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GENERATION DIFFERENCES IN THE BEHAVIOUR OF HOUSEHOLD CONSUMERS IN ROMANIA RELATED TO VOLUNTARY MEASURES TO REDUCE ELECTRIC ENERGY CONSUMPTION

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Abstract

The Ukraine crisis, the sharp increase in the price of electricity and the excessive dependence of the European Union countries on fossil fuels from Russia have led to a series of actions in the direction of energy saving, clean energy production and diversification of energy sources. The REPowerEU plan, through related financial and legal measures, aims to build a new infrastructure and a new energy system at the EU level. The reduction of energy consumption represents an important orientation of this plan, and in this context, the present study investigates, based on a questionnaire, the behaviour of consumers (households) in Romania towards voluntary measures to reduce electricity energy consumption and identify the behavioural differences between four generations: Baby Boomers, X, Y, and Z. The analysis of the results was performed using ANOVA and Tukey statistical tests, using the SAS Studio software application.

The results highlight some differences in the behaviour of generations and the patterns regarding the approach to behavioural integration for responsible energy consumption. The work is useful because it outlines the attitude and behaviour of Romanian consumers toward the national and European objectives of reducing energy consumption, energy waste, and increasing the share of alternative energy sources.

Keywords: REPowerEU, ANOVA, Tukey, sustainable behaviour, generations

JEL Classification: D10, L94, P18, Q28

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Introduction

Today, modern societies depend on electricity and it is hard to imagine a world without electricity (Androniceanu et al., 2021; Podbregar et al., 2021), especially when almost all innovations and discoveries rely on one source or another of energy (Ogrean and Herciu, 2022). Regardless of the source (fossil fuels, nuclear energy, renewables), electricity is essential for ensuring economic prosperity. In the context of the exhaustion of certain resources, but also of the influence exerted on the environment by the consumption and production of energy, a transition towards a sustainable supply of electricity is sought. The international energy market is under constant technological, climatic, geopolitical, and economic change. In this context, it is desirable for each country to practise an energy policy that ensures its energy security by having a balanced and diversified energy mix (European Commission, 2021b).

The process of transition to a clean and diversified energy system has been accelerated by the current geopolitical context, with Russia's military aggression against Ukraine causing deep disruptions in the global energy system. In response to the armed conflict in the east, the European Commission came up with a plan, called REPowerEU (European Commission, 2022a), which aims to eliminate the European Union's dependence on Russian fossil fuels and accelerate the transition to clean energy in Europe. The fastest and cheapest way to counteract the negative effects of the current energy crisis is energy savings. This can be analysed from a twofold approach. In the medium and long term, energy can be saved through structural changes aimed at increasing energy efficiency and, in the short term, with immediate effect, through behavioural changes.

At the national level, the Government of Romania has adopted measures for the protection of consumers (Bănulescu, 2018) in order to avoid energy poverty and economic blockages, and support programs are carried out to promote the production of electricity from renewable sources by prosumers. Through the Recovery and Resilience Mechanism (RMR), the central instrument through which the REPowerEU plan is implemented, Romania benefits from €1.4 billion in funding (Ministry of Investments and European Projects, 2023) for strategic investments in the key area of security energetic. The proposed measures aim to save energy, diversify production capacities, ensure supply chain, etc., which will strengthen the resilience of the national energy system with a positive impact in supporting the acceleration of Europe's transition to clean energy.

In addition to the measures adopted at the national and European levels, it is particularly important to involve energy consumers by adopting a responsible behaviour toward electricity consumption. In this sense, it should be noted that in 2022, in Romania, the population's consumption of electricity registered a decrease of 9.3% compared to the previous year (INS, 2023) and the number of prosumers increased almost 3 times in the same interval of time (183%). On January 1st, 2023, 40,171 prosumers were registered in Romania with a capacity to produce electricity from renewable sources of 423 MW total installed power (ANRE, 2023). This fact denotes the application by domestic consumers of some voluntary measures to reduce electricity consumption, but also an increased interest in the production of electricity from renewable sources and implicitly for sustainable development.

The authors frame the article in a European and national context regarding the framework and implications of the adoption of the REPowerEU plan (May 2022) - a strategy of the European Union to reduce and eliminate dependence on fossil fuels imported from the Russian

Federation and for the transition to a green economy - emphasising the contribution of domestic consumers to the objective of reducing electricity consumption (Malatinec, 2021).

In 2022, more than 8 million domestic electricity consumers in Romania (ANRE, 2022) consumed 12,523.9 million kWh, representing 24% of the final electricity consumption and 20% of the total electricity consumption (INS, 2023). At the level of the European Union, the electricity consumption of household consumers varies, from more than 10,000 thousand TOE (tons of oil equivalent) in countries such as France and Germany, to less than 200 thousand TOE in countries such as Malta, Luxembourg, Latvia, Cyprus, and Malta. In 2021, Romania ranked 14th in the ranking of electricity consumption by household consumers, with a consumption value of 1,125 thousand TOE (Eurostat, 2023a).

The electricity consumption per capita of household consumers in the European Union is mainly attributable to consumption for home heating, water heating, and consumption for lighting and electrical appliances. In Romania, the electricity consumption per capita attributed to household consumers is due to space heating, water heating, lighting, and electrical appliances (Eurostat, 2023b).

In the EU, the price of electricity is set according to a number of factors, such as supply and demand, the geopolitical situation, the energy configuration of the member states, weather conditions, and various costs (Eurostat, 2023c). The price of electricity for household consumers in all EU countries is part of an upward trend. The price of electricity increased significantly in 2022, reaching the maximum value of 0.253 euro/kWh at the EU level and 0.236 euro/kWh in Romania (Eurostat, 2023c). The price is expected to remain high for the year 2023, which means exposing citizens to high economic pressure.

Through our research, our aim is to discover the attitude and behaviour of consumers (households) in Romania towards voluntary measures to reduce electricity consumption, in the context in which domestic consumers can contribute to the implementation of the REPowerEU plan by increasing consumption efficiency and achieving energy savings through careful behaviour. The study aims to identify the behavioural differences of four generations of consumers, Baby Boomers (1946-1964), Generation X (1965-1980), Generation Y (1981-1996), and Generation Z (1997-2012) in terms of knowledge, application, and the intention to apply voluntary measures to reduce electricity consumption and limit energy waste.

Structurally, the article includes a review of specialised literature that reflects the current state of knowledge in the analysed field, followed by the research methodology, the results obtained, and finally the conclusions section.

1. Review of the scientific literature

Due to the growing need for energy from the world's population and the increasingly felt impact of global warming and climate change, corroborated by the energy crisis caused by the war in Ukraine, it becomes imperative to reduce energy consumption worldwide (European Commission, 2021a, b; Dincă et al., 2022; Dinu and al., 2023; Relich et al., 2023). According to the EU Communication on energy savings (European Commission, 2022b), short-term behavioural changes of households and economic agents could reduce gas and oil demand by 5%.

The economic and political situation in Romania related to the increase in energy prices, the legislative changes that regulate the market and the operation of electricity suppliers, the uncertainty related to the origin of energy sources, greatly influence the consumption behaviour of the population.

Saving behaviour is a factor with a direct impact on reducing household energy consumption and is to some extent affected by energy policy (Manjunath et al., 2014; Che and Wang, 2022; Hoffmann-Burdzinska et al., 2022). Comparative studies undertaken in the direction of consumer behaviour towards the reduction of electricity consumption focus on the analysis of the results obtained on different groups, such as countries, regions, sex, residential areas, population categories, etc. (Hori et al., 2013; Billewicz et al., 2015; Rainisio et al., 2022).

Nie et al. (2019) classify household energy-saving behaviours into three categories, based on the costs they involve, as follows: investment behaviours, control behaviours, and careful-use behaviours. Investment behaviours are the costliest due to the high initial investment cost, such as purchasing an energy efficient home appliance or improving the insulation of a house to save heat (Cayla et al., 2011; Siebert et al., 2017; Never et al., 2022). Control behaviours involve relatively modest costs and refer, for example, to controlling the temperature in the room at a level that allows saving heat (Cilibiu et al., 2022). Careful-use behaviours have zero cost and include voluntary actions such as turning off lights upon leaving the room, using natural light during the day, or unplugging appliances when not in use. These measures produce obvious effects on energy by simply changing people's habits. However, the problem of behaviour towards voluntary measures to reduce electricity consumption is treated in a small number of studies. However, the issue of behaviour toward voluntary measures to reduce electricity consumption is treated in a small number of studies (Brandon and Lewis, 1999; Nakamura, 2016). Using the Theory of Planned Behaviour model, Nie et al. (2019) and Qalati et al. (2022) concluded that careful usage intentions are the most important determinant of consumers' energy-saving behaviour. The authors recommend that future energy policies focus more on careful use behaviour and changing consumption habits because they do not require additional investment and can make a significant contribution to reducing energy consumption.

Factors influencing consumer saving behaviour are covered in many publications. Hoffmann-Burdzinska et al. (2022) conclude that there are a set of five factors that influence energy saving behaviour, namely: energy saving knowledge, energy saving cost perception, consumer environmental values, materialism, social influence, beliefs, and consumer awareness. There are a number of measures aimed at stimulating efficient consumption of electricity in households (Podbregar et al., 2021). These measures can be of a financial nature (e.g., subsidies for the purchase of energy-efficient household appliances) or nonfinancial instruments that have an informative and educational role (e.g., education on the efficient use of electricity) (Kazmi et al., 2022).

Schaufele (2021) suggests that prices are a much better incentive than subsidies to reduce electricity consumption. A significant number of studies examine how electricity prices affect the change in household electricity consumption (Podbregar et al., 2021; Wang et al., 2022; Zhang et al., 2023). Considering the empirical results, it is generally known that electricity is very inelastic in terms of price. Therefore, a percentage increase in the price of electricity will cause a smaller percentage decrease in consumption. This can be explained by the fact that electricity is indispensable nowadays and it is impossible to imagine a modern society without electricity (Podbregar et al., 2021). However, the coefficient of elasticity can

undergo changes over time. For low-income groups, the price elasticity of electricity consumption is relatively low, as the electricity consumption of these households aims to meet the basic life energy demand. The price elasticity of high-income groups is relatively high because the electricity consumption of high-income households is largely generated by improving the quality of life (Zhang et al., 2023).

Psychological models show that old habits are a strong barrier to implementing pro-environmental behaviour (Evans et al., 2018). Childhood and adolescence are very important for the transfer of energy-saving habits to adulthood (Mattson and Laike, 2022). Changing habits in adulthood seems more difficult. Keller et al. (2022) conclude that energy education in general and the energy education initiative can have a considerable impact on reducing household energy consumption.

The present study focusses on the analysis of the behaviour of four generations of domestic electricity consumers in Romania towards measures to reduce electricity consumption and generational differences. The study was developed to better understand how generations of household consumers relate to reducing electricity consumption, if they know, apply, and intend to apply voluntary measures to reduce electricity consumption in the future. The research has a high originality, the searches carried out with the help of bibliographic reference management software tools (EndNote, Mendeley) did not return article titles in which the behaviour of four generations of consumers was analysed in relation to voluntary measures to reduce consumption of electricity in Romania. But there are studies in which the authors propose as future research directions the division of respondents according to age (generation) and place of residence in order to indicate the relationship between their attitudes and behaviours focused on conscious and sustainable energy consumption (Jaciow et al., 2022).

2. Research methodology

Data collection that is the basis of this study was carried out using a survey based on an online questionnaire. The application of the online questionnaire was chosen due to the multiple advantages that it offers with low costs, quick implementation, obtaining honest answers from the respondents, and the possibility of fast data processing. The questionnaire was developed using the Google Forms application and consists of two sections.

The first section is dedicated to general information and includes 4 questions with a single answer option (period corresponding to the year of birth, sex, place of residence, and educational level). The second section includes eight questions of the type of evaluation scales comprising 38 items. To evaluate the items, an interval type scale was used in which 1 was marked 'not at all' and 5 was "very much" or 'frequently'.

By evaluating the items, the objective was to obtain information related to aspects such as the interest of household consumers in reducing electricity consumption and the knowledge, application, and intention to apply measures to reduce electricity consumption by household consumers. Among the 38 items, 33 items are presented in the form of measures that can be adopted to reduce household electricity consumption, and the other 5 items refer to the interest in reducing household electricity consumption (Table no. 1).

To eliminate some shortcomings, the questionnaire was pre-tested, being sent beforehand to a number of 15 people. Based on suggestions given by some of the respondents, some questions in the questionnaire have been reformulated to make the questionnaire easier to navigate.

Table no. 1. Analysis of aspects and coding of items

Analysed aspect	Item code	Item
Interest in reducing electricity consumption in one's own home	Q.II.1.EE.cons	Are you concerned about your household's electricity consumption?
	Q.II.2.CEE.red	Are you interested in finding solutions to reduce your household's electricity consumption?
	Q.II.4.RCEE.cun	Do you know measures that can reduce electricity consumption in a home?
	Q.II.5.RCEE.apl	Are you taking measures to reduce your household's electricity consumption?
	Q.II.6.RCEE.int	Are you planning to take measures to reduce your household's electricity consumption in the future?
Knowledge of actions that can reduce electricity consumption	Q.II.8.ARCEE.cun.1	Use of electronics and household appliances in energy efficiency class A
	Q.II.8.ARCEE.cun.2	Using LED bulbs for home lighting
	Q.II.8.ARCEE.cun.3	Disconnecting electronic and household appliances from the power source when not in use
	Q.II.8.ARCEE.cun.4	Turn off light bulbs when leaving the room
	Q.II.8.ARCEE.cun.5	Use of natural light during the day
	Q.II.8.ARCEE.cun.6	Household provision with motion sensors
	Q.II.8.ARCEE.cun.7	The use of multiple lighting sources, of low power
	Q.II.8.ARCEE.cun.8	Using the washing machine/dishwasher at full capacity
	Q.II.8.ARCEE.cun.9	Using low temperature or even cold and hot water only for heavily soiled clothes
	Q.II.8.ARCEE.cun.10	Regular defrosting and cleaning of the fridge/freezer before the ice layer exceeds 2 mm thick
Applying actions to reduce electricity consumption	Q.II.9.ARCEE.apl.1	I own household appliances and electronics with energy efficiency class A
	Q.II.9.ARCEE.apl.2	I use LED bulbs for home lighting
	Q.II.9.ARCEE.apl.3	I disconnect electronic and household appliances from the power source when not in use
	Q.II.9.ARCEE.apl.4	I turn off the light bulbs when leaving the room
	Q.II.9.ARCEE.apl.5	I use natural light during the day
	Q.II.9.ARCEE.apl.6	My home is equipped with motion sensors for rarely frequented spaces
	Q.II.9.ARCEE.apl.7	In my house, multiple lighting sources of low power are used
	Q.II.9.ARCEE.apl.8	I use the washing machine/dishwasher at full capacity
	Q.II.9.ARCEE.apl.9	I use low temperatures or even cold and warm water only for heavily soiled clothes
	Q.II.9.ARCEE.apl.10	Defrost and clean the fridge/freezer regularly before the ice layer is more than 2 mm thick
	Q.II.9.ARCEE.apl.11	I use the residual heat of the electric oven
The intention is to apply some actions in the future in order to reduce	Q.II.10.ARCEE.int.1	I will purchase household appliances and electronics in energy efficiency class A
	Q.II.10.ARCEE.int.2	I will use LED bulbs for home lighting
	Q.II.10.ARCEE.int.3	I will disconnect electronic and household appliances from the power source when not in use
	Q.II.10.ARCEE.int.4	I will turn off the light bulbs when I leave the room
	Q.II.10.ARCEE.int.5	I will use natural light during the day

Analysed aspect	Item code	Item
electricity consumption	Q.II.10.ARCEE.int.6	My household will be equipped with motion sensors for rarely frequented spaces
	Q.II.10.ARCEE.int.7	In my household, multiple low-power lighting sources of low power will be used
	Q.II.10.ARCEE.int.8	I will use the washing machine at full capacity
	Q.II.10.ARCEE.int.9	I will use low temperatures or even cold water and warm water only for heavily soiled clothes
	Q.II.10.ARCEE.int.10	I will periodically defrost and clean the fridge/freezer before the ice layer is more than 2 mm thick
	Q.II.10.ARCEE.int.11	I will use the residual heat of the electric oven

The questionnaire was applied online, distributed through social networks in Romania (Facebook, WhatsApp), between February 1 and February 27, 2023. The number of respondents who answered all questions is 292. The sample is divided into 4 categories corresponding to the 4 generations for whom it is desired to investigate behaviour towards voluntary measures to reduce electricity consumption. The motivation for choosing a sample made up of 4 generations of household electricity consumers consists in a broader perspective on consumers' interest in reducing electricity consumption and adopting measures to reduce electricity consumption by them, as well as identifying differences between generations.

All information obtained by applying the questionnaire was transferred into a database to analyse the results of the survey by applying statistical tests. For each item analysed, four sets of data were produced, sets related to each generation.

The statistical significance of the differences between the groups of respondents belonging to each generation was determined using the One-way ANOVA statistical test. We motivate the choice of the ANOVA method since the answers to the questions were expressed by numerical values, and the classification according to generations led to more than two different groups. It was also decided to carry out some analyses of the type of multiple comparisons to highlight the behavioural differences of each generation in relation to the others. The null hypothesis consists in the fact that there are no significant differences between the groups in terms of the answers obtained. The chosen significance level was $\alpha=0.05$. Specifically, post hoc pairwise comparisons were performed using Tukey's test with the SAS Studio software application.

3. Results and discussions

3.1. Description of generations

This study examines four generational groups, Baby Boomers, X, Y, and Z. Without a doubt, the year of birth, political, economic, and cultural events leave their mark on generational identities and behaviours. In Table no. 2, the main features of the four generations under study are presented (Jiří, 2016; Betz, 2019; Dimock, 2019).

Table no. 2. Comparative analysis of generations

Generations	BB*	X**	Y***	Z****
Period	1946-1964	1965-1980	1981-1996	1997-2021
Age range	59-77 years	43-58 years	27-42 years	11-26 years
Historical context	<ul style="list-style-type: none"> • The postwar period • Dictatorship • Asserting women's rights 	<ul style="list-style-type: none"> • Capitalism • The dominance of democracy • AIDS 	<ul style="list-style-type: none"> • Globalization • Prosperity • The advent of ICT • Terrorism • Swine flu 	<ul style="list-style-type: none"> • Digital Nativity • Mobility • Social networks
Behavioural traits	<ul style="list-style-type: none"> • Optimism • Responsibility • Loyalty to the workplace • Addiction to work • Teamwork • Look for future rewards 	<ul style="list-style-type: none"> • Efficiency • Autonomy • Materialism • Competitiveness • Confidence • Entrepreneurs • Balance • Prudent, conservative, save money 	<ul style="list-style-type: none"> • Sociable • Confident • Less independent • With high tolerance • Balance • Get involved • Earn money to spend 	<ul style="list-style-type: none"> • Poor communication skills • Realism • Using technology • Career oriented

Notes: *Baby Boomers; ** The Forgotten Generation; *** Millennials; **** Gen Z, GenZers, Zoomers.

3.2. Profile of respondents

The profile of the respondents is presented in table no. 3.

Table no. 3. The profile of the respondents

		Generations			
		BB	X	Y	Z
Total respondents	292	32	87	91	82
Female	181	18	48	56	59
Male	111	14	39	35	23
Urban	168	20	56	59	33
Rural	124	12	31	32	49
Secondary studies	9	6	1	0	2
High-school studies	111	14	21	25	51
University studies	100	5	30	38	27
Postgraduate studies	64	4	33	25	2
Other studies	8	3	2	3	0

3.3. Statistical processing of responses

The statistical summary consisting of the average values, the standard deviation, and the mode of the data series (the value in the series that appears most frequently), respectively, N – the number of respondents from each generation, is shown in Table no. 4.

Table no. 4. Statistical summary of the answers

Analysed aspect	Item code	Generations	N	Mean	Standard deviation	Mode
Interest in reducing electricity consumption in one's own home	Q.II.1.EE.cons	BB	32	4.31	0.78	5
	Q.II.4.RCEE.cun			3.50	0.98	4
	Q.II.5.RCEE.apl			3.78	0.90	4
	Q.II.1.EE.cons	X	87	4.23	0.88	5
	Q.II.4.RCEE.cun			3.90	0.88	4
	Q.II.5.RCEE.apl			3.95	0.96	4
	Q.II.1.EE.cons	Y	91	3.94	1.05	5
	Q.II.4.RCEE.cun			3.53	0.97	3
	Q.II.5.RCEE.apl			3.46	1.06	3
	Q.II.1.EE.cons	Z	82	3.68	1.06	3
	Q.II.4.RCEE.cun			3.25	1.08	3
	Q.II.5.RCEE.apl			3.34	1.08	3
Knowledge of actions that can reduce electricity consumption.	Q.II.8.ARCEE.cun.1	BB	32	4.40	0.79	5
	Q.II.8.ARCEE.cun.2			4.21	1.03	5
	Q.II.8.ARCEE.cun.7			3.56	1.29	4
	Q.II.8.ARCEE.cun.1	X	87	4.36	0.91	5
	Q.II.8.ARCEE.cun.2			4.58	0.82	5
	Q.II.8.ARCEE.cun.7			3.88	1.09	4
	Q.II.8.ARCEE.cun.1	Y	91	4.34	0.89	5
	Q.II.8.ARCEE.cun.2			4.48	0.87	5
	Q.II.8.ARCEE.cun.7			3.37	1.39	3
	Q.II.8.ARCEE.cun.1	Z	82	3.76	1.17	5
	Q.II.8.ARCEE.cun.2			4.14	0.99	5
	Q.II.8.ARCEE.cun.7			3.51	1.19	3
Applying actions to reduce electricity consumption	Q.II.9.ARCEE.apl.1	BB	32	3.84	0.88	4
	Q.II.9.ARCEE.apl.2			3.87	0.97	4
	Q.II.9.ARCEE.apl.11			3.21	1.15	4
	Q.II.9.ARCEE.apl.1	X	87	4.32	0.98	5
	Q.II.9.ARCEE.apl.2			4.46	0.92	5
	Q.II.9.ARCEE.apl.11			2.73	1.36	3
	Q.II.9.ARCEE.apl.1	Y	91	4.13	1.09	5
	Q.II.9.ARCEE.apl.2			4.44	0.96	5
	Q.II.9.ARCEE.apl.11			2.49	1.44	1
	Q.II.9.ARCEE.apl.1	Z	82	3.80	1.07	5
	Q.II.9.ARCEE.apl.2			3.85	1.23	5
	Q.II.9.ARCEE.apl.11			2.97	1.30	3
The intention is to apply some actions in the future in order to reduce electricity consumption	Q.II.10.ARCEE.int.1	BB	32	4.37	0.75	5
	Q.II.10.ARCEE.int.2			4.40	0.83	5
	Q.II.10.ARCEE.int.1	X	87	4.50	0.96	5
	Q.II.10.ARCEE.int.2			4.65	0.88	5
	Q.II.10.ARCEE.int.1	Y	91	4.51	0.87	5
	Q.II.10.ARCEE.int.2			4.69	0.71	5
	Q.II.10.ARCEE.int.1	Z	82	4.12	1.03	5
	Q.II.10.ARCEE.int.2			4.30	0.88	5

The data presented in the two tables are only for items that led to significant differences after applying ANOVA, at the chosen significance level $\alpha=0.05$.

Items not found in the two tables are those for which no statistical evidence was found to show that people in different groups gave different and statistically significant answers to this test.

Regarding the interest in reducing electricity consumption in one's own household, significant differences between the groups determined by the generations from which the respondents come were observed in four cases. The significance of the differences between the answers, using the ANOVA and Tukey tests, is shown in Table no. 5.

Table no. 5. Statistical significance of the differences between the responses indicated by the respondents of the Baby Boomers (BB), X, Y, and Z generations)

Analysed aspect	Item code	Item	ANOVA (p value)	Tukey (Meaning): * - p<0,05, ** - p<0,01)
Interest in reducing electricity consumption in one's own household	Q.II.1.EE.cons	Are you concerned about your household's electricity consumption?	0.001	Z≠BB* Z≠X**
	Q.II.4.RCEE.cun	Do you know measures that can reduce electricity consumption in a home?	0.0004	Z≠X**
	Q.II.5.RCEE.apl	Are you taking measures to reduce your household's electricity consumption?	0.0005	Z≠X** Y≠X**
Knowledge of actions that can reduce electricity consumption	Q.II.8.ARCEE.cun.1	Use of electronics and household appliances in energy efficiency class A	0.0001	ZBB* Z≠Y** Z≠X**
	Q.II.8.ARCEE.cun.2	Using LED bulbs for home lighting	0.008	Z≠X*
	Q.II.8.ARCEE.cun.7	The use of multiple lighting sources, of low power	0.048	Y≠X*
Applying actions to reduce electricity consumption	Q.II.9.ARCEE.apl.1	I own household appliances and electronics with energy efficiency class A	0.006	Z≠X**
	Q.II.9.ARCEE. apl.2	I use LED bulbs for home lighting	<0.0001	BB≠X* Z≠X** Z≠Y**
	Q.II.9.ARCEE.apl.11	I use the residual heat of the electric oven	0.028	BB≠Y*
The intention to apply some actions in the future in order to reduce electricity consumption	Q.II.10.ARCEE.int.1	I will purchase household appliances and electronics in energy efficiency class A	0.022	Z≠Y* Z≠X*
	Q.II.10.ARCEE.int.2	I will use LED bulbs for home lighting	0.007	Z≠Y* Z≠X*

The concern for electricity consumption in one's own household (Q. II.1.EE.cons) (Figure no. 1) leads to significant differences between groups, using ANOVA, p=0.001.

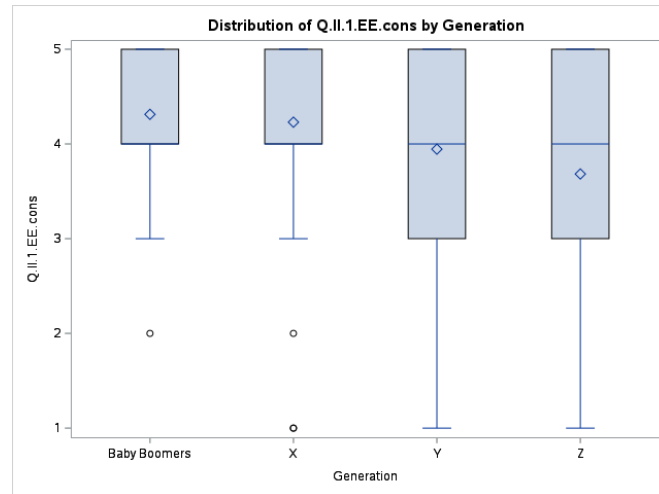


Figure no. 1. Comparative boxplot diagram for the answers to Q.II.1.EE.cons

Limiting energy consumption can be approached through the prism of four dimensions (Pearce et al., 2020): cognitive, affective, moral, and behavioural. First of all, the cognitive dimension refers to people's knowledge about basic energy concepts, about energy waste, and about practical cognitive skills in order to make decisions related to limiting energy consumption. However, knowledge cannot be interpreted as a decisive factor in behaviour (Karlin et al., 2014).

The affective dimension investigates people's feelings towards energy waste and their motivations to adopt responsible behaviour. The behavioural dimension looks at people's abilities to make decisions related to reducing energy consumption and behaving sustainably. This behaviour is strictly related to age (generations), developed habits that are later transferred into actions, and the financial power of individuals. Young people (Generation Z) will be most affected by the challenges of climate change and energy topics. However, the question arises as to whether and to what extent young people can effectively influence the reduction of electricity consumption. There are scientific arguments to the contrary. On the one hand, since young people are not directly responsible for paying energy bills (electricity, heating) or for energy-consuming investments (purchases) (cars, thermal insulation, electronics and household appliances, LED bulbs, etc.) they have a sphere of limited action. On the other hand, young people through the increased use of public transport, bicycles, or 'carpooling' (Aguirre-Bielschowsky et al., 2018; Pearce et al., 2020) and efficient applications from an energy point of view (Pop et al., 2022) can have a considerable impact on the reduction of energy consumption at the societal level.

The moral dimension refers to people's moral judgment regarding waste and pro-environmental behaviour. Here, the younger generation, through the ecological education received at school or acquired through various extracurricular activities, has a considerable advantage over the Baby Boomers generation, and this translates into morally based thinking towards nature and its protection.

In the study conducted, respondents of generation Z answered significantly differently than respondents of generations BB and X (Table no. 4). Specifically, the average value of the

answers indicated by the BB generation respondents to this question was 4.31. This is the highest average value among the four generations of respondents. Thus, respondents of generation X indicated answers with an average value of 4.23. Generation Y respondents indicated answers with an average value of 3.94. The responses with the lowest mean value were given by the Gen Z respondents, that is, 3.68. The most frequent answer to this question, indicated by people of generations BB, X, and Y, was 5. At the same time, people of generation Z indicated answers with a lower modal value, the most frequent answer being 3.

When respondents were asked if they apply measures to reduce household electricity consumption, Q.II.5.RCEE.apl (Figure no. 2), people of generation X answered significantly differently compared to people of generations Y and Z, respectively.

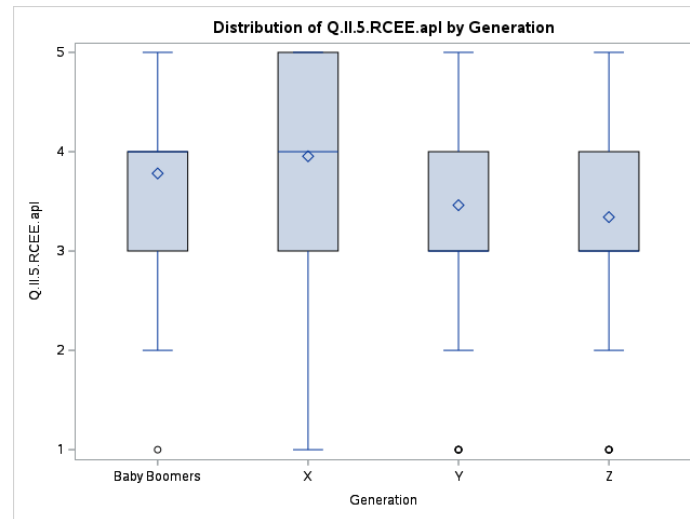


Figure no. 2. Comparative boxplot diagram for the answers to Q.II.5.RCEE.apl

Thus, the average value of the answers to this question of the respondents of generation X was 3.95, while people of generation Y indicated answers with a lower average value, 3.46. Gen Z respondents indicated the lowest mean answer of 3.34. There were no significant differences between the responses of people of the BB generation compared to those of the other generations.

When asked if they intend to apply measures aimed at reducing electricity consumption in their own home in the future, statistically significant differences were identified in 2 of the 11 items, namely Q.II.10.ARCEE.int.1 (“I’ll purchase household appliances and electronics from energy efficiency class A”) and Q.II.10.ARCEE.int.2 (“I will use LED bulbs for home lighting”). People of Generation Z answered significantly differently compared to people of Generation Y and Generation X. Respondents who belong to Generation Z indicated the lowest mean answers (4.12), compared to those of Generation X (4.50), respectively, Y (4.51).

The results highlight generational differences and patterns regarding the approach to integrating generations for responsible energy consumption. The usefulness of the study consists in the fact that it seeks to shape the attitude and behaviour of Romanian consumers

towards the global objective aimed at reducing energy consumption, energy waste, and increasing the share of alternative energy sources.

Conclusions

Of the 292 people who participated in the study, 70.2% declared that they are concerned about electricity consumption in their own households, and a high percentage of respondents (83.2%) are interested in finding solutions to reduce electricity consumption. This attitude of household consumers, orientated towards careful energy behaviour, is gratifying under the conditions of the new European energy paradigm. At the level of household consumers, electricity savings can be achieved inside homes, as well as at the level of the energy system, by increasing the efficiency of consumption.

The results of the study reveal that there are generational differences in the behaviour of domestic consumers in Romania towards voluntary measures to reduce energy consumption. The research carried out allowed the realisation of the behavioural profile of the four generations of respondents and the patterns regarding the approach to behavioural integration for responsible energy consumption.

The representatives of the BB generation (59-77 years old) show a different behaviour towards the adoption of new habits. The main reasons underlying the development of a different behaviour are related to the period in which they were born (political, economic, cultural events), and implicitly the experiences lived. Although currently the Baby Boomers generation has access to the same information as the rest of the generations, they require more time to be informed in order to adopt and use some novelty elements, such as the use of LED bulbs instead of the traditional ones or the use of the residual heat of the electric oven.

Generation X (43-58 years old) represents the “engine” when referring to the reduction of electricity consumption in their home. Representatives of this generation adopt both investment behaviour and careful use behaviour and control behaviour, behaviours that lead to lower electricity consumption.

According to the results obtained, the respondents of generation Y (27-42 years old) are less informed than those of generation X, when the level of knowledge of some actions that can reduce electricity consumption at the household level is assessed. They also apply on a smaller scale careful investment and usage behaviour. Instead, they are interested and show an intention to act, to apply some measures in the future in order to reduce household electricity consumption.

The youngest generation, Generation Z (11-26 years old), is less concerned about taking actions to reduce household electricity consumption compared to Generations BB and X. Respondents of Generation Z are less informed than Generation X about the knowledge and application of measures aimed at reducing domestic electricity consumption. It is noteworthy that generation Z shows a lower intention, compared to generations X and Y, regarding the future application of some investment measures to reduce electricity consumption in their own household. We believe that this thinking is influenced by a lack of current financial strength. But, according to the answers given by the older generations (BB and X), behaviour can change over time under the influence of a number of factors, age, and implicitly experience having a major influence on behaviour.

The results of the study can serve energy organisations and authorities in designing strategies aimed at, on the one hand, promoting measures that can reduce electricity consumption and, on the other hand, promoting energy-efficient purchases.

The limitations of the study are related to the representativeness of the Baby Boomer generation (11%) at the level of the analysed sample. As participation in the survey involved completing an online questionnaire distributed through social media, the number of respondents of the Baby Boomer generation was lower, as they use less information and communication technology compared to the other generations that participated in the survey. To generalise the analysed aspects, the study can be extended to the level of other European states, and this can take shape in the form of future research that can allow comparisons with the results of the present study.

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