Figure 1 and Table 2) show that on average per household per month expenditure increased 3 times for the period 2010–2020. But, no significant changes have taken place in their structure – about 90% of all expenditure of households is spent on the consumption of goods and services. Thus, we cannot draw conclusions about the improvement of their financial stability based on the absolute values of indicators.

2. Our proposed relative indicators for estimating household expenditure (Table 1 and Table 2) – Food cost ratio coefficient ( $C_{fe}$ ) and Engel's coefficient ( $C_e$ ) – showed a decrease in their values in 2020 compared to 2010. This indicates a deterioration in the financial stability of domestic households.

3. The linear functions of the dependence of household expenditure show the amount of household income had a greater impact on their expenditure than the change in prices for goods and services (Table 3 and Table 4). This is confirmed by the coefficient of elasticity ( $\varepsilon$ ), the total variance ( $\sigma_y^2$ ), the residual variance ( $\sigma_e^2$ ), and the factor variance ( $\sigma_{y_x}^2$ ) calculated for the period 2010–2020.

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