"Modeling the Ukrainian consumption"

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BUSINESS PERSPECTIVES

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MODELING THE UKRAINIAN CONSUMPTION

Abstract

Consumption is a fundamental determinant of the economic success. Consumer spending is approximately 70 percent of the Gross domestic product (GDP). It is common to divide consumer spending into nondurables (clothing and food), durables ("large" goods, which are not purchased very often), and of course services (day care, banking, medical). The way to identify how the economy influences consumption is to look at specific economic cycles. At the top of the economy (when the economy is strong), people reaction is physically powerful, and consumers spend money freely. When the economy falters, confidence falls; consumers cut back on the spending and conserve their money. They stop buying, getting out of debt and focus on saving money. Understanding consumption is vital to the implementation and development of marketing strategies. The purpose for this empirical research is to review main indicators, which influence on consumption and identify methodological issues in need of resolution, and present possible approaches that may prove helpful in resolving those issues. The growth of interest in modeling consumption has led to behaviorally conceptual models in which selection dynamics play a vital role. The authors introduce two empirical models, which demonstrate correlation between macroeconomic indicators, social factors and Consumer price index (CPI). The first conceptual model shows that the CPI is a straighter measure than per capita Gross domestic product of the standard of living in Ukraine. By including a wide range of thousands of services and goods with the basket (fixed), the CPI can obtain a precise estimate of the cost of living. The second empirical model shows the interdependence of economic indicators (CPI, GDP, and Average wage index (AWI)) and social factors (gender, age, location).

Keywords	consumption, modeling, consumer behavior, GDP, Ukrainian consumer

JEL Classification	M31, O30, O35

INTRODUCTION

Ukrainian consumption is the value of services and goods purchased by Ukrainian consumer. Normally, consumption is the largest GDP element. Many scientists understand the economic performance mostly in terms of dynamics and consumption level. There are ten chapters of spending:

1) clothing and footwear;
2) food;
3) heating and energy;
4) housing;
5) transport;
6) health;
7) communication;
8) house furniture and appliances;
9) entertainment;
10) culture and schooling.

Ukrainian consumers in respect to their income have systematically different consumption structures. People with high income spend

more for each chapter. The rich people have both higher levels of savings and consumption. People with high income can usually buy high quality goods and services than the poor. This happens because they use different decision-making rules. At the same time, the poor people can pay sometimes more than the rich people to satisfy same needs.

Consumption depends on social groups, factors and their behavior. For durable goods such difference is very important, since they are used for very long time periods. Purchased non-durable goods and services that are usually not consumed before the deadline are a typical squander.

1. LITERATURE REVIEW

Consumer behavior has been always of huge interest to economists. The understanding of consumer behavior helps the economists to realize how customers select their products and brands; think and feel, also how the consumers are impacted by the economic situation, environment, the reference groups, and family, etc. Consumer's buying behavior is influenced by cultural, social, economic, psychological, and personal factors. Most of these factors are out of control.

The consumer is the study "of the processes involved when individuals or groups select, purchase, use, or order of products, ideas, experiences, or services to satisfy needs and desires" (Solomon, 1995).

In the economic context, "consumer" refers to patterns of total buying; post-purchase and pre-purchase activities has implications for repurchase and purchase (Foxall, 1987).

Engel et al. (1986) generated the term "consumer behavior" as "those acts of individuals directly involved in obtaining, using, and disposing of economic goods and services, including the decision processes that precede and determine these acts". Cheung et al. (2005) collected specific literature in order to categorize the contradictory and fragmented studies (published from 1994 until 2002, 351 papers), presenting an integrated framework of the motivating factors of consumer behavior. They thought that five factors clarify consumer behavior:

- individual characteristics;
- product or service characteristics;
- merchant;
- medium characteristics; and
- intermediaries' characteristics.

The economists were the primary to dominate model constructing, in the context of buying behavior. Economic theory holds that purchasing decisions are the effect of mostly conscious and "rational" economic calculations.

Thus, every buyer wants to spend the income on those products that will bring the most satisfaction according to his relative prices and tastes. The background of this vision can be traced back to Adam Smith (1776).

Marshall (1890) generated the classical and neoclassical theory in economics, into a refined theoretical framework. His theoretical work was about simplification assumptions and examination the effects of changes in single variables (e.g., price) holding all additional variables constant. For example, Muller (1954) wrote that only one-fourth of the consumers bought with any significant degree of deliberation. The Marshallian model ignores the main question of how brand and product preferences are created. Quite a few studies have recognized the impacts of price differentials on consumers' brand preferences; changes in product cues on demand variations; changes in price on demand sensitivity; and scarcity on consumer choice behavior amongst many others (Lewis et al., 1995).

Hirschman and Holbrook (1982) advocated that the purchase decision is a very small component in the constellation of proceedings involved in the consumption experience. Holbrook (1987) suggested that consumer researchers have to expand their view to study "all facets of the value potentially provided when some living organism acquires, uses, or disposes of any product that might achieve a goal, fulfill a need, or satisfy a want".

Overall, it is argued that the scientific study of consumer behavior is rapidly growing as re-

searchers identify and implement innovative transdisciplinary perspectives and techniques to recognize the nature of consumption behavior and purchase. This wider view attempts to research consumer behavior in the light of rapidly evolving values, lifestyles, priorities, and social contexts.

2. DATA AND METHODS

The data set of our research consists of detailed information on economic and social indicators, such as CPI, GDP, AWI and gender, age, location. This empirical research is based on the idea that we have the big set of data (three economic indicators, three social factors and a period from 1991 until 2016), and we want to analyze that set-in conditions of the relationships between the points in that data set.

This is a quantitative empirical research, which is connected with sampling macroeconomics problems as well as with questions pertaining to modelling qualitative variables. This research based on historical documents, journal articles and corporate annual reports. Research mainly applies statistical techniques (regression statistics, dispersion analysis) to data drawn from commercial and noncommercial databases.

3. RESULTS

3.1. Model 1

Consumption has an immediate impact on GDP. Rise of consumption increase GDP by the identical amount, other things equal. Current income (GDP) is a significant determinant of consumption, the increase of income will be followed by a further rise in consumption: a positive feedback loop has been triggered between consumption and income. An autonomous increase of consumption, if at the same level of income, would reduce savings, but the positive loop just described ("Keynesian multiplier") will cause an increase of income level with a positive impact on future savings. If directed to goods and services produced abroad, an increase of consumption will immediately push up imports, while a similar indirect effect will result from consuming domestic products requiring foreign raw materials, energy, semi-manufactured goods.

Table 1. Data variables (economic and social indicators)

Source: The State Statistics Service of Ukraine (2016).

y	x_1	x_2	x_3	x_4	x_6	x_9	x_{11}	x_{14}
281.7	124.48	37.009	35,118.8	51,728.4	23,792.3	12,668.1	33,810.6	6,961.1
139.7	151.51	44.559	34,767.9	51,297.1	23,591.6	12,416.7	33,569.1	7,059.0
110.1	165.81	50.152	34,387.5	50,818.4	23,366.2	12,124.4	33,394.8	7,052.8
120.0	176.09	41.883	34,048.2	50,370.8	23,163.5	11,823.0	33,322.4	7,026.6
119.2	218.88	31.581	33,702.1	49,918.1	22,963.4	11,469.7	33,437.2	6,901.6
125.8	296.26	31.262	33,338.6	49,429.8	22,754.7	11,116.0	33,515.1	6,818.9
106.1	378.45	38.009	32,951.7	48,923.2	22,530.4	10,740.7	33,446.3	6,844.0
99.4	442.91	42.393	32,574.4	48,457.1	22,316.3	10,307.0	33,312.4	6,978.6
108.2	372.72	50.133	32,328.4	48,003.5	22,112.5	9,878.6	33,060.2	7,193.4
112.3	524.14	64.888	32,146.4	47,622.4	21,926.8	9,503.3	32,826.5	7,369.3
110.3	735.57	86.183	32,009.3	47,280.8	21,754.0	9,129.2	32,603.5	7,507.2
111.6	928.81	107.753	31,877.7	46,929.5	21,574.7	8,802.0	32,417.4	7,567.1
116.6	1,197.91	142.719	31,777.4	46,646.0	21,434.7	8,536.1	32,256.2	7,603.1
122.3	1,573.99	180.116	31,668.8	46,372.7	21,297.7	8,325.7	32,184.5	7,506.7
112.3	1,650.43	117.227	31,587.2	46,143.7	21,185.0	8,186.3	32,169.8	7,317.4
109.1	1,982.63	136.417	31,524.8	45,962.9	21,107.1	8,081.1	32,130.2	7,168.8
104.6	2,370.53	163.423	31,441.6	45,778.5	21,032.6	8,003.3	32,137.0	6,965.2
99.8	2,752.95	176.235	31,380.9	45,633.6	20,976.7	7,971.6	31,993.3	6,928.5
100.5	2,979.46	177.834	31,378.6	45,553.0	20,962.7	7,990.4	31,846.8	6,905.3
124.9	3,149.95	130.908	31,336.6	45,426.2	20,918.3	8,009.9	31,606.4	6,928.8
143.3	3,661.41	90.524	29,673.1	42,929.3	19,787.8	7,614.7	29,634.7	6,675.8
112.4	4,482.35	93.812	29,585.0	42,760.5	19,717.9	7,614.0	29,327.7	6,768.9

The authors selected six indicators CPI, GDP, AWI and gender, age, location from 1991 until 2016 (Appendix A). As a result of critical analysis, the authors decided to distribute coefficients as following: y – CPI; x_1 – average wage index; x_2 – GDP; x_3 – location (urban); $x_{4\_}$ location (rural); $x_{6\_}$ gender (man); x_9 – age (0-17); x_{11} – age (15-64); x_{14} – age (65 and older) (Table 1). Other components do not have a significant impact.

The implementation of the analysis is possible in the packet of analysis in program Statistics. By means of a though analysis, it is possible to perform:

1. Report forming from analyzed data to a single table.

2. Normalization of indicators.

Based on the results from the Table 2 the authors have built a model which demonstrate the impact of economic (Average wage index, GDP) and social indicators (Population: location, gender, age) on the Consumer Price Index:

$$y = 190.6626117 - 0.046320899 \cdot x_1 - \\ -0.062262478 \cdot x_2 + 0.899351535 \cdot x_3 - \\ -1.386324188 \cdot x_4 + 0.620262501 \cdot x_6 + \\ +0.530973534 \cdot x_9 + 0.462652689 \cdot x_{11} + \\ +0.437998045 \cdot x_{14} \tag{1}$$

Analysis of the data set shows that each component influence on CPI negatively or positively as following:

$$\left[\begin{array}{l} y = -0.046320899 \cdot x_1 \left(AWE \right); \\ y = -0.062262478 \cdot x_2 \left(GDP \right); \\ y = 0.899351535 \cdot x_3 \left(location \left(urban \right) \right); \\ y = -1.386324188 \cdot x_4 \left(location \left(rural \right) \right); \\ y = 0.620262501 \cdot x_6 \left(gender \left(man \right) \right); \\ y = 0.530973534 \cdot x_9 \left(age \left(0-17 \right) \right); \\ y = 0.462652689 \cdot x_{11} \left(age \left(15-64 \right) \right); \\ y = 0.437998045 \cdot x_{14} \left(age \left(65 \; and \; older \right) \right). \end{array} \right. \tag{2}$$

Table 2. Calculations of the result

Source: Authors' processing data in Statistics.

Regression statistics

Multiple R	0.86326172
R-square	0.745220798
Normalized R-square	0.588433597
Standard Error	23.99525454
Observations	22

Dispersion analysis

	df	SS	MS	F	Relevance F
Regression	8	21893.4936	2736.686701	4.75307163	0.006621739
Balance	13	7485.039123	575.7722402		
Total	21	29378.53273			

	Coefficients	Standard error	t-statistics	P-Value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Y-Intersection	190.6626117	1050.5054	0.18149608	0.85877749	–2078.816328	2460.141551	–2078.816328	2460.141551
x_1	–0.046320899	0.047092886	–0.983607144	0.343261549	–0.148058894	0.055417096	–0.148058894	0.055417096
x_2	–0.062262478	0.384589604	–0.161893293	0.873879026	–0.893117804	0.768592849	–0.893117804	0.768592849
x_3	0.899351535	0.217342848	4.137939406	0.001167243	0.429810859	1.368892212	0.429810859	1.368892212
x_4	–1.386324188	0.365963233	–3.788151549	0.002257589	–2.176939687	–0.59570869	–2.176939687	–0.59570869
x_6	0.620262501	0.539937004	1.148768276	0.271349975	–0.546200478	1.78672548	–0.546200478	1.78672548
x_9	0.530973534	0.196612377	2.700610926	0.018172785	0.106218317	0.955728752	0.106218317	0.955728752
x_11	0.462652689	0.17517611	2.641071836	0.020354466	0.084207713	0.841097666	0.084207713	0.841097666
x_{14}	0.437998045	0.167781248	2.610530381	0.021570545	0.075528696	0.800467395	0.075528696	0.800467395

3.2. Model 2

Based on the principal components analysis the authors have built the table with 14 components and Eigen value, percent of variance, cumulative percentage.
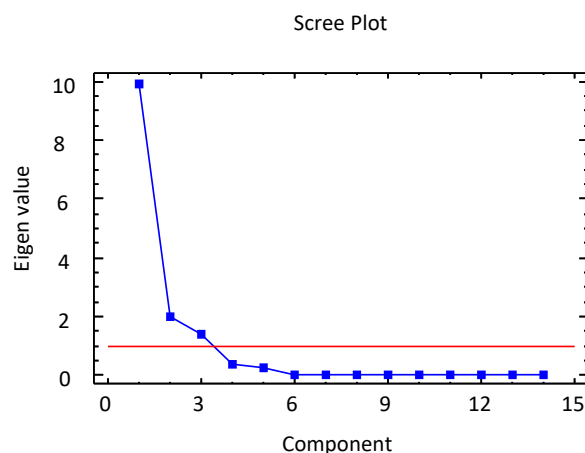
Table 3. Principal components analysis

Component number	Eigen value	Percent of variance	Cumulative percentage
1	9.93405	70.958	70.958
2	1.98347	14.168	85.125
3	1.37483	9.820	94.945
4	0.393668	2.812	97.757
5	0.27565	1.969	99.726
6	0.0363817	0.260	99.986
7	0.00158373	0.011	99.997
8	0.000187763	0.001	99.999
9	0.000132165	0.001	100.000
10	0.0000272103	0.000	100.000
11	0.0000126896	0.000	100.000
12	4.24377E-16	0.000	100.000
13	2.57157E-16	0.000	100.000
14	0.0	0.000	100.000

This procedure performs a principal components analysis. The purpose of the analysis is to obtain a small number of linear combinations of the 14 variables, which account for most of the variability in the data. In this case, 3 components have been extracted, since 3 components had Eigen values greater than or equal to 1.0. Together they account for 94.9454% of the variability in the original data.

In this case, the scheme means that the first three components significantly affect CPI.

Table 4. Component weights

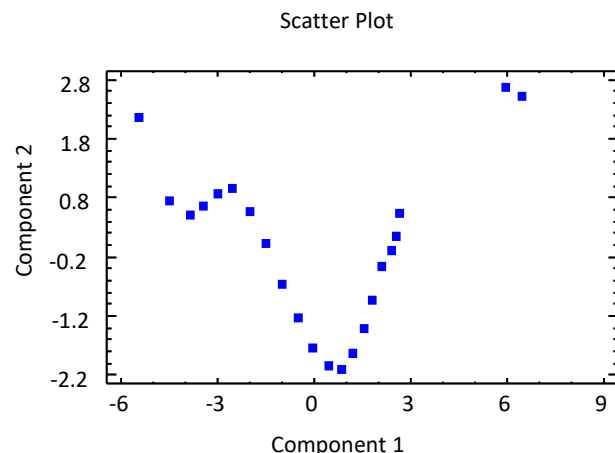|	Component 1	Component 2	Component 3
x_1	0.295542	0.177902	0.0959305
x_2	−0.11972	0.307038	0.57215
x_3	−0.312301	0.0679877	0.0778314
x_4	−0.314242	−0.00702064	−0.0842469
x_5	−0.316987	0.00683482	0.0075389
x_6	−0.316223	0.0464684	0.00132323
x_7	−0.282211	0.300581	0.0598024
x_8	−0.289392	0.269825	0.0312977
x_9	−0.299622	0.207742	−0.00817634
x_{10}	−0.2641	−0.343483	0.188929
x_{11}	−0.299781	−0.164435	−0.123218
x_{12}	−0.268495	−0.330732	0.0279422
x_{13}	−0.126192	0.00997385	−0.727398
x_{14}	−0.0277269	−0.637485	0.254637

Table 4 shows the equations of the principal components. For example, the first principal component has the equation:
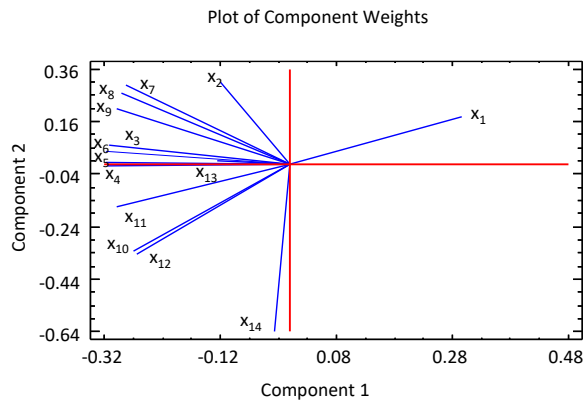
$$0.295542 \cdot x_1 - 0.11972 \cdot x_2 - 0.312301 \cdot x_3 -$$
$$-0.314242 \cdot x_4 - 0.316987 \cdot x_5 - 0.316223 \cdot x_6 -$$
$$-0.282211 \cdot x_7 - 0.289392 \cdot x_8 - 0.299622 \cdot x_9 - \quad (3)$$
$$-0.2641 \cdot x_{10} - 0.299781 \cdot x_{11} - 0.268495 x_{12} -$$
$$-0.126192 \cdot x_{13} - 0.0277269 \cdot x_{14},$$

Figure 1. The impact of 14 components on CPI

Figure 2. The impact of 14 components

Figure 3. The impact of 14 components
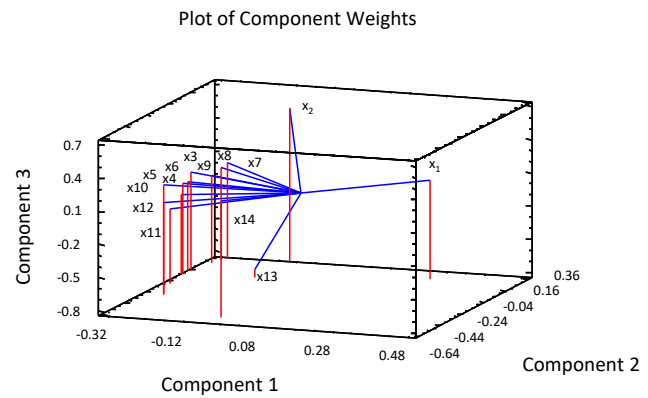
Figure 4. The impact of 14 components

Table 5. Principal Components

Row	Component 1	Component 2	Component 3
1	−5.46427	2.14743	3.15231
2	−4.4964	0.751369	1.02124
3	−3.86672	0.524548	0.272983
4	−3.44876	0.671922	−0.270388
5	−3.01139	0.860533	−0.995271
6	−2.57052	0.95283	−1.39749
7	−1.98926	0.580431	−1.87694
8	−1.48708	0.0328384	−2.08152
9	−1.016	−0.658731	−1.37519
10	−0.515702	−1.24473	−0.564306
11	−0.038213	−1.75312	0.00625466
12	0.446647	−2.02571	0.709695
13	0.834399	−2.11062	1.03691
14	1.21928	−1.82035	1.2039
15	1.52534	−1.40669	0.879561
16	1.80206	−0.940352	0.451745
17	2.09991	−0.345287	0.0386723
18	2.37637	−0.0989097	−0.264501
19	2.53083	0.154381	−0.467317
20	2.67051	0.525797	−0.191812
21	5.94212	2.67356	0.629025
22	6.45684	2.52885	0.0824404

where the values of the variables in the equation are standardized by subtracting their means and dividing by their standard deviations.

Table 5 shows the values of the principal components for each row of your data file. Select Component Weights from the list of Tabular Options to obtain the equations for each component. Select 2D Scatterplot or 3D Scatterplot from the list of Graphical Options to plot this

data. You may save the components by pressing the fourth button from the left on the analysis toolbar.

In this case, smaller value of component distance is the closer value of considered parameter corresponding to the center of the cluster. In turn, the concentrated value to each other impacts on center-orientation of financial conglomerate form corresponding cluster.

CONCLUSION

The panel data covers a large sample formed from Ukraine's' main indicators, divided in two categories depending on their influence – economic and social. The study regarded annual observations for a period of 26 years, from 1991 to 2016. The results have shown that the relationship between consumption, income and GDP is very strong. A minimum level of income determines its use especially for consumption and a high level of income increases consumption as there are more available resources to cover large investments as well.

The association between consumption, income and GDP was found significant in the all the considered panels. The result to this fact that a greater level of consumption and income increases the proxy of the standard of living, but to a lower degree for the high income which are more proficient in investments and R&D activities, especially in human capital. However, even the consumerism is sometime blamed for slowing the developing process of a country, because it concurs with the savings and the investments. Also, the author confirms that the psychological law stated by Keynes, according to which as the level of income increases, the difference between income and consumption increases as well, is validated by the empirical evidences. Also, it reveals that consumption habits depend on the level of income and that consumption and income contribute to the formation of gross domestic product per capita differentially, according to the level of income resources. Moreover, in this direction, further investigations can be made. For example, a study in which we would estimate the standard equation of panel of different countries could reveal the importance degree of income in the level of consumption and the significance of income and consumption in the level of gross domestic product per capita, for each of the three categories of country panels.

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APPENDIX A

Table A1. Input data (Economic and Social Indicators)

Indicator		Units of measurement	x/y	Year									
				1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
ECONOMIC													
Average wage index		KRB*, UAH	x_1	495.4*	16,987.8*	836,534*	3,490,047*	124.48	151.51	165.81	176.09	218.88	296.26
Consumer price index (CPI)		%	y	390	2,100	10,256	501	281.7	139.7	110.1	120	119.2	125.8
GDP		USD bln	x_2	24.343	21.459	33.866	36.755	37.009	44.559	50.152	41.883	31.581	31.262
SOCIAL													
Population	Location	Urban	x_3	35,085.2	35,296.9	35,471	35,400.7	35,118.8	34,767.9	34,387.5	34,048.2	33,702.1	33,338.6
		Rural	x_4	16,859.2	16,759.7	16,773.1	16,713.7	16,609.6	16,529.2	16,430.9	16,322.6	16,216.0	16,091.2
		Total		51,944.4	52,056.6	52,244.1	52,114.4	51,728.4	51,297.1	50,818.4	50,370.8	49,918.1	49,429.8
	Gender	Women	x_5	27,737	27,758.8	27,824.1	27,734.3	27,508.1	27,282.5	27,033.8	26,810	26,581.4	26,360.3
		Man	x_6	23,886.5	23,949.4	24,046.3	23,981.1	23,792.3	23,591.6	23,366.2	23,163.5	22,963.4	22,754.7
		Total		51,623.5	51,708.2	51,870.4	51,715.4	51,300.4	50,874.1	50,400	49,973.5	49,544.8	49,115.0
	Age	0-14	x_7	11,029.5	10,951.4	10,915.4	10,767.7	10,528.7	10,246	9,952.4	9,624.5	9,206.0	8,781.0
		0-15	x_8	11,762.1	11,690.8	11,625.0	11,489.8	11,248.4	10,988.6	10,673.4	10,366	10,012.6	9,571.9
		0-17	x_9	13,225.7	13,148.4	13,101.0	12,937.1	12,668.1	12,416.7	12,124.4	11,823.0	11,469.7	11,116.0
		16-59	x_{10}	30,230.3	30,314.4	30,523.7	30,646.9	30,595.7	30,424.3	30,166.5	29,793.6	29,500	29,353.4
		15-64	x_{11}	34,264.9	34,248.7	34,264.6	34,084.4	33,810.6	33,569.1	33,394.8	33,322.4	33,437.2	33,515.1
		18 and older	x_{12}	38,397.8	38,559.8	38,769.4	38,778.3	38,632.3	38457.4	38,275.6	38,150.5	38,075.1	37,999.0
		60 and older	x_{13}	9,631.1	9,703.0	9,721.7	9,578.7	9,456.3	9,461.2	9,560.1	9,813.9	10,032.2	10,189.7
		65 and older	x_{14}	6,329.1	6,508.1	6,690.4	6,863.3	6,961.1	7,059.0	7,052.8	7,026.6	6,901.6	6,818.9
		Total		51,623.5	51,708.2	51,870.4	51,715.4	51,300.4	50,874.1	50,400.0	49,973.5	49,544.8	49,115.0

Table A1 (cont.). Input data (Economic and Social Indicators)

Indicator		Units of measurement	x/y	Year									
				2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
ECONOMIC													
Average wage index		UAH	x_1	378.45	442.91	372.72	524.14	735.57	928.81	1,197.91	1,573.99	1,650.43	1,982.63
Consumer price index (CPI)		%	y	106.1	99.4	108.2	112.3	110.3	111.6	116.6	122.3	112.3	109.1
GDP		USD bln	x_2	38.009	42.393	50.133	64.888	86.183	107.753	142.719	180.116	117.227	136.417
SOCIAL													
Population	Location	Urban	x_3	32,951.7	32,574.4	32,328.4	32,146.4	32,009.3	31,877.7	31,777.4	31,668.8	31,587.2	31,524.8
		Rural	x_4	15,971.5	15,882.7	15,675.1	15,476.0	15,271.5	15,051.8	14,868.6	14,703.9	14,556.5	14,438.1
		Total		48,923.2	48,457.1	48,003.5	47,622.4	47,280.8	46,929.5	46,646.0	46,372.7	46,143.7	45,962.9
	Gender	Women	x_5	26,133.2	25,924.6	25,710.6	25,515.3	25,346.5	25,174.5	25,031.0	24,894.6	24,778.4	24,675.5
		Man	x_6	22,530.4	22,316.3	22,112.5	21,926.8	21,754	21,574.7	21,434.7	21,297.7	21,185.0	21,107.1
		Total		48,663.6	48,240.9	47,823.1	47,442.1	47,100.5	46,749.2	46,465.7	46,192.3	45,963.4	45,782.6
	Age	0-14	x_7	8,373.3	7,949.9	7,569.5	7,246.3	6,989.8	6,764.7	6,606.4	6,501.1	6,476.2	6,483.6
		0-15	x_8	9,144.8	8,743.7	8,315.9	7,966.1	7,664.8	7,408.3	7,218.1	7,071.0	7,005.0	6,982.6
		0-17	x_9	10,740.7	10,307.0	9,878.6	9,503.3	9,129.2	8,802.0	8,536.1	8,325.7	8,186.3	8,081.1
		16-59	x_{10}	29,259.4	29,154.6	29,314.5	29,514.6	29,656.3	29,812.1	29,799.8	29,738.5	29,586.0	29,328.6
		15-64	x_{11}	33,446.3	33,312.4	33,060.2	32,826.5	32,603.5	32,417.4	32,256.2	32,184.5	32,169.8	32,130.2
		18 and older	x_{12}	37,922.9	37,933.9	37,944.5	37,938.8	3,7971.3	37,947.2	37,929.6	37,866.6	37,777.1	37,701.5
		60 and older	x_{13}	10,259.4	10,342.6	10,192.7	9,961.4	9,779.4	9,528.8	9,447.8	9,382.8	9,372.4	9,471.4
		65 and older	x_{14}	6,844.0	6,978.6	7,193.4	7,369.3	7,507.2	7,567.1	7,603.1	7,506.7	7,317.4	7,168.8
		Total		48,663.6	48,240.9	47,823.1	47,442.1	47,100.5	46,749.2	46,465.7	46,192.3	45,963.4	45,782.6

Table A1 (cont.). Input data (Economic and Social Indicators)

Indicator		Units of measurement	x/y	Year					
				2011	**2012**	**2013**	**2014**	**2015**	**2016**
ECONOMIC									
Average wage index		UAH	x_1	2,370.53	2,752.95	2,979.46	3,149.95	3,661.41	4,482.35
Consumer price index (CPI)		%	y	104.6	99.8	100.5	124.9	143.3	112.4
GDP		USD bln	x_2	163.423	176.235	177.834	130.908	90.524	93.812
SOCIAL									
Population	Location	Urban	x_3	31,441.6	31,380.9	31,378.6	31,336.6	29,673.1	29,585.0
		Rural	x_4	14,336.9	14,252.7	14,174.4	14,089.6	13,256.2	13,175.5
		Total		45,778.5	45,633.6	45,553	45,426.2	42,929.3	42,760.5
	Gender	Women	x_5	24,565.6	24,476.6	24,410	24,327.6	22,971.9	22,873.0
		Man	x_6	21,032.6	20,976.7	20,962.7	20,918.3	19,787.8	19,717.9
		Total		45,598.2	45,453.3	45,372.7	45,245.9	42,759.7	42,590.9
	Age	0-14	x_7	6,496	6,531.5	6,620.6	6,710.7	6,449.2	6,494.3
		0-15	x_8	6,975.7	6,993.1	7,047.7	7,120.1	6,816.0	6,856.3
		0-17	x_9	8,003.3	7,971.6	7,990.4	8,009.9	7,614.7	7,614.0
		16-59	x_{10}	29,090.1	28,842.2	28,622.9	28,372.5	26,613.3	26,317.4
		15-64	x_{11}	32,137.0	31,993.3	31,46.8	31,606.4	29,634.7	29,327.7
		18 and older	x_{12}	37,594.9	37,481.7	37,382.3	37,236	35,145	34,976.9
		60 and older	x_{13}	9,532.4	9,618.0	9,702.1	9,753.3	9,330.4	9,417.2
		65 and older	x_{14}	6,965.2	6,928.5	6,905.3	6,928.8	6,675.8	6,768.9
		Total		45,598.2	45,453.3	45,372.7	45,245.9	42,759.7	42,590.9