

*This study has proven that the economic system is determined by various components, in particular, it includes the real sector of the economy, which is formed on mega-, macro, meso-, micro- and nano-levels. In addition, it was proved that the nano-level is determined by the activities of individuals whose economic activity begins with the birth and attitude of parents, attending various educational and upbringing institutions, and studying at university. A separate segment of the nano-level of the economic system is the baby industry responsible for the production of goods and services for children and future parents. All these aspects are indicators of the development of the baby economy. Such an economic category as the baby economy was separated and defined. The study uses the following methods: analysis, synthesis, structural analysis, systemic approach, observation, comparison, multifactor regression. These methods made it possible to achieve the results, which involve isolation of the baby economy as a component of nanoeconomy and definition of such components of the baby economic segment of nanoeconomy as a family or household economy, the baby industry, the economy of the educational process and upbringing. For this purpose, the value-institutional approach was applied. In addition, multifactorial analysis of the impact of indicators of the baby economy development on the population of a country with a transitive economy with incomes below the subsistence minimum was performed. This analysis identified a direct but minor relationship between these phenomena, which demonstrates the need to intensify and create a policy for the baby economy in similar states. The theoretical significance of the obtained results is determined by the introduction of a new economic category of "the baby economy" for the formation of a nano economic component within socio-economic systems*

**Keywords:** *the baby economy, household economy, baby industry, economy of educational process and upbringing*

UDC 339.166.5

DOI: 10.15587/1729-4061.2022.252334

# IDENTIFICATION OF REGULARITIES IN THE DEVELOPMENT OF THE BABY ECONOMY AS A COMPONENT OF THE NANOLEVEL OF ECONOMIC SYSTEM

**Tetiana Ostapenko**

*Corresponding author*

PhD, Associate Professor

Department of Foreign Economic

Activity Enterprise Management

National Aviation University

Liubomyra Huzara ave., 1, Kyiv, Ukraine, 03058

E-mail: ostapenko@ukr.net

**Igor Britchenko**

Doctor of Science in Economics, Professor

Department of Economic Science

State Higher Vocational School Memorial of Prof.

Stanislaw Tarnowski in Tarnobrzeg

Henryka Sienkiewiczza str., 50,

Tarnobrzeg, Poland, 39-400

**Peter Lošonczi**

PhD in Economics, Vice-Rector for Scientific Work and

Educational Process

University of Security Management in Košice

Kostova str., 4, Kosice, Slovakia, 04001

**Matveiev Serhii**

PhD, Senior Lecturer

Department of Legal Support of Entrepreneurial Activity

and Financial Security

Kharkiv National University of Internal Affairs

L. Landau ave., 27, Kharkiv, Ukraine, 61080

Received date 06.01.2022

**How to Cite:** Ostapenko, T., Britchenko, I., Lošonczi, P., Matveiev, S. (2022). Identification of regularities in the development of

Accepted date 15.02.2022

the baby economy as a component of the nanolevel of economic system. *Eastern-European Journal of Enterprise Technologies,*

Published date 28.02.2022

1 (13 (115)), 92–102. doi: <https://doi.org/10.15587/1729-4061.2022.252334>

## 1. Introduction

In the world, the issue of individualization of economic relations is relevant, which is manifested in the definition of such category as nano-economy. Nano-economy is a human economy outlined by the decision-making system of individuals regarding the development and implementation of nano innovations. Such a system begins with the education and training of specialists in this field, which is the responsibility

of the baby economy. The category of "the baby economy" reflects the phenomenon of training nano specialists in various spheres of life: from nanochemistry and nanophysics to nano-economy. At the present stage of development of economic science, the baby factor for the development of economic systems is the starting point for the formation of an individual factor of impact on the highest economic levels.

The baby economy is an economic concept that is in a state of formation of interpretations and definitions. Thus,

an economic person is formed not immediately at his workplace, but rather in a family cell, preschool educational institution, school, technical school, or university. The quality of life of a small person is determined by the development of the baby industry, that is, the level of development of the industries of goods for children (children's clothing and footwear, food, furniture, services, etc.). In a complex, household economy, the system of education and training and the baby industry form the baby economy, which in this composition is a component of nano-economy as a systemic entity.

How to form the baby economy in a particular country and whether conditions of influence of the child factor on the quality of the economic system at the highest levels will depend on it is the issue of practical value. After all, even human capital begins to operate at the level of education. The household also creates conditions for the development of an individual in the educational, upbringing systems and in the system of management and economic relations within enterprises, industries, national economies, and international economic relations.

This makes the research into the development of the concept of the baby economy and its components relevant.

---

## 2. Literature review and problem statement

---

Paper [1] studies the private and social impacts of the education system, their relationship with production, costs, and financing conditions. The circumstances of the development of markets of teaching work, educational markets as a whole, their progress vector, and other aspects were also outlined. Paper [1] does not address the impact of the education economy on the development of the baby economy and does not determine the place of the younger generation of residents of a particular country in the education system. The economy of education is part of the baby economy system and are narrower than the latter.

Another author [2] states that future growth and social well-being are influenced by well-known industries and various relevant services. In this case, most jobs require high educational qualifications. It is important to define the relationship between the education policy and other types of policies (such as research and technological development) and the economic evolution of a country. Human capital is analyzed as a production factor. Conditions of influence of educational labor markets on the formation of knowledgeable specialists in various sectors of the economic system are not explored.

Socio-economic equality is considered in article [3] as a factor in the development of the academic environment. The essence and significance of the participants in the educational process are revealed. The academic environment is one that includes macro-, meso-, micro- and nano-levels. This environment includes scientific, educational, and production institutions that should influence the development of baby and nano-economy.

A significant proportion of employees are those with financial education, especially domestic workers who can bring up the younger generation as financially conscious and ready to receive higher education. Thus, paper [4] determines the direction of influence of financial education of immigrant women working in private homes in Singapore. Aspects of the implementation of domestic workers regarding the formation of younger people within households are

not studied. It is also part of the baby industry, through the channels of which household assistants influence the upbringing and training of the younger generation. These questions are not highlighted in this study.

Particular attention should be paid to paper [5] dealing with the economy of higher education, when the conditions, concepts, and other applied issues of the development of higher education are assessed. Paper [5] focuses on the definition of higher education as a component of the economic system of a particular country. For the baby economy, obtaining a university diploma, after which the diploma holder can realize his professional potential and work for the development of nanotechnological solutions in various fields of knowledge, is becoming increasingly important.

The issues of the educational component of the baby economy are dealt with in article [6], which reveals the specific features of education, economy, and their relationship. This study also focuses on the issues of the impact of education, economy, and their relationship on the development of an economic personality and conditions for its formation and determining of issues of creating baby economic development.

However, it should be noted that all these works [1–6] slightly touch upon the development of the nano-economy, which are explored in the papers published in the late twentieth and early 21<sup>st</sup> centuries. The issue of the development of nano-economy was studied by various scientists in their research. Thus, paper [7] contains the definition of the economic category of “nano-economy”, and paper [8] mentions the concept of “the baby economy”. Research [8] was the first to define the baby economy as a component of the nano-economy. Study [9] was devoted to the analysis of the formation of the household economy and its management system. Institutional approaches to determining the components of the baby economy are based on article [10], and article [11] focuses on the value components of the baby economy and others. In general, the issue of the impact of education and family relations on the development of economic systems was studied insufficiently. The baby economy is becoming the factor that determines the dependence of industrial relations and productive forces on the quality of growing up conditions and the formation of institutional foundations of the system of the baby economy. It is known that inestims are the rules of the game, and their subjects are players who implement these rules of the game. An attempt is made to analyze the baby economy as an integrated institution. In general, this aspect is unexplored in the economic literature.

The separation of insufficiently researched aspects of the problem makes it possible to determine the conditions for the formation of the nano-economy and its component of the baby economy. The conditions for the development of the baby industry, which should be separated as a segment of the national economy and regulated by state policy, were not sufficiently explored. In addition, it is necessary to single out the economy of the educational process and upbringing as an institutional component of the baby economy and human economy.

---

## 3. The aim and objectives of the study

---

The purpose of this study is to determine the place of the baby economy in the system of nano-level of economic

relations and the formation of a system of the baby economy under conditions of human economy development using multifactor analysis. This will make it possible to identify the possibilities of the impact of the component of the baby economy on the development of the economic system at its nano- and higher levels.

To achieve the goal, the following tasks were set:

- to outline the institutional approaches to the definition of “rules of the game” and organizations for the development of the baby economy;
- to determine the places of the household economy within the framework of the baby economy;
- to determine the specific features of the formation of the economy of the educational process and upbringing;
- to analyze the conditions for the development of the baby industry;
- to carry out a multifactor analysis of the impact of the aspects of the baby economy on the economic growth in transitive countries.

---

#### 4. The study materials and methods

---

The object of research is the baby economy as a component of the economic system. The author’s hypothesis assumes that the nano-level of the economic system is the level of economic relations “person-to-person”, in which the starting link is the child’s economy or “the baby economy”. Thus, the development of a person’s economic system and the system of making his own decisions depends on the education and upbringing in the family and on the proper institution, as well as on providing everything necessary for the economic growing up of a child. Nano-economy begins with the baby economy when the quality of the economic system at all its levels depends on it from the birth to the creation of nanotechnology solutions.

The following methods were applied in the study:

- analysis of the components of the baby economy to be studied;
- synthesis for the formation of a unified system of separate parts of the whole the baby economy;
- structural analysis implied separation of components and regularities of interrelations between them;
- the systemic approach involved the formation of the nano economic system as a single whole and outlining its component of the baby economy;
- monitoring the processes of development of the baby economy;
- components of the baby economy in statics and dynamics, multifactorial regressions.

These methods enabled achievement of the results, which provide for the isolation of the baby economy as a component of nano-economy and defining such components of the baby economic segment of nano-economy as family economy, baby industry, economy of the educational process, and upbringing. For this purpose, the value-institutional approach was applied. In addition, multifactor analysis of the impact of indicators of the development of the baby economy on the population of Ukraine with incomes below the subsistence minimum was carried out. This analysis identified a direct but insignificant relationship between these phenomena, which demonstrates the need to intensify and create a policy of the baby economy in our country.

---

#### 5. Studying the content of the baby economy as a component of the nano-level of the economic system

---

##### 5.1. Directions of application of the institutional approach to defining the category of “the baby economy”

The baby economy is a component of the nano-economic system, which was determined based on the value-institutional approach.

According to the definition of article [10], institutions are a set of rules and norms that people impose on their relationships. Thus, stimuli and control mechanisms, which, along with the budget, resource, technological and other restrictions, outline the limits of choice in the activities of economic agents, are defined [10]. The article also shows that institutions are the framework that organizes relationships between people and influences the economic process. The baby economy is an institution as a collection of “rules of the game”, and its agents subjects are children, adults (as individuals), households (as family centers), educational organizations (as subjects of children and adults union), production organizations (as subjects – producers of goods for the younger generation). Let’s dwell in more detail on the characteristics of these subjects.

The main subject of the baby economy is a child, from birth to graduation in a specialty (it can be secondary-special educational institutions, technical schools, or colleges and universities). The specificity of the definition of such a subject is that a child is taken care of by adults until he comes of age, and it is actually inseparable from the institution of the family and their parents or people replacing them. This subject is economically dependent on the older generation. A child is not a subject of economic relations, only in terms of consumption through guardians who are able to provide children with appropriate goods and services. A child has no skills and is not a subject of labor relations in the labor market. However, there is a black market for child labor, where certain products are produced, which takes place in the territory of developing countries. Such cases are becoming less common due to the illegal form of business.

The rules of the game of children as a subject of the baby economy are that children should be educated and brought up within family centers and educational organizations. Children must learn to be responsible consumers and be initiators of transformations in the world around them.

If we recall the theory of transaction costs, it can be noted that a child should, through parents, influence the receipt of benefits from a range of these costs. Thus, the theory [11] interprets: “if ownership rights are clearly defined and transaction costs are zero, the allocation of resources (structure of production) will remain unchanged and effective regardless of changes in the distribution of ownership rights”. Thus, if parents own property, and transaction costs are low, the creation of a business will be effective if all expenses of household members are covered. On the other hand, rights of ownership of educational institutions can be transferred to private owners, or private institutions can be nationalized. Several theoretical and practical conclusions as for the development of the baby economy can follow from this theory:

Firstly, the concept reveals the baby economic content of property rights. According to [11], externalities (that is, differences between private and social expenditures and benefits) appear only when property rights are defined vaguely and are blurred. When the rights are clearly defined,

all externalities are “internalized” (external expenditures become internal). This means, for example, that education costs become not the state but intra-family costs for those families who own property and business based on it.

Secondly, the theorem removes market accusations of “failures”. The way to overcome externalities lies through the creation of new ownership rights in those areas where they were vaguely defined. This is especially true of ownership of educational institutions that cannot be privatized, but private educational organizations can become nationalized. And “failures” depend on the activities of the state in the field of education in relation to private educational institutions.

Thirdly, the mentioned theorem reveals the key value of transaction costs. When they are positive, the distribution of property rights ceases to be a neutral factor and begins to affect the efficiency and structure of production. Thus, when the number of private educational institutions increases, the efficiency of the production system also increases.

Fourthly, the outlined concept indicates that reference to external effects is an insufficient basis for state intervention. Thus, the state should itself create the concept of interference in the activities of educational institutions, when external and internal factors pose a positive or negative threat to the activities of these institutions.

Adults as subjects of the baby economy are providing persons on whom the emergence of children in the world, their life and upbringing depend starting from the first days to the time they get an education and come of age. We distinguish two categories of adults as subjects of the baby economy:

1. Parents who have given birth to a child and provide their livelihoods until adulthood and after that.
2. Persons who direct their activities to education, training, and providing children with the necessary goods and services.

## 5. 2. Determining the role of households in the intensification of nano economic relations

The household as one of the subjects of the baby economy has an extremely important role in the system of economic relations. In Ukraine, with the development of market relations, the household found itself in new conditions of functioning.

Firstly, meeting the needs of the household in material and intangible benefits is a natural goal of new production. Household demand is one of the most important components of aggregate demand for end benefits. Secondly, households as owners of production factors pass them on to business units (enterprises) that should carry out their effective combination. Thirdly, part of the income that is not used by the household during the current period turns into savings and can under certain circumstances become a powerful source of nano economic growth of the country. It can be stated that the household performs three main functions in the nano-economy: consumption, supply of production factors, savings. Consequently, a household is a nano economic unit consisting of one or more persons who run a joint household, which provides the economy with production factors and uses the funds earned for the current consumption of goods and services and savings in order to meet their needs. However, from the point of view of the nano economic level of management, the function of consumption is certainly a leading function.

In order to analyze how a household performs this function, the nano economic science resorts to a number of abstractions that make it possible to study the behavior of the analyzed object in its pure form:

- 1) it is believed that a household acts as a single nano economic entity and realizes its needs as a single whole; that is, its internal structure is not taken into consideration, it is identified with the concept of “individual”;
- 2) it is assumed that a household receives income through the sale of production factors, or rather their services, for the use or redistribution between members of society and spends them entirely on consumption, without making savings;
- 3) it is considered that it can consume all consumer benefits that are produced at the moment by the manufacturing sector, and these benefits are considered infinitely divisible; there is complete information about the consumer properties of goods;
- 4) such actions of a household that may affect its current consumption, namely: a property increase or decrease; obtaining a loan; investment of part of income in consumer stocks, are not taken into account.

Under such circumstances, a household is placed in the conditions of choice: it needs to distribute available monetary income among various benefits that meet its needs. It is this process that primarily interests economists, that is, how a household decides on a certain structure of consumption.

The order of preferences of a household must correspond to certain properties that collectively describe a rational behavior of a consumer. Figuring out the properties of an individual’s preferences leads to an understanding of how the usefulness of a particular set of benefits that an individual can choose can be measured. In the nano economic theory, there are two concepts in this regard: quantitative and ordinal.

The essence of the quantitative concept of utility, the theoretical foundations of which were laid by representatives of the Austrian economic school in the mid-nineteenth century [12, 13] is that an individual is able to measure the amount of “utility” he has from the consumption of each benefit, and therefore from a certain set of benefits. According to this concept, the behavior of a consumer boils down to the fact that he chooses the most useful one. However, one fundamental question remains unexplored: how to measure “utility”, in what units.

The essence of the ordinal concept of utility [14] is that the plan that an individual chooses under certain restrictions, and that is the best, means the highest utility for him. It is the order of advantages that makes it possible to find out the degree of desirability of this set of benefits for an individual, and therefore there is no need to resort to the quantitative definition of utility. The ordinal concept of utility is the theoretical foundation of modern theories of supply and demand.

A household economy is a special form of economy that has always existed, but scientific approaches to its interpretation are formed only under modern-day conditions. The household economy provides for the formation of a system of family cell management when a person is formed from a positively minded system of family relations, capable of creating innovative knowledge, especially in nano sectors. Scientific tasks regarding households and their management are those, the solution that will lead to determining the household participation in the system of economic relations of nano-

micro-, meso-, macro- and global levels. In turn, this is necessary to understand the essence of the economic system as a holistic multicomponent phenomenon of establishing connections in the internal and external environment and environment of the global order.

The impact of the household economy on the international economy and international economic relations is becoming a link in the impact of the nano-economy on the evolution of the global environment. Thus, an individual affects the quality of international relations, forming a positive development of centers – the closest environment of a person.

It should be noted that all the features of the nano-economy are also inherent in the household economy system [9]. We also stress that along with the household economy, household management, which is characterized by the performance of management functions, is distinguished. It all starts with planning income and expenditures and financial behavior in households. It is continued by organizing the process of setting up household chores. The participation of family members in necessary home activities is motivated. The process of relationships among family members is coordinated. And lastly, at the last stage of household management, it is monitored if the result meets the goals and plans of the family.

Such functions of household management lead to the formation of economic behavior in younger family members and their development into full-fledged economic individuals.

### 5. 3. Determining the economy of the educational process and upbringing as a component of the baby economy

Of course, a separate sector of the baby economy is the subsystem of education and upbringing. These are institutions of preschool, secondary, secondary special education, and universities. Currently, education is very differentiated: there are state, communal, and private educational institutions. Holistic educational networks and online education are created. Thus, in Europe, there is the Bologna process, which involves the standardization of the educational process and many countries implement an international approach to baby economy management [6].

Scientists-economists determined in their works that one of the approaches to understanding the baby economy is the interpretation of the specific features of its component – the economy of the educational process and upbringing [8]. Certain papers, for example [15], focus on the formation of the economic thinking of younger learners who are involved in the basics of economic literacy. In this aspect, the economy of the educational process and upbringing can be considered as the economic behavior of a child.

Aristotle defined an economy as a system that produces goods for its citizens. Note that the economy of the educational process and upbringing is a component of the economic system, which, along with the use of certain resources (physical, natural, social) in childhood, leads to the formation of personality. Based on creative behavior, benefits are formed and produced in adulthood with the use of the formed knowledge and skills. Thus, the economy of the educational process and upbringing is characterized by the process of growing up and using the conceptual and terminological apparatus of developmental psychology. In addition, it is necessary to use economic categories to study the economy of the educational process and upbringing, since the economics of the educational process and upbringing are part of economic science.

In institutionalism, there is a theory of economic organizations. Thus, while institutions are the rules of the game, organizations (companies) can be compared with sports teams. Educational organizations are teams for the baby economy. In neoclassical theory, the concept of the company actually merged with the concept of the production function. The company for this study is an educational institution that can be public or private. If it is a private educational institution, it is also a company, because it is a business, albeit educational or upbringing. And if we are talking about a state educational institution, its activities are subject to the laws of the institutional economy.

In 1937, it was possible to set and partially solve the problem of the reasons for the existence of a company or the reasons for the existence of the market, for the first time in certain studies. These studies raised the problems concerning private companies, the task was to determine whether a kindergarten, a school, or a university is a company. It was underlined in paper [11], that a distinctive feature of a company is the relationship of hiring, and its existence is associated with the fact that it contributes to better risk distribution between employees (trying to prevent risk) and entrepreneurs (risk-neutral). In exchange for a stable payment protected against accidental fluctuations, employees agree to submit to the control of an entrepreneur. Under these circumstances, employees are teachers, educators, psychologists, management personnel of educational institutions. These institutions meet the market conditions of hiring because it is a labor force with market value. Such labor force has a stable payment, although not the maximum under market conditions. The risks of hiring an educational workforce are that you need to have only the diploma of a teacher to apply to an educational institution and even if one has such a diploma, the salary can be quite low (if we are talking about state educational institutions). Of course, if we are talking about private preschool or secondary educational institutions, the level of payment there is quite high, but the quality of hired staff should also be of a high level (own teaching methods that are different from ordinary teaching). If you trace personnel hiring to universities, private universities like those in the 1990s and early 2000s had more part-time employees. Associate professors and professors from public institutions taught part-time at private higher education institutions without leaving the main place of work.

It should be noted that the market of educational labor in these years had the signs of a supply market, where institutions dictated working and hiring conditions. At the present stage, the educational market focuses on the specific skills of the teaching staff, namely: teaching specialist disciplines in English, author's developments and teaching methods, relations with the practical sector, and internship at enterprises of a given profile.

The economy of transactional expenditures is crucial when choosing the organizational form and the size of an educational institution. Since such expenditures are real, any educational unit has a choice: which is better and cheaper – to cover expenditures by themselves, receiving educational labor force in the market, or to be free from them, training these specialists with their own efforts. Thus, schools and universities can track promising students and encourage them to acquire appropriate education and work at their alma mater.

It should also be noted that the administrative educational mechanism is also not free from costs that are in-

creasing along with an increase in the size of an educational institution. That is why the boundaries of the institution will lie where the final costs associated with the use of the labor market are compared with the final costs associated with the use of a hierarchical educational organization.

The next step in the development of the transaction approach was made in paper [11] when the essence of a company was derived from the advantages of cooperation when it is possible to achieve better results by using jointly a certain resource as part of a whole team rather than acting alone. This is the synergy principle.

Educational institutions are also teams, and cooperation takes place at the level of ministries of education of different countries. However, the activities of a united “team” complicate the assessment of each participant’s contribution to the joint result. Hence there is the need for control, which would limit such behavior by a rigid framework. The controlled work of teachers and instructors regarding reporting and quality of the educational process is well known. An agent who takes control of functions in relation to other participants becomes the headmaster of the school or the rector of the university.

Developing this approach, certain authors identified a company as a “network of contracts”. The problem of an educational institution is understood as a problem of choosing the optimal contractual form, which ensures maximum savings on transaction costs. The task boils down to devising such contracts that could be best adapted to the characteristics of each particular agreement. Transactional expenditures of educational institutions are the cost of training, hiring leading specialists to teach certain parts of separate courses and disciplines, the cost of installing computer systems (multi-media), conducting extracurricular work, learning languages on an optional basis, etc.

The 1990 theory [11] revolves around the concept of “organizational culture”. Due to the incompleteness of contracts, the issue of adapting to unexpected changes is crucial for any educational institution. However, it manages to get the necessary freedom of maneuver only when its employees are firmly convinced that it does not restrict their freedom.

The transactional theory identifies several end-to-end characteristics that determine the essence of an educational institution as a company:

- the existence of a complex network of contracts. These are contracts with various subjects of the baby economy, contracts for training and teaching. The difference between these contractual values is the profit of the educational institution;
- long-term nature of the relationship. Agreements are concluded with
  - students and learners for a certain cycle of education (secondary, baccalaureate, or magistracy);
  - production by the “united team”. It is when a team of high-profile teachers works in the same direction. The baby economy requires effective teams for training and upbringing;
  - administrative coordination mechanism through orders. Thus, all conditions for regulating and managing the educational process are formed clearly hierarchically. Matrix systems of management are not observed;
  - investment in specific assets. Education is an element of human capital because only specific specialists and their special methods have a prerogative for using in training;

- an educational institution is a tool for saving transaction costs. Since individual training is quite expensive (tutoring, individual lessons, etc.), its relative cheapening occurs within educational institutions;

- competition in the market of organizational forms leads to the fact that structures that most meet the requirements of the educational environment survive in competition. In particular, the educational institutions that join the Bologna process and various educational directions like “Rostock”. The baby economy involves combining conditions of competition and cooperation of educational institutions.

Note, one author identifies three main components within institutions:

- informal restrictions (traditions of educational institutions, their customs, and various social conventions);
- formal rules (laws on education, administrative acts of schools, universities);
- enforcement mechanisms that ensure the implementation of the rules (verification, accreditation, licensing, etc.).

Technological progress, the opening of new markets, population growth – all this leads either to changes in tuition prices in relation to prices for production factors, or to changes in labor prices compared to the prices of other resources. Technological progress has a decisive impact on the educational system and its “rules of the game”. All levels of education should focus on the latest developments in the world of science, both fundamental and applied. That is why educational programs should be constantly reviewed to meet modern-day requirements.

New markets emerge as a reaction to the emergence of new goods and services, or to move away from other non-market systems to open economic rails. And the baby economy should respond accordingly to such innovations, to introduce into the educational process new aspects of the production and consumption of certain goods and services.

#### 5. 4. Formation of the baby industry as a prerequisite for the development of nano economy

Production organizations (as entities – producers of goods for the younger generation) are also organizations in the rules of the game regarding the baby economy. The process of giving birth to a child is also one that can be planned, organized, motivated, coordinated, and controlled. Usually, these issues are handled by the head of the family, whose role in many countries of the world continues to be performed by men. However, modern women, especially single, in Europe, North America, and in some other regions of the world control this process independently, because the quality of the process of the emergence of a new person depends on such control. In many ways, these functions and their components are performed by specialized institutions (maternity hospitals, prenatal centers, red cross cells, etc.). In general, this process requires the investment of moral, mental, material, and monetary resources.

The process of giving birth to a child may involve direct and indirect conditions of fulfillment. As in ordinary trade relations, it is possible to directly conclude contracts, for example, for prenatal services when expectant parents directly receive appropriate services to support a pregnant woman. However, such conditions for obtaining services can occur through intermediaries. Thus, there are whole clinics for the provision of services for surrogate mothers. Parents who cannot give birth to a child naturally make an agreement not directly with the surrogate mother, but through the appro-

priate intermediary. This industry is developing especially intensively in different countries of the world.

Depending on the experience of conducting intermediary activities by the producer of baby natal services, the nature of the relationship between them and the intermediary organization, as well as on the functions performed by the intermediary, there are several types of trade and intermediary operations:

- officially organized baby intermediaries (clinics, hospitals, maternity hospitals, perinatal centers, etc.);
- individual intermediaries that provide services of parents' communications with medical personnel regarding the birth, maintenance, and birth of a child on the commercial basis;
- services of intermediaries for re-selling children's goods, both used and new (these are the intermediaries that correspond to the classification of resellers – dealers, commissioners, and agents).

The last type of intermediaries implies the influence of the child life support industry, which is a special sector of the national economy, is characterized by significant volumes. Thus, the children's products industry consists of functioning enterprises that can enter and often enter the world market. In particular, children's toys of Chinese enterprises flooded the whole world.

The baby industry includes the following areas:

- children's clothing;
- children's shoes;
- children's toys;
- children's furniture;
- children's food;
- children's support goods (trolleys, hygiene items, paper items, stationery, etc.).

Such products are manufactured within the framework of the relevant industries, but statistics do not separate them. The global baby industry was born with the baby boom of the postwar period. More new generation children were born, and this required more suitable products, existing niches were increasingly filled with new manufacturers. For example, this is a whole sector of brands of children's clothing, when there are lines of luxury clothes and footwear for children of all ages and genders. Those parents who can provide their children with exclusive clothes do so by spending heavily.

Children's furniture is always relevant because in every house there is the children's room with appropriate decoration and appropriate pieces of furniture. Most of this furniture is made by order because the dimensions are not standard.

Support goods are also the direction of the baby industry. They are different for children of all ages. Thus, for young children, these are trolleys, pencils, and paints, for older children, these are special subjects for doing lessons, for classes in interest groups, for their pastime. In general, statistics separates such industries as the stationery industry, which is also used by children.

Baby food is a whole area in the production of edible goods, starting with products that replace mother's milk, and complementary foods for young children and ending with not very useful snacks. Some food manufacturers have a certain line of goods for children. For example, the "Obolon" plant has children's brand "Zhyvchyk", which was developed and manufactured for children according to the appropriate formulation. Almost all brands of dairy products have products for children (special yogurts, desserts, and other dairy products).

The global baby product market is just beginning to turn into a particular industry. This is a huge niche for manufacturers looking for areas of application of their own efforts. This is a global market at the early stages of the life cycle. It has a positive growth trend. And there is also a whole industry, for example, relevant programs and exhibitions. After all, manufacturers of baby products have to present their products with the help of the latter and develop technological innovations for related businesses and potential consumers.

Pricing in the baby industry meets the requirements of adult goods production. It is known that children's goods, albeit small in size, are almost similar to those for adults. This practice has existed for manufacturers of children's goods since the middle of the twentieth century. It is not a cheap segment of the product.

Business organizations that make baby goods have grown from representative offices of companies for adults. Thus, for example, Chanel has a children's clothing line and positions itself as a manufacturer of children's goods or manufacturers of children's hygiene products, which are mostly multinational corporations such as Unilever or Procter & Gamble.

The baby economy involves management of the household, the process of the child's appearance, the system of the child's life support, the process of education and upbringing in the preschool educational institution, school and higher educational institution. Such management is indirectly related to the objective impact of globalization processes on the baby economy.

Note that the baby economy as a system consists of the following elements:

- household economy (as a subsystem that provides for the economic life of family cells with different numbers of households with or without children);
- subsystems of the educational process and upbringing (as subsystems of educational institutions of different levels from preschool to higher and post-university level);
- baby industry (as a subsystem consisting of economic agents that produce children's products ranging from food to clothes and footwear for children and pregnant women).

### 5. 5. Multifactor analysis of the dependence of nano economy on the factors of baby economic development

The influence of external environmental factors of the economic situation, political imperatives, legal collisions, in particular, becomes the basis for determining these resources as leading in the formation of the economy of the educational process and upbringing, and nano-economy in general. The multifactor analysis reflects the influence of the baby economy factors on the indicators of changes in the GDP per capita in Ukraine. Per capita indicators of the gross domestic product are the reflection of the development of the nano-economy as a human economy.

It is known that the central place in the system of national accounts is taken by the indicator of gross domestic product (GDP), which is defined as the gross value of all goods and services created on the territory of a given country during a certain period, with the exception of their intermediate consumption. An economic person is determined by the number of goods and services that may fall on him. GDP per capita is a relative indicator that proves the ability to produce a certain amount of goods per person. These indicators reflect the existence of a nano economy because the volume of those goods or services

that are manufactured in the national economy falls for an economic person. The essence of GDP per capita reveals its general features:

- it is the most general indicator of the final result of nano-economic activity in the national economy as a whole;
- characterizes the unity of interrelated aspects of the nano-economic process: the production of material benefits and the provision of services by one person, distribution of income of individuals and households, the final use of material goods and services by one person;
- covers the results of nano economic activity of all economic units: enterprises, organizations, and institutions both as the sphere of material production and the service sector; personal subsidiary farms of the population; individuals engaged in business;
- is a value, monetary indicator, measures the market value of annual nano production;
- has a quantitative, time dimension.

These signs of the GDP per capita as an expression of nano economic development suggest that it is influenced by various factors that include the factors of the baby economy, and especially the system of educational process and upbringing. The way the final product is made depends on the preparation of the economic individual who works in the economic environment of a particular country. If there are a significant number of people with higher education, it affects an increase in the innovative potential of both a particular production and the national economy as a whole. Of course, it all depends on the quality of education, because in the 1990s the number of certified specialists was significant, but their specialty did not meet the requirements of the formation of a market economy. Today, the relationship between the number of innovative companies and the number of people with higher education is growing, in general, these phenomena predict a link between the nano economy (in terms of GDP per capita) and educational factors.

To construct a model of linear regression, the following input and output variables were used:

- Dependent variable – gross domestic product per capita;
- Independent variables:
  - number of people in preschool educational institutions;
  - number of students in secondary schools;
  - number of people in higher educational institutions;
  - a number of postgraduates and doctoral students.

The source data to construct multifactor regression are shown in Table 1, as noted, GDP per capita is a de-

pendent variable, and the number of people in preschool educational institutions, the number of school students, the number of university students, and the number of postgraduate students and doctoral students are independent variables.

The model of linear regression is as follows:

$$Y = a_0 + a_1 \cdot X_1 + a_2 \cdot X_2 + a_3 \cdot X_3 + a_4 \cdot X_4.$$

The data from 2010–2019 were studied.

Results of the study:

$$Y = 11.97 - 1.418(e-05) \cdot X_1 - (1.982e-06) \cdot X_2 + 1.403(e-06) \cdot X_3 + (1.381e-06) \cdot X_4.$$

Call:

lm(formula=Y~X1+X2+X3+X4, data=REG)

Coefficients:

Estimate Std. Error t value Pr(>|t|)

Table 2

Determination factor

	1.197e+01	7.764e+00	1.541	0.366
Intercept	1.197e+01	7.764e+00	1.541	0.366
X1	-1.418e-05	1.515e-05	-0.936	0.521
X2	-1.982e-06	8.222e-06	-0.241	0.849
X3	1.403e-06	4.924e-06	0.285	0.823
X4	1.381e-06	3.646e-06	0.379	0.770

Residual standard error: 0.2379 on 1 degrees of freedom

Multiple R-squared: 0.9966

Adjusted R-squared: 0.9691

F-statistic: 36.3 on 8 and 1 DF, p-value: 0.1277

The results show a fairly low quality of the model, there are no statistically significant coefficients, determination factor of 0.9966 is high enough, which indicates the existence of a linear relationship between the factor and objective variables.

The model was tested for heteroscedasticity, multicollinearity, and autocorrelation.

The heteroscedasticity was tested using the Breusch-Pagan test. Fig. 1 shows the plot of variance of model residues.

Table 1

Source data to construct a linear regression

Year	GDP per capita (Y)	Number of people in the preschool educational establishment (X <sub>1</sub> )	Number of pupils in secondary school (X <sub>2</sub> )	Number of students of HEI (X <sub>3</sub> )	Number of postgraduate and doctoral students (X <sub>4</sub> )
2010	23603,6	1272745	2100395	1433590	36214
2011	28813,9	1354394	1928313	1270327	35823
2012	30912,5	1428390	1926819	1153791	35454
2013	31988,7	1470817	1909691	1672194	33313
2014	35834,0	1294891	1914321	890277	30031
2015	46210,2	1291207	1708172	855683	30308
2016	55833,5	1300129	1743530	800450	27735
2017	70224,3	1303787	1796094	774076	26432
2018	84192,0	1278237	1845424	746330	23974
2019	100432,5	1230398	1914429	726336	26558



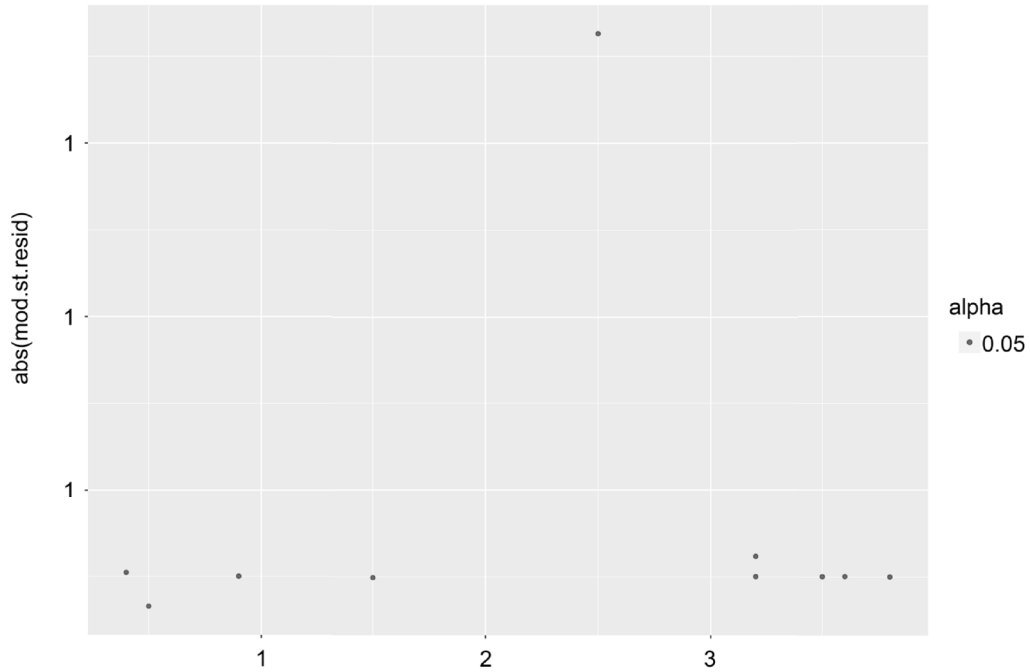


Fig. 1. Graph of the variance of model residues

Breusch-Pagan test

data: mod

$BP=8.3539$ ,  $df=8$ ,  $p\text{-value}=0.3997$

Non-constant Variance Score Test

Variance formula:  $\sim$ fitted.values

Chisquare= $0.9057871$ ,  $Df=1$ ,  $p=0.34123$

Heteroscedasticity in Fig. 1 is shown as the one grouped in the bottom area of the graph, and non-sequential magnitudes are “scattered” from above. Sequential variance is absent and does not affect the results of constructing a model. The test shows that the variance of residues is constant and there is no heteroscedasticity.  $p=0.34123$ , which gives reason to accept the hypothesis of homoscedasticity.

Verification for multicollinearity of the model was made according to the Belsey method. Fig. 2 shows the correlation matrix  $X$ .

Table 2

Correlation matrix

Factor	X1	X2	X3	X4
X1	1.00000	0.00816	0.17335	0.61965
X2	0.00816	1.00000	-0.02005	-0.37456
X3	0.17335	-0.02005	1.00000	0.74352
X4	0.61965	-0.37456	0.74352	1.00000
X5	0.54723	-0.64552	0.58528	0.86888
X6	0.71745	-0.47606	0.62382	0.94378
X7	0.4051	-0.56508	0.77414	0.90563
X8	0.3693	-0.22614	0.89007	0.85094

Observing a high paired correlation factor ( $>0.6$ ) between many pairs of variables, we can conclude that there is multicollinearity in the system.

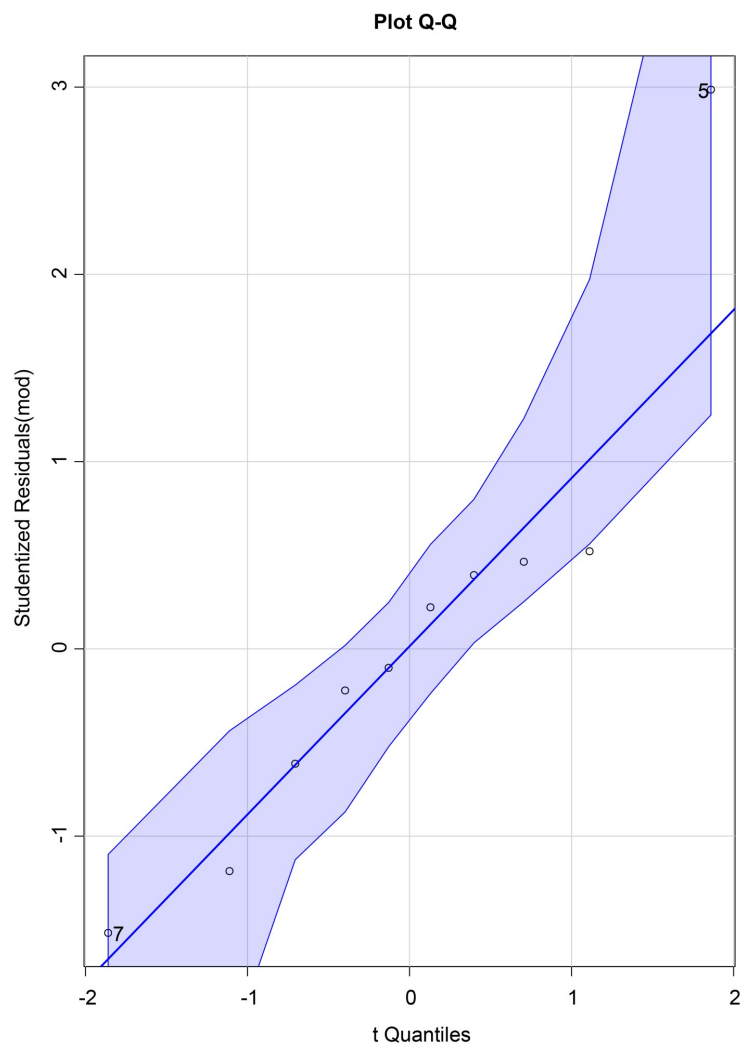


Fig. 2. Plot of standardized model residues

Overall Multicollinearity Diagnostics  
MC Results detection

Determinant  $|X'X|$ : 0.0000 1

Farrar Chi-Square: 115.9398 1

Red Indicator: 0.6870 1

Sum of Lambda Inverse: 2100.1324 1

Theil's Method: 0.8821 1

Condition Number: 1132.6056 1

1 --> COLLINEARITY is detected by the test

0 --> COLLINEARITY is not detected by the test  
Multicollinearity is proved for all Belsey text indicators.

The autocorrelation of residues was checked using the Durbin-Watson method. Fig. 2 shows the graph of the standardized residues of the model.

Autocorrelation is sometimes known as sequential correlation in the case of discrete time – a correlation of a signal with a delayed copy of itself as a function of delay. Informally, it is the similarity between observations as a function of the time lag between them. Fig. 2 shows that the results of the Durbin-Watson test and  $p$ -value=0.028 proves the existence of autocorrelation of residues in the model.

The results of the multifactor analysis show that the GDP of Ukraine, its per capita indicator, has a direct but insufficient dependence on the indicators of the development of the baby economy (mostly the system of educational process and upbringing). The model shows that the GDP depends most on the development of preschool education, which can be explained by the popularity of preschool institutions among parents and their use for primary education and the upbringing of a child. This relation is indirect because preschool education is the investment in the development of human capital, dividends from which should be received in adulthood, when developing nanotechnological solutions, in particular.

The national economy of the educational process and upbringing should be implemented in the national and world processes of activation of the nano-economy. And this is not only an exchange of students but rather an opportunity to adapt to the new requirements of world innovation progress, it is an opportunity to be in the trend of world-economic scientific, and technical innovations.

---

## 6. Discussion of results of studying the content of the baby economy within the nano economic system

---

The obtained results on the formation of the baby economy can be explained by the facts that:

- the existence of a child is limited to the family and household, so the laws of household development affect the formation of a personality who grows up and becomes an economic person. The household ensures the creation of human capital of the future adult, who may become a researcher of nanotechnological solutions in this national innovation system;

- the system of the educational process and upbringing is also a link that provides conditions for growing up and socialization of a child. This system assumes that within its

framework, there is an acquisition of the first competencies, which will become the basis for professional specialization in adulthood. A child learns how to use knowledge in practice starting from preschool and acquires the skills to apply theoretical knowledge in professional life at university. It should be noted that the majority of papers in this area deal with the economy of education. This is the economy of the educational process as a set of forms, methods, and educated workforce. This category becomes the basis for the interpretation of the baby economy. Thus, the baby economy is a complex phenomenon that includes the economy of education (at all levels – preschool, secondary, higher, and post-university). Correlation of these categories is the direction of subsequent research;

- the baby industry is a niche category, so products for children are not made in all countries of the world, but the demand for them is quite significant. In addition to the practical component, a qualitative component is outlined here, because the quality of life of certain children depends on the possibility of having high-quality children's goods. This is the provision of a basic need to protect physical existence. Having closed this aspect, it is possible to develop other needs, the quality and quantity of which are formed when a child grows up;

- the regression model made it clear that the impact of baby factors on the nano economy is negligible. This shows that in countries with transitive economies, there is a process of formation of such phenomena as nano- and the baby economy. Both theoretically and practically, these phenomena pass through the initial stage of formation, which indicates the influence of the individual factor on all levels of the household systems.

The limitations characteristic of these studies are as follows:

- determining the differences between an economic person-child and a person-adult (with an emphasis on their economic capabilities rather than psychological ones);

- a combination of analysis of physical (separate children and adults) and legal entities (enterprises and institutions).

The disadvantages include the lack of analysis of specific cases of planning the birth of a child, his/her entry into the family cell, further training and upbringing, and consumption of specific children's benefits. Such examples are quite subjective, but they compose a system called the baby economy. In the future, these aspects can be eliminated due to the calculation of the impact of the household budget on per capita indicators of the GDP of the country.

This study may be subsequently developed by exploring the impact of the baby economy on the nano economy and the development of the national economy and international economic relations. Difficulties that can be faced in the analysis of this issue are defined as the influence of a separate child or a person on the activities of a separate enterprise or industry, region, or country as a whole. In the future, it is necessary to find a model of this influence and use it in practice.

---

## 7. Conclusions

---

1. The institutional and value approach to the definition of the baby economy involves analyzing it as an institution with a collection of "rules of the game", and its subjects are children, adults, households, educational organizations, and production structures. This approach determines that a child

should, through parents, influence the receipt of benefits from low costs. Qualitative indicators show that the key subject of the baby economy is a child, all other subjects ensure the development of a child and turn him into a highly qualified specialist.

2. The qualitative characteristic of the baby economy indicates that the new conditions for the functioning of households with the satisfaction of their needs for tangible and intangible benefits are a natural goal of the nano-production. There are also three important functions of households: consumption, supply of production factors, and savings. Households need to distribute available monetary income among various benefits that meet their needs. In addition, we revealed the problem that the economy of households provides for the formation of a system of family cell management, when a person capable of creating innovative knowledge, especially in nano sectors, is formed from a positive system of family values.

3. One of the approaches to understanding the baby economy is the interpretation of the specificity of its component – the economy of the educational process and upbringing. The latter is a component of the economic system, which, along with the use of certain resources in childhood, leads to the formation of a personality that, based on creative behavior in adulthood, forms and produces benefits based on knowledge and skills. The entire educational market consists of institutions of private and state ownership. The educational market focuses on the specific skills of the teaching staff. Qualitative theory

of cooperation shows that educational institutions are teams, and cooperation takes place at the level of ministries of education of separate countries. In addition, new education markets are the reaction to the emergence of new goods and services.

4. Qualitative results of the study prove that from pregnancy planning to the first years of a child's life, the people around the child enjoy the benefits of the medical system. These are prenatal centers, maternity hospitals, and children's clinics. In addition to medical institutions, the baby industry is formed from enterprises producing children's clothing, footwear, toys, furniture, food, and supporting goods. These are niche products and markets tend to grow. The whole system of the baby economy includes the following components: household economy, the subsystem of the educational process and upbringing, and the baby industry.

5. Multifactor analysis proved that there is no consistent and determining relationship between the GDP per capita and baby factors in a country with a transitive economy. These quantitative and qualitative results showed that in the countries of the world, the economy of which is not highly developed, the baby economy is in the state of formation. The denser the relationship between the indicators of the development of nano-economy and baby factors, the more reasons there are to argue that the process of personality formation affects the human economy and its quintessence – the economy of nano-technology.

---

#### References

- Bradley, S., Green, C. (Eds.) (2020). *The Economics of Education: A Comprehensive Overview*. Academic Press, 562.
- Dumciuviene, D. (2015). The Impact of Education Policy to Country Economic Development. *Procedia - Social and Behavioral Sciences*, 191, 2427–2436. doi: <https://doi.org/10.1016/j.sbspro.2015.04.302>
- Maragkou, K. (2020). Socio-economic inequality and academic match among post-compulsory education participants. *Economics of Education Review*, 79, 102060. doi: <https://doi.org/10.1016/j.econedurev.2020.102060>
- Barua, R., Shastry, G. K., Yang, D. (2020). Financial education for female foreign domestic workers in Singapore. *Economics of Education Review*, 78, 101920. doi: <https://doi.org/10.1016/j.econedurev.2019.101920>
- Toutkoushian, R. K., Paulsen, M. B. (2016). *Economics of Higher Education. Background, Concepts, and Applications*. Springer, 390. doi: <https://doi.org/10.1007/978-94-017-7506-9>
- Noblit, G. W., Pink, W. T. (Eds.) (2016). *Education, Equity, Economy: Crafting a New Intersection*. Springer, 237. doi: <https://doi.org/10.1007/978-3-319-21644-7>
- Arrow, K. J. (1962). The Economic Implications of Learning by Doing. *The Review of Economic Studies*, 29 (3), 155. doi: <https://doi.org/10.2307/2295952>
- Kleyner, G. (2004). Nanoekonomika. *Voprosy ekonomiki*, 12, 70–93.
- Holzmann, P., Boudreau, T., Holt, J., Lawrence, M., O'Donnell, M. (2008). *The Household Economy Approach. A guide for programme planners and policy-makers*. Published by Save and Children, 140. Available at: [https://www.savethechildren.org.uk/content/dam/global/reports/HEA\\_Guide.pdf](https://www.savethechildren.org.uk/content/dam/global/reports/HEA_Guide.pdf)
- North, D. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press. doi: <https://doi.org/10.1017/cbo9780511808678>
- Abreo, C., Bustillo, R., Rodriguez, C. (2021). The role of institutional quality in the international trade of a Latin American country: evidence from Colombian export performance. *Journal of Economic Structures*, 10 (1). doi: <https://doi.org/10.1186/s40008-021-00253-5>
- Menger, K. (2014). *Issledovaniya o metodah sotsial'nyh nauk i politicheskoy ekonomii v osobennosti*. Moscow: Dekret-Media, 569.
- Vizer, F. (1992). *Problema vmeneniya dohoda. Teoriya obschestvennogo hozyaystva*. Moscow: Ekonomika. Available at: <http://ek-lit.narod.ru/viz005.htm>
- Bryu, S. L., Makkonnell, K. R. (2008). *Ekonomiks: printsipy, problemy i politika*. Moscow: OZON.RU, 468.
- Hodovana, T. L. (2017). *Formuvannya ekonomichnoho myslennia molodshykh shkolariv. KRVUZ «Tsentr detskoho y yunosheskoho tvorchestva»*. Available at: <http://metodportal.com/node/53362>