THE NEW ECONOMIC THEORY IS THE MAIN BRANCH OF THE NEW PHYSICS

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Abstract: *The paper covers the theory of economy and market from the standpoint of physics. The capabilities of the physics-based approach to the "economy" lets apply the mentioned mechanisms as universal ones in studies of economic processes and phenomena. The study's purpose to present a new economic theory as consistent as possible and explain some inexplicable matters of physics through economy. As a result, the authors compared and generalized the principles and mechanisms of economy with the known laws of physics in all its sections ("electricity", "mechanics", "vibrations", etc.). This allowed for the development of a completely new economic theory, the introduction of relevant definitions and concepts, and the development of new economic calculation methods. The study has established the foundation for new approaches to physical science, allowing us to rethink its laws and lay the groundwork for the development of cutting-edge physics.*

Keywords: economic energy, market field, commodity dynamics, market demand field, charge of usefulness, potentials of goods.

As known, energy is a general quantitative measure of the movement and interaction of all types of matter. Energy does not arise from nothing and does not disappear, it can only transfer from one form to another, but its quantity remains constant. In accordance with the various forms of motion of matter, different energy types are known: mechanical, electromagnetic, thermal, etc. At the same time, in our research we have introduced a new concept – "economic energy", which takes place in the economy. It is also converted into other forms of energy and, conversely, known types of energy are converted into economic energy[1]. On the one hand, this energy is a quantitative measure of the movement of products and services in the market[2]. On the other hand, it is a general universal value appraisal of the energies, including the spent physical energy of a person, included in products and services. For example, the cost of

[1] R.D. Akbarov, R.O. Zhilisbaeva, S.S.H. Tashpulatov, I.V. Cherunova, R.T. Bolysbekova, "Application of composite materials for protective clothing from exposure electric fields", in *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, 2018, vol. 377, no. 5, p. 188-192; A.T. Aimen, D.O. Atasheva, D.M. Khazhgalieva, L.T. Myrzakhmet-Sarykulova, A.T. Duysembaeva, "Problems of light industry development in Kazakhstan", in *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, 2020, vol. 386, no. 2, p. 42-47.

[2] I.A. Kapitonov, A. Vilks, "Economic regulation of energy costs when integrated into distribution networks of industrial enterprises", in *Energy and Environment*, 2022, vol. 33, no. 3, p. 435-448; G.S. Ukubassova, A.K. Daribayeva, A.N. Toxanova, D. Zhenskhan, A.A. Mukhamejanova, "Development of innovation infrastructure of energy complex enterprises", in *Industrial Engineering and Management Systems*, 2020, vol. 19, no. 1, p. 120-132.

living is the total value appraisal of a set of products and services included in the commodity bundle and necessary to meet the minimum needs of a citizen[3].

The basis for the movement of economic energy is the demand for this energy. And our research has concluded that the movement of all types of energy is based on the demand for any energy type. Everything on our planet and in the universe is built on the need and demand for energy and its satisfaction[4]. Gravity, the rotation of planets, the transmission of energy from a hotter body to a less hot one, the movement of material bodies and elementary particles, the energy consumption by living natures, etc. – here is an incomplete list of energy needs and movement. Even conducting physical experiences and experiments is based on the needs of researchers and is associated with the movement of energy.

A field of force is a commonly known concept in physics that determines the effect of a force on a material particle placed in the space of effect of this force. In the physical theory of economy, we have introduced a new term "market force field", which determines the effect of the demand forces of buyers on products or services. This field emerged caused by the potential energy of customer demand, extending to the entire force field. It is this energy that determines the action of the forces of demand and becomes a quantitative measure of the movement and interaction of all market components[5].

In our study, we compared and generalized the principles and mechanisms of economy with the known laws of physics in all its sections ("electricity", "mechanics", "vibrations", etc.)[6]. We searched for and relied on analogies with the well-known theses of physics, gave a number of new definitions and provisions in the new economic theory. Furthermore, our research made it possible to summarize and supplement the basic principles of physics itself in all its sections.

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[3] C.R. McConnell, S.L. Brue, S.M. Flynn (Eds.), *Economics: Principles, problems and policies*, INFRA-M, Moscow, 2019; E.S. Madiyarova, K.Z. Madiyarova, B.A. Abdiev, M.A. Ezhebekov, "Green economy: its optimization and modeling", in *Mediterranean Journal of Social Sciences*, 2015, vol. 6, no. 4, p. 186-192.

[4] U. Shalbolova, Z. Kenzhegaliyeva, "Main directions of smart city development in the republic of Kazakhstan", in *MATEC Web of Conferences*, 2018, vol. 251, article number 05042.

[5] A.S. Bulatov (Ed.), *Macroeconomics*, Yurayt, Moscow, 2019; T. Mirzoieva, V. Heraimovych, Y. Loshakova, M. Tripak, I. Humeniuk, "Optimization of the sown areas structure as a tool for the development of medicinal crop production on the basis of sustainability and regenerative agriculture", in *E3S Web of Conferences*, 2021, vol. 244, article number 03027.

[6] O. Semenenko, A. Solomitsky, P. Onofriichuk, I. Chernyshova, L. Skurinevska, R. Pekuliak, "Methodical approach to assessing level of the state energy security and its influence on the national security and economy of the country", in *Scientific Horizons*, 2021, vol. 24, no. 4, p. 90-96.

Product dynamics: Market product demand field

The physical value that characterizes the property of bodies or particles to enter into electromagnetic interactions and determines the values of forces and energies in such interactions is called an electric charge[7]. Electric charges are divided into positive and negative. The stable carriers of electric charges are elementary particles. The electric charge of any charged entity is equal to the whole number of elementary charges. An electrically neutral (uncharged) system contains an equal number of elementary charges of the opposite sign. If the electrical neutrality of the entity is violated, then it is called electrified (the charge conservation law). For all phenomena associated with the redistribution of electric charges, the sum of these charges remains constant. A force (**F**) of the interaction of two charges ($\mathbf{q_1}$ and $\mathbf{q_2}$) is called the Coulomb force. It is known that opposite charges attract each other, and the like charges repel each other[8].

A person, in the process of vital activity, loses biological energy and periodically needs to replenish it. In an energy-neutral system of the human body, when it does not need to replenish energy (for example, after eating, during sleep, etc.), its energy balance is stable. The energy balance of the human body is a state of balance between the energy coming from food and the energy involved in various life processes, including professional activities. Therefore, a person who spends energy periodically needs to replenish it[9]. In addition to the above-mentioned biological needs, a person needs to meet material (clothing, housing, household arrangements, etc.) and spiritual needs (education, attending concerts, cinemas, etc.), which are determined, respectively, by the material and spiritual energies of vital activity.

In other words, a need is a person's necessity for the energies creating the conditions for his/her existence not only as a biological object, but also as a member of society. Consequently, the person's global energy balance is determined by the balances of all the above-mentioned types of energy. When any of the abovementioned balances is disturbed, becoming negative, the person needs a positive portion of energy to make up for the negative and restore the balance. For example: a person needs to buy food to replenish energy expended, or needs to buy new clothes to replace the old one, or to continue education and eliminate the imbalance in education. It is obvious that energy itself does not overflow, but there should be a general term that

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[7] Y. Borisov, V. Korzhyk, S. Revo, "Electric and magnetic properties of thermal spray coatings with an amorphous structure", in *Proceedings of the International Thermal Spray Conference*, 1998, vol. 1, p. 687-691.

[8] V.V. Davydkov (Ed.), *Physics: Mechanics, electricity and magnetism*, Yurayt, Moscow, 2019.

[9] S.N. Kuzmin, V.I. Lyashkov, Yu.S. Kuzmina (Eds.), *Bioenergetics*, Publishing House of Tambov State Technical University, Tambov, 2011.

expresses certain types of portions of energy that a person needs. Let's call these portions charge of utility. And the charge of utility defining negative energy will be called the negative utility charge, while the energy that expresses positive energy – the positive charge of utility.

Thus, a person who needs to satisfy his/her needs in replenishing the energy spent becomes a market participant, that is, a buyer of various positive charges of utility in the products carrying these charges. This is how the market demand for products and services is formed. The analogy with the above-mentioned electrical concepts, such as: electricity, positive and negative electric charge, as well as charge carrier is obvious. In the market, as in the case of electrodynamics, there are forces of market interaction between the charges of utilities. Obviously, the opposite utility charges attract each other, and the like ones – repel. The gravity force between two opposite utility charges has opposite directions on the part of these charges.

Let's repeat some well-known definitions from economics, to which we will give a physical explanation and new concepts. Utility is the satisfaction that the product brings to the consumer. Product is a type of goods manufactured for sale. Service is a type of product, which can be produced, transmitted, and consumed simultaneously. Price (synonym – value) is a consumer's monetary assessment of the utility shaping in the market. Demand is the quantity of a product that customers want and can purchase over a certain period of time at all possible prices for that product[10].

We call the charge of utility of the product the physical value that characterizes the property of a product to enter into market interaction and determines the value of forces and energies in such interactions. A certain energy, which is concentrated in the utility charge, is invested in all products and services (bread, butter, concert tickets, laundry services, etc.). The charge of utility means the amount of energy contained in a given product and is expressed by the final price of this product on the market[11]. It is obvious that each product has its own charge of utility. For example, the utility charge of one kilogram of butter has one price and the utility charge of one car has a different price, etc. As stated above, the utility charges are divided into positive and negative ones. A positive utility charge is a utility that is formed in the process of production and organization of the sale of goods and is determined

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[10] A.S. Bulatov (Ed.), *Microeconomics*, Yurayt, Moscow, 2019; B. Derevyanko, L. Nikolenko, I. Syrmamiik, Y. Mykytenko, I. Gasparevich, "Assessment of financial and economic security of the region (based on the relevant statistics of the Donetsk region)", in *Investment Management and Financial Innovations*, 2018, vol. 15, no. 4, p. 283-295.

[11] A.S. Baktymbet, G.S. Ukubassova, S.S. Baktymbet, A.S. Baktymbet, A.M. Bakirbekova, "Economic and environmental aspects of the development of renewable energy in Kazakhstan", in *Journal of Environmental Management and Tourism*, 2020, vol. 11, no. 5, p. 1025-1039.

by the demand and value of the goods on the market[12]. Negative utility charge is a utility that the buyer does not get, but he/she has the money to buy a product on the market that has a positive charge and thereby make up (pay off) the negative charge. In electrodynamics, the carrier of the electric charge is an elementary particle, while in economy the product with a utility charge included is the very carrier[13]. The utility charge of the finished product can consist of the utility charges of raw materials, goods, component parts and assemblies, labour power, etc.

For the convenience of the subsequent presentation of the research findings, those who are involved in the production, transportation, and sale of productswill be called "the product makers"[14]. Market or product-money interaction will be called the interaction between the maker and the buyers of these products. Product dynamics is the section where these market interactions are examined. The market or product-money force field of demand we can call the form of matter through which market interactions are carried out. The market demand field is created by negative utility charges that determine the need for some product, causing demand in the market.

The market demand field is described by certain power and energy characteristics[15]. Electro dynamic as the concept of the dielectric field intensity, being the power characteristic of this field[16]. The force characteristic of the market demand field is called the intensity ($\mathbf{E^k}$) of this field:

$$E^k = F/q_1, \quad (1)$$

where: $\mathbf{E^k}$ – the intensity created by one negative utility charge (one buyer). $\mathbf{F}$ – the force affecting one positive utility charge in that field. $\mathbf{q_1}$ – one positive utility charge.

The intensity of the market demand field at some point is equal to and coincides in direction with the force affecting one positive charge of utility. The force affecting the charge $\mathbf{q_1}$ in any market demand field with the intensity $\mathbf{E^k}$ is equal to:

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[12] N.M. Kaparov, Z. Omarkhanova, A.B Rakhisheva, S.S. Saparbayeva, D.I. Zakirova, A. Bakytgul, "Development of production and investment measures for energy saving and energy efficiency in rural areas", in *Journal of Environmental Management and Tourism*, 2020, vol. 11, no. 5, p. 1251-1258.

[13] Yu.M. lankin, V.G. Soloviov, V.G. Tyukalov, I.Yu. Romanova, "Comparison of the processes of electroslag welding at power connection by mono- and bifilar circuits", in *Paton Welding Journal,* 2021, no. 11, p. 22-28.

[14] F.S. Mishkin, *Economic theory of money, banking and financial markets*, Williams, Moscow, 2018.

[15] Yu.M. Lankin, V.G. Soloviov, V.G. Tyukalov, I.Yu. Romanova, "Stability of the process of electroslag welding with bifilar power circuit", in *Paton Welding Journal,* 2021, no. 12, p. 24-28.

[16] V. Glukhov, E. Balashova, *Economics and management in communications*, Piter, Saint Petersburg, 2012.

$$F = q_1 \cdot E^k. \quad (2)$$

Obviously, the force **F** is the monetary expression of the utility charge, and the intensity $\mathbf{E^k}$ is the proportionality factor between the cost of the utility charge and the charge itself. Namely, the utility charge causes the force of demand in a certain market field. For example: winter fur coat is a utility charge causing the force of demand for it in countries with a cold climate, will not have the force of demand in countries with a hot climate, because there is no demand for its utility charge.

It should be noted that the intensity of the market field E is identical to the coefficient of elasticity (stiffness) under the deformation of an elastic body (Hooke's law)[17]. A market field is called homogeneous if its intensity $\mathbf{E^k}$ is the same at all points of the field. For example: the cost of one product in all the markets of the city is almost the same.

The lines of intensity are disconnected – they start at positive charges and end at negative charges. In electrodynamics, according to the "principle of superposition" of electric fields, the field strength of a system of charges is equal to the sum of the field strengths created by each of them separately[18].

As mentioned above, a negative utility charge creates a market field determined by the demand for a positive charge. According to the same superposition principle, the intensity of the market field of a system of utility charges is equal to the sum of the field intensities created by each of them separately. It is obvious that the total demand for a certain quantity of products is determined by the sum of the demand for this product on the part of each buyer.

Some clarification is needed. In electrodynamics, there are terms – "charged particle", "electric charge", and "charge carrier", the electric charge included in the charge carrier is a charged particle[19]. The positive charge of utility is included in its carrier, and the term "product" is the carrier of the product together with the charge of utility[20].

So: Product = utility charge · 1 pc of carrier, or:

$$Q_1 = q_1 \cdot 1pc. \quad (3)$$

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[17] N.A. Gorelov, O.N. Korableva, *Development of the information society: Digital economy*, Yurayt, Moscow, 2019.

[18] R.S. Grinberg, A.Ya. Rubinstein, R.M. Nureyev, *Economy of the public sector (New theory)*, Infra-M RIOR, Moscow, 2016; V. Sydorets, V. Korzhyk, V. Khaskin, O. Babych, O. Berdnikova, "On the thermal and electrical characteristics of the hybrid plasma-MIG welding process", in *Materials Science Forum*, 2017, vol. 906, p. 63-71.

[19] V. Iokhin, *Economic theory*, Yurayt, Moscow, 2017.

[20] *Ibidem*.; G.B. Kaznachevskaya, *Fundamentals of economic theory*, Feniks, Rostov-on-Don, 2020.

If a consignment of $\mathbf{Q_n}$ products in the amount of **n** pieces is offered to the market for sale, then:

$$Q_n = Q_1 \cdot n, \tag{4}$$

where: $\mathbf{Q_1}$ – the product providing general information about its utility in its name.

For example: product ($\mathbf{Q_1}$) – 1 kg of butter 82% fat. In this case, "1 kg of butter" is the charge carrier, and "82% fat is the utility charge expressed calories. As an example: there are three different products – butter, sunflower and olive oils with the same charges of utility (in this case of the same calories), but the carriers of this charge are substances of different composition.

Or, another example: an engine of a new car in a car dealership is defective. And in this case, the car itself and the engine, which are carriers of utility charges, cease to be products, but they are utility charges carriers, and if an engine is replaced on this carrier to a new one, then the car will become a product again. As exemplified herein, a product without a utility charge makes no sense.

It should be noted that the force of demand affecting the utility charge performs work and moves the carrier together with the utility charge in it. The work of the force **F** on the product movement and the satisfaction of the buyer's demand for one product will be:

$$A_1 = E \cdot Q_1 = F/q_1 \cdot (q_1 \cdot 1pc) = F \cdot 1pc. \tag{5}$$

The work of the force on the sale of the product is equal to the force affecting the carrier of the utility charge at the time of purchase of this product by the buyer. We call this value the product potential φ_1.

$$\varphi_1 = A_1 = F \cdot 1pc, \tag{6}$$

where: φ_1 – is the cost of one product, determined by demand. That is, the potential, as the price of one product, is a cost (monetary) analogue of the utility charge together with its carrier.

Then, the work of ($\mathbf{A_n}$) forces to satisfy the demand of a consignment of products in the amount of **n** pieces will be:

$$A_n = \varphi_n = \varphi_1 \cdot n. \tag{7}$$

Let's give an explanation about the expressions- **n** pieces of the product and **n** pieces of the carrier. Obviously, they are identical. The work of the force

to satisfy market demand does not depend on the form and product movement path (in electrodynamics- the property of the potentiality of electrostatic forces), that is, wherever the product is located, entering the market field of demand, the demand forces of this field affect it and the final position of this product is the moment of its acquisition by the buyer[21].

A given market field of demand (for example: a country), covering the maximum space, can receive products from different manufacturers and even from other countries at a price that has developed in this field. It should be added that the energy characteristic of the market field of demand for a certain quantity of products is the potentials of these products. It is these potentials that make up the total potential energy of the market field – $\mathbf{P_n}$:

$$P_n = \varphi_1 \cdot n. \tag{8}$$

The energy coming to one product will be:

$$\varphi_1 = P_n/n, \tag{9}$$

where: **n** – is the quantity of the product.

The positive potential of one product, i.e. the supply potential, is a quantity numerically equal to the potential product energy created by a single positive charge of the utility of this product, which is able to satisfy the buyer's demand for this utility. The negative potential, that is, the demand potential, is numerically equal to the potential energy of the unit charge of utility that the buyer needs. These opposite potentials must be equal in absolute value, which determines the ability to sell the product, its actual utility and cost[22].

It is obvious that the product maker brings to the market for sale a real product with a charge of utility and a positive potential, and the buyer, having a value analogue of this product in the form of cash, buying the product, pays the product maker the price of this product, compensates for the negative potential and repays its negative charge.

To describe the market field of demand, the difference in the potentials of products before the sale of a consignment of products and after, that is, φ_{n1}-φ_{n2} and both of these potentials tend to zero as they are sold. Therefore, we will apply the term "potential difference" for the further explanations, keeping in mind the buyer's potential φ_{n2} equal to zero, and in the course of sale, the number of potentials decreases to zero at the end of the sale.

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[21] A. Butyrskyi, L. Nikolenko, B. Poliakov, N. Ivanyuta, L. Donchak, I. Butyrska, "Economic, investment and legal paradigm of shale gas development: World experience and prospects for ukraine", in *Montenegrin Journal of Economics*, vol. 15, no. 2, p. 165-179.

[22] G. Chaizhunusova, D. Tsoi, *Fundamentals of economics*, Folio, Moscow, 2016.

Thus, the total potential energy of $\mathbf{P_n}$ per consignment in the amount of *n* pieces before sale is decreased by the potential energy of $\mathbf{P_1}$ as each product is sold:

$$P_{n-1} = P_n - P_1 \; ; \quad P_n \rightarrow 0. \tag{10}$$

At the end of the sale, the potential energy of the entire consignment will be equal to zero ($\mathbf{P_n = 0}$).

It follows from the above that the potential of one piece of product is equal to the force of demand for this product, performing the potential work of moving the finished product and selling it. The force of demand for a product is defined by the energy in the action of this force to meet the demand for this product.

The intensity of the market demand field is also defined through the potential of one product:

$$E = F/q_1 = \varphi_1/q_1 \cdot 1pc = \varphi_1/Q_1, \tag{11}$$

where: $\boldsymbol{\varphi_1}$ – potential of one product or its value, $\mathbf{Q_1}$ – one product, $\mathbf{q_1}$ – utility charge.

The physical significance of intensity lies in the fact that this value determines the potential (cost) of one product (or to the utility of a product). The intensity is the proportionality factor between the value of a product and the product itself with its utility charge. For example: In-store cost of 1kg of butter is 8 USD ($). Obviously, the buyer pays $4 for 0.5 kg of this butter.

$$E = \varphi_1/Q_1 = 8\$/1 \text{ kg} = 4\$/0{,}5 \text{ kg}. \tag{12}$$

Thus, the market-value of a product shapes the power[23] and energy features of both the product itself and its market demand field as a whole.

There are the concepts of "electric capacitance" and "mutual electric capacitance" in the electrodynamics. And there is a device called a capacitor, concentrating the mutual electric capacitance. The physical value measured by the ratio of the $\mathbf{q_{el}}$ – charge of the conductor (plate) to $\boldsymbol{\varphi_{el}}$ – its potential is called the electric capacitance of a secluded conductor – $\mathbf{C_{el}}$:

$$C_{el} = q_{el}/\varphi_{el}. \tag{13}$$

[23] V.V. Levchenko, "Improvement of thermometric control of nuclear power plant equipment based on the study of the possibility of using intelligent sensors", in *Scientific Herald of Uzhhorod University. Series "Physics"*, 2021, vol. 49, p. 26-34.

The capacitor consists of two parallel flat plates, charged with the same absolute value, but opposite charges (positive and negative). There is a dielectric between the plates (a material preventing the charges from passing through). The plates are positioned in the way for the electric field created by these plates to be concentrated in the space between them. The mutual electric capacitance ($\mathbf{C_{el}}$) of these two conductors is a physical value numerically equal to the charge ($\mathbf{q_{el}}$), to be transferred from one plate to another to change the potential difference $\mathbf{(\varphi_{n1}-\varphi_{n2})_{el}}$. per unit.

The transfer of charges is carried out through an external wire in the key make:

$$C_{el.} = q_{el.} /(\varphi_{n1}-\varphi_{n2})_{el.} \quad (14)$$

The mutual capacitance is directly proportional to the specific inductive capacity of the medium between the plates. A negatively charged plate needs electrical charges in a positively charged plate[24]. Applying the above-mentioned principle to the economy, we see that the electric field between the capacitor plates is similar to the market demand field.

Imagine that a positively charged plate of a capacitor is a product and its maker with financial and production resources, while a negatively charged one is the buyers with their monetary resources. The plates are spaced apart to cover the market demand field. It can be in the same city or same country; a maker can be located in another country as well.

As in the case of electrodynamics, some physical values on the plates of a maker and a buyer, such as utility charges, potentials, potential energy and so on, are equal in absolute value[25]. The physical value (Cdemand) to be found by the ratio of the number of products demanded to the number of their potentials, that is, their total value, will be called the product capacitance of demand for a certain product.

$$C_{demand} = Q_{n2}/\varphi_{n2}$$

or

$$C_{demand} = Q_2 \cdot n_2/(\varphi_2 \cdot n_2) = Q_2/\varphi_2. \quad (15)$$

[24] V.V. Davydkov (Ed.), *Physics: Mechanics, electricity and magnetism*, Yurayt, Moscow, 2019.

[25] S.S. Tashpulatov, Z.A. Sabirova, I.V. Cherunova, L.F. Nemirova, U.T. Muminova, "A device for studying the thermophysical properties of bulk textile materials and their packages by the regular mode method in air [Dispositivo para estudo das propriedades termofísicas de materiais têxteis de volume e suas embalagens pelo método de modo regular no ar]", *Periodico Tche Quimica*, 2020, vol. 17, no. 34, p. 940-950.

The physical value ($\mathbf{C_{supply}}$) to be found by the ratio of the number of products offered for sale, to the number of their potentials, that is, their total value, will be called the supply capacitance for a certain product:

$$C_{supply} = Q_{n1}/\varphi_{n1}$$

or

$$C_{supply} = Q_1 \cdot n_1/(\varphi_1 \cdot n_1) = Q_1/\varphi_1. \quad (16)$$

Mutual product capacitance or market product capacitance is a physical value numerically equal to the quantity of products to be sold by the buyer to satisfy the demand expressed by the potential difference (φ_{n1}-φ_{n2}):

$$C = Q_{n1}/(\varphi_{n1}-\varphi_{n2}). \quad (17)$$

Besides, the market product capacitance is a physical value numerically equal to one product to be sold to the buyer to change (reduce) the potential difference by one unit (φ_{n1}-φ_{n2}).

As it is known, the regulatory function of the market is to ensure that the demand for products is equal to their supply, therefore:

$$C_{demand} = C_{supply};$$

$$Q_{n2}/\varphi_{n2} = Q_{n1}/\varphi_{n1}$$

or

$$Q_2 \cdot n_2/(\varphi_2 \cdot n_2) = Q_1 \cdot n_1/(\varphi_1 \cdot n_1). \quad (18)$$

To keep this ratio, all the values must be equal. Otherwise, the cases known from the economy history arise on the market.

Let's consider the physical significance of the "product capacitance" concept. On the one hand, the product capacitance on demand: $\mathbf{C = Q_2 \cdot n_2/(\varphi_2 \cdot n_2)}$ – is an indicator of the market capacity, showing the quantity of a product $\mathbf{Q_2 \cdot n_2}$ the market can accommodate (per day, decade, month, etc.) at a certain price φ_2 to satisfy demand. The bigger the product capacitance **C**, the more products will be in demand at a constant price. On the other hand, the product capacitance according to the formula $\mathbf{C=Q_1/\varphi_1 = Q_2/\varphi_2}$ is the proportionality factor for all the values in this formula.

Let's introduce a new concept – "energy capacity of the market field", being the inverse value of the product capacitance. Market energy capacity is a physical value to be found by the ratio of the total potential (cost) of demand to the quantity of goods:

$$1/C = \varphi_n / Q_n = \varphi \cdot n / (Q \cdot n) = \varphi / Q. \quad (19)$$

The value of the energy capacity defines the amount of energy the market contains in monetary terms using a formula $\mathbf{1/C = \varphi_n / Q_n}$, and using a formula $\mathbf{1/C = \varphi / Q}$ it defines the amount of energy within the utility of one product. In the existing market, the increased energy capacity means the increase of the demand for the product, with the same volume of product supply. If the energy capacity has decreased, then the supply of products has increased at the same price.

Let's express the potential energy of the market demand field in terms of the energy capacity:

$$P_n = \varphi \cdot n = Q \cdot n / C. \quad (20)$$

Upon sale of a product, energy in monetary terms, according to the formula $\mathbf{P_n = \varphi \cdot n}$ transfers from buyers to a product maker, and energy in product terms $\mathbf{P_n = Q \cdot n / C}$, transfers from a product maker to buyers, that is, the cost of a product goes to a product maker, and the product – to buyers.

Marketable current

All substances are divided into conductors, insulators, or semiconductors in the field of "electricity" based on their electric conductivity (electrical conductivity), or their capacity to conduct electric current[26]. The orderly movement of electric charges is known as electric current or conduction current. The electric current's direction is the direction in which the electric charges move in a logical order.

Current $\mathbf{I_{el}}$ is an amount equal to the charge **q**, which is passed via the conductor's cross-section in time **t**[27].

$$I_{el} = q/t$$

Electrical conductivity is determined by the conductor's electrical permeability. Permeability ε_r indicates how many times the force of interaction between two electric charges in a conductor is smaller than in vacuum, when $\varepsilon_o = 1$ (electric constant.):

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[26] V. Sydorets, V. Korzhyk, V. Khaskin, O. Babych, O. Bondarenko, "Electrical characteristics of the equipment for the hybrid plasma-MIG welding", in *58th Annual International Scientific Confererence on Power and Electrical Engineering of Riga Technical University, RTUCON 2017 - Proceedings*, 2017, vol. 2017-November, p. 1-6.

[27] A.A. Detlaf, B.M. Yavorsky, *General physics course*, Vysshaya Shkola, Moscow, 2017.

$$\varepsilon_a = \varepsilon_o \cdot \varepsilon_r, \quad (21)$$

where: ε_a– absolute permeability used in various "electricity" formulas.

The impact of polarization of the conductor under the action of an electric field causes a variation in permeability from unity[28]. In insulators, there is no conduction current ($\varepsilon_r=0$). Electrical conductivity in semiconductors is somewhere between insulators and conductors. Semiconductors are extremely sensitive to environmental factors such as temperature, light, and so on[29]. All of these external impacts, such as, energy injection from the outside, increase their electrical conductivity.

Since our research is based on comparisons with "electricity", we will continue to introduce new definitions and concepts in "economics"[30]. Commodity current is the orderly movement of goods from a commodity producer to buyers. Commodity conductivity is a feature of the market capable of providing a commodity current. The market for any commodity is classified into market ones based on commodity conductivity: conductors, insulators, and semiconductors. A market conductor for a certain commodity is a market with commodity conduction capable of providing a stable commodity current[31].

We will designate a market insulator for this product one that is defined by the lack of a conduit for any product. The winter clothing market in hot climates, or the pork market in Arab countries, are examples of market insulators. We will term a market semiconductor for a given commodity a market with low commodity conductivity but the possibility to enhance commodity current under external influence from commodity producers and sellers (marketing). External influence implies financial costs (energy injection) for advertising and other marketing techniques[32]. Commodity permeability refers to the market's ability to ensure demand for a certain commodity, particularly one that has never been on the market before.

Permeability is influenced by a variety of factors, including economic ones such as government regulation, purchasing power, and so on (climate,

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[28] E.F. Borisov, A.A. Petrov, T.E. Berezkina, *Economics*, Prospect, Moscow, 2020; T.G. Popovych, V.I. Polyukhovych, T.B. Pozhodzhuk, O.R. Kovalyshyn, "Economy, law, community: Sustainable development and a new paradigm", in *Asia Life Sciences*, no. 1, p. 39-56.

[29] A.T. Aimen, D.O. Atasheva, D.M. Khazhgalieva, G. Amirova, I. Suleymenova, "Experience of foreign countries in light industry development", in *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, 2020, vol. 386, no. 2, p. 57-59; L.V. Korolchuk, "Decoupling of economic growth from environmental damage: A theoretical aspect", in *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 2021, vol. 8, no. 1, p. 37-45.

[30] S.G. Kalashnikov, *Electricity*, Nauka, Moscow, 2017.

[31] M. Aydarkhanov, *Foundations of economic theory*, Folio, Moscow, 2017.

[32] S.G. Kalashnikov, *Electricity*, Nauka, Moscow, 2017.

eating habits, etc.). The coefficient of permeability, which is involved in determining the degree of demand for a product and market tension, is used to define commodity permeability. The known values of the existing market for a product in the producer's country and the assumed values in the studied market of a certain country are used to calculate this coefficient.

To determine the coefficient more precisely, it is preferable to compare it to the existing market for this product[33], which is similar to the market under investigation in terms of purchasing power and other economic parameters[34]. We propose using the following formula to compute the permeability coefficient:

$$\varepsilon = \varepsilon_u \cdot \varepsilon_d$$
$$\varepsilon_u = (\varphi_u \cdot n_u) / (\varphi_c \cdot n_c)\ \varepsilon_d = d_u / d_c$$
$$\varepsilon = (\varphi_u \cdot n_u \cdot d_u) / (\varphi_c \cdot n_c \cdot d_c), \quad (22)$$

where: $\boldsymbol{\varepsilon}$ – the permeability coefficient of a product on the market in the country under investigation; $\boldsymbol{\varepsilon_u}$ – the relative permeability coefficient of a product in the market under investigation; $\boldsymbol{\varepsilon_d}$ – constant coefficient of permeability for all products in the existing and researched markets; $\boldsymbol{\varphi_c}$ and $\boldsymbol{\varphi_u}$ – the cost of the goods, respectively, in the existing and researched markets; $\mathbf{n_c}$ and $\mathbf{n_u}$ – the amount of goods, respectively, sold on the existing and, presumably, sold on the market under investigation; $\mathbf{d_c}$ and $\mathbf{d_u}$ – purchasing power, respectively, in the existing and markets under study.

If the population sizes of the countries with the study and current markets are similar, this formula can be applied. If this is not the case, new concepts such as $\mathbf{n_{ua}}$ (number of items sold) and $\boldsymbol{\kappa}$ (coefficient of reduced population) must be used:

$$n_{ua} = n_c \cdot K;$$
$$K = a_u / a_c, \quad (23)$$

where: $\mathbf{n_c}$ – the number of goods sold in the existing market of a particular country; $\mathbf{a_u}$ – population in the country with the market under investigation; $\mathbf{a_c}$ – population size in a country with an existing market.

The permeability coefficient formula will therefore be as follows:

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[33] V. Adamchuk, O. Dovbnenko, Y. Danik, O. Skydan, "Technological aspects of energy-efficient high-quality cleaning of indoor air from harmful impurities", in *Scientific Horizons*, 2021, vol. 24, no. 4, p. 17-24.

[34] A.T. Okanova, G.S. Kaipova, A.Z. Nurmagambetova, A.Z. Shakbutova, D.I. Zakirova, "The measurement of quality of income tax assessment in building contractors", in *Intellectual Economics*, vol. 15, no. 1, p. 140-164.

$$\varepsilon = (\varphi_u \cdot n_{ua} \cdot d_u)/(\varphi_c \cdot n_c \cdot d_c). \quad (24)$$

Due to additional transportation expenses and customs charges, the cost of the goods φ_u in the market under study will be greater than the value of the item φ_c in the existing market. Permeability ε should be within unity, or better, greater than it.

For market conductors – $\varepsilon \geqslant 1$. For market insulators – $\varepsilon = 0$. For market semiconductors at the start of sales, $\varepsilon = 0.5\text{-}0.7$, with subsequent growth to unity due to marketing strategies and, as a result, higher costs (energy injections)[35].

The path of movement of commodities is shown by the diagram of a simple commodity flow: production – transportation – sale. Individual industrial entrepreneurs, transporters, and sellers of goods are the organizers of the above points in the commodity flow scheme.

Let us recall the previously accepted fact that for the convenience of further clarifications, we called them all in one word – a commodity producer who, in one person, produces transports and sells goods. As it was said in the first part of our research, product $\mathbf{Q_1}$ – is a carrier with a charge of utility $\mathbf{q_1}$ included in it:

$$Q_1 = q_1 \cdot 1pc, \quad (25)$$

where: **1pc –** one piece of carrier of one charge of utility. We called this definition the usefulness of the product. There is another definition of a product through its cost:

$$Q_1 = \varphi_1. \quad (26)$$

Product $\mathbf{Q_1}$ is equal to the potential, which indicates the amount of energy contained in the product in value terms. The strength of the commodity current **I** is a scalar quantity numerically equal to the ratio of one piece of carrier (**1 piece**) to the time **Δt** of its production (manufacturing and sale):

$$I = 1pc./\Delta t. \quad (27)$$

By the density of the commodity current **J** we mean the number of carriers simultaneously manufactured and sold by the commodity producer during the time **Δt**:

$$J = I \cdot n = 1pc./\Delta t \cdot n. \quad (28)$$

[35] S.N. Ivashkovsky, *Economy for managers. Micro and macro levels*, Business, Moscow, 2019.

For example: a company has three production lines. In this case:

$$J = 3\text{pieces} / \Delta t \quad (29)$$

A demand for a commodity is required for the emergence and maintenance of a commodity current. This need for this commodity establishes a possible market area of demand. Because demand forces are potential and does not conduct work, the demand field is unable to provide a commodity current. The following requirements must be followed in order for a continuous commodity current to exist in a conductor:

a) The action of the forces of the market field for the manufacture and sale of goods, or, in short, "the market supply field," is required to establish a commodity current. The market demand field is what generates the conditions for a supply field to arise, complete with its own forces, intensity, potentials, and energy. The market supply field is potentially determined by the capacities of the commodity producer before the commencement of production and sale of commodities, and when the process of manufacturing goods begins, the supply field from the potential becomes the field of action of real forces.

b) The chain of commodity current: "production – sale – production" must be closed. As a result, a potential difference in the market conductor at the commodity chain's endpoints is maintained, and a constant commodity current flows through the chain.

c) The pressures formed by the market supply field must work on the utility charges in addition to the potential forces of demand. Let us refer to these forces as "real forces." Real forces are not potential; they are active participants in the production and selling of things.

d) The supply field and real forces are created in the source of the commodity current. From "electricity" it is known that electrical energy is generated in sources of electric current by converting other types of energy into it, such as mechanical, thermal, chemical, etc.[36] As a result, the charges are divided into positive and negative ones. This energy is concentrated in a source with "plus" and "minus" terminals[37].

The commodity producer and his production components – premises, means of production, raw materials and materials, labor, and so on – are the source of the commodity current. Each of these production factors has potential energy, and the overall potential energy of the commodity producer,

[36] G. Dyussembekova, G. Bayandina, D. Zakirova, R. Sartova, M. Kalmenova, "The electric energy sector of Kazakhstan: State and vision for the country taking into account the international trends", in *International Journal of Energy Economics and Policy*, 2019, vol. 9, no. 3, p. 179-186.

[37] S.G. Kalashnikov, *Electricity*, Nauka, Moscow, 2017

or the potential energy of the market supply field, is the sum of these components. During the manufacturing process, particles of this energy are invested in the product, forming a positive charge on the usefulness of the product. Other types of energy (mechanical, thermal, chemical, etc.) are turned into the type of energy that corresponds to the utility charge in sources of marketable current, in the process of making various items (food, clothing, vehicles, etc.)[38]. As previously said, we referred to the general cost estimate of these types of energy contained in the utility charge as economic (or cost) energy, which is universal not only for evaluating a specific product, but also for evaluating all factors of production[39].

Negative utility charges are formed as a result of the producer's expenses for the manufacture of goods – a decrease in production factors (in warehouses – raw materials and materials, depreciation deductions, etc.) and, most importantly, as a result of the mental and physical energy consumption of workers employed in production. The value of an employee's expended energy is clear, and in order to replace his negative utility costs, he becomes a consumer, acquiring things on the market[40]. The partition of charges into positive and negative occurs at the source of the commodity current, determining the formation of the supply field. The commodity producer again purchases raw materials and materials, hires labor, etc. All these factors are calculated in advance for the entire amount (batch) of goods for which there is demand. This calculation determines the potential (value) φ_1 of one product and the potentials φ_{n1} – of the total number of goods.

The number of potentials φ_{n1} constitutes the potential energy of the supply field. These potentials will be called supply potentials. When there is a demand for any product in the amount of n -pieces with potentials of buyers (money) φ_{n2}, potentials φ_{n1} arise on the market supply field, opportunities for the production and sale of goods with potentials to meet the demand. This is how a potential difference ($\varphi_{n1} - \varphi_{n2}$) arises between the producer and the buyers.

Supply potentials create supply forces capable of creating and sustaining a commodity flow. These forces, creating positive charges, by their action move them towards the forces of demand. We called these forces real forces

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38 A.S. Baktymbet, S.S. Baktymbet, R.K. Yelshibayev, G.S. Ukubassova, A.S. Baktymbet, "The fourth energy transition and development of energy sector in Kazakhstan", in *Journal of Advanced Research in Law and Economics*, 2020, vol. 11, no. 3, p. 735-746.

39 G.S. Ukubassova, A.B. Amirbekova, K.K. Primzharova, A.K. Daribayeva, D.T. Ismailova, "Competitive peculiarities of industrial enterprises' products", in *Periodico Tche Quimica*, 2019, vol. 16, no. 33, p. 434-447.

40 D.O. Atasheva, A.T. Aimen, A.B. Moldasheva, I.K. Suleimenova, "State and ways of development of the light industry in Kazakhstan", in *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, 2020, vol. 386, no. 2, p. 36-41.

and it is they who do the real (not potential) work. The strength of the supply field $\mathbf{E^c}$ is a physical quantity that is numerically equal to the supply force $\mathbf{F^c}$, acting in the supply field on a positive charge of utility q:

$$E^c = F^c/q. \quad (30)$$

Towards $\mathbf{E^c}$ coincides with $\mathbf{F^c}$.

Tension is the proportionality coefficient between the force acting on the utility charge and the charge itself. Nonetheless, as previously said, the force operates on the charge; however, the job of this force consists of the production of the carrier and, as it is being manufactured, the incorporation of a utility charges into it, as well as the movement and implementation of this carrier:

$$A_1 = E^c \cdot Q_1 = (F^c/q) \cdot Q_1 = (F^c/q) \cdot q \cdot 1pc = F^c \cdot 1pc. \quad (31)$$

Obviously, $\mathbf{F^c}$ is the cost of the utility charge. Based on this, the product formula can be written as:

$$Q_1 = F^c \cdot 1pc$$
$$Q_1 = \varphi_1 = F^c \cdot 1pc, \quad (32)$$

where: $\boldsymbol{\varphi_1}$ – potential of one product, expressing its value. All work on the manufacture and sale of goods in quantity **n** – pieces will be:

$$\varphi_{n1} = A_1 \cdot n = \varphi_1 \cdot n = A_n. \quad (33)$$

According to the theory of superposition of fields, the total strength **E** of the market field inside the market conductor, through which the commodity current flows, is equal to:

$$E = E^k + E^c, \quad (34)$$

where: $\mathbf{E^k}$ and $\mathbf{E^c}$ – is the intensity of the supply and demand fields accordingly.

The entire process of manufacturing and selling commodities, as well as its flow along the market conductor, will be as follows:

$$A = A_{potention.} + A_{real.}, \quad (35)$$

where: $\mathbf{A_{potention.}}$ – work of potential forces. $\mathbf{A_{real.}}$ – work of the real forces of the current source.

The work of two potential fields – supply and demand is equal to:

$$A_{potential.} = \varphi_{n1} - \varphi_{n2}. \quad (36)$$

Let us repeat once more – when one product with potential φ_1 from the supply field passes through the commodity chain and is sold to the buyer, then the demand of the buyer φ_2 is satisfied. The work performed by real forces for the manufacture and sale of goods (its movement along the commodity chain) will be called commodity-driving force $\mathscr{E}$ (c.d.f.).

$$\mathscr{E}_1 = A_1 / 1pc. \; ; A_n = \mathscr{E}_n, \quad (37)$$

where: $\mathbf{A_1}$ – Work on the manufacture and sale of one piece of charge carrier; $\mathbf{A_n}$ – Work on the manufacture and sale of **n** – pieces of charge carriers; **n** – The number of utility charge carriers.

The kinetic energy of products movement is the energy of real forces at work. Demand voltage, also known as demand voltage drop, is a physical quantity that is numerically equal to the entire work produced by potential and actual forces as a product goes from a commodity producer to a buyer:

$$U_{2\text{-}1} = (\varphi_1 - \varphi_2) + \mathscr{E}. \quad (38)$$

The voltage at the ends of the circuit is equal to the potential difference, if the circuit is not applied c.m.f.:

$$U_{2\text{-}1} = (\varphi_1 - \varphi_2) \quad \text{at} \quad \mathscr{E} = 0. \quad (39)$$

The physical interpretation of the above is that the demand field's potential energy generates the supply field's potential energy. As each product is made at the start of the commodities current, the supply field's potential energy decreases by φ_1 and converts into kinetic energy $\mathscr{E}_1$, which, at the time of implementation, becomes the actual potential φ_1 and reduces the number of demand potentials φ_{n2} by one. This action decreases the potential energy of the demand field, but increases the potential energy of the buyer himself.

The cost that determines the commodity's cost is one of the elements that affect the commodity's current. All costs incurred by the producer for the payment of factors of production and the sale of goods are included in the costs (production, transportation, warehousing, objects of sale, etc.). The main costs are the costs of producing and manufacturing a product. The physical meaning of costs is that, as previously said, while a product is made, energy

particles in the form of cost of production factor particles are collected into a product and form a positive charge of utility in it at the end stage[41].

Commodity driving force (c.d.f.) $\mathscr{E}$ is actually spent on costs and direct movement of products without taking into account costs, that is, it is spent on the commodity producer's costs and profits (entrepreneurial revenue). The main component in c.d.f. is profit. In fact, if there is no profit, then there is no point in the movement of goods, except for the so-called normal profit, when the commodity producer includes the minimum profit in costs.

Thus, c.d.f. equals to the sum:

$$\mathscr{E}_1 = \mathscr{E}_{R1} + \mathscr{E}_{r1}, \tag{40}$$

where: $\mathscr{E}_{R1}$ – c.d.f., spent on the costs of manufacturing and selling goods; $\mathscr{E}_{r1}$ – c.d.f., generating profit;

$$\mathscr{E}_{R1} = R_1 \cdot I \quad \text{or} \quad \mathscr{E}_{R1} = R_1 \cdot 1pc \,/ \Delta t,$$

where, $\mathbf{R_1}$ – force applied to factors of production for the manufacture and sale of a product, or the cost of a product.

Physical meaning of c.d.f. costs lies in the fact that this value shows the quantity in value terms, which, as part of the utility charge, is included in one charge carrier during the time **Δt** of its manufacture. The product $\mathbf{R_1 \cdot 1pc \,/ \Delta t}$ is known in the "economy" as an indicator of labor productivity.

In addition to the main costs of manufacturing goods, there are costs on the flow of goods for transportation, storage and sale of goods. Their sum is the value of all costs included in the charge of utility. In "electricity" the value of **R** is called electrical resistance and is included in the formula for the electromotive force. The total resistance of an electrical circuit consisting of several series-connected conductors is equal to the sum of the resistances of individual conductors[42]. Physical meaning c.d.f. with profit lies in the fact that this value shows the amount of profit in value terms, which, as a part of the utility charge, is included in one charge carrier during the time **Δt** of its production:

$$\mathscr{E}_{r1} = r_1 \cdot I \quad \text{or} \quad \mathscr{E}_{r1} = r_1 \cdot 1pc./\Delta t. \tag{41}$$

There can be no utility bill if profit r has no power. This force not only contributes to the development of a utility charge in the commodity, but it also

[41] A.B. Amirbekova, G.S. Ukubassova, A. Galiyeva, R.K. Yelshibayev, S.A. Kozhabaeva, "The energy structure of Kazakhstan and its environmental impact", in *Journal of Environmental Management and Tourism*, 2020, vol. 11, no. 5, p. 1067-1080.

[42] S.G. Kalashnikov, *Electricity*, Nauka, Moscow, 2017.

acts on the charge, moving the carrier with the charge attached along the complete commodity current chain[43]. There can be no utility charge and no commodities current without profit. Profit is calculated in the source of the commodity current as entrepreneurial income, such as, as a payment to the commodity producer for his entrepreneurial abilities.

The force r in "electricity" is called the internal resistance of the current source. Without this resistance, the process of separating charges into positive and negative is impossible, so an electric current will not arise[44]. Obviously, if the estimated profit from the sale of the goods does not suit the commodity producer, then he will not be engaged in its production and there will be no commodity flow.

Commodity driving force (c.d.f.) $\mathscr{E}_{\mathbf{n}}$ for the entire consignment will be:

$$\mathscr{E}_{n} = \mathscr{E}_{Rn} + \mathscr{E}_{rn}, \tag{42}$$

where: $\mathscr{E}_{\mathbf{Rn}}$ – tp spent on the costs of the entire consignment of goods in the amount of **n** – pieces; $\mathscr{E}_{\mathbf{rn}}$ – c.d.f., spent on making a profit from the sale of goods in the amount of **n** – pieces;

$$\mathscr{E}_{Rn} = R_1 \cdot I \cdot T = R_1 \cdot (1pc./\Delta t) \cdot \Delta t \cdot n = R_1 \cdot n; \ \mathscr{E}_{rn} = r_1 \cdot I \cdot T = r_1 \cdot (1pc./\Delta t) \cdot \Delta t \cdot n = r_1 \cdot n,$$

where, **T** – time spent on the movement and sale of the entire consignment.

$$T = \Delta t \cdot n.$$

Based on the above, we obtain the formula for calculating the current strength **I** via c.d.f.:

$$\mathscr{E}_1 = \mathscr{E}_{R1} + \mathscr{E}_{r1} = R_1 \cdot I + r_1 \cdot I = I \cdot (R_1 + r_1);$$
$$I = \mathscr{E}_1 / (R_1 + r_1). \tag{43}$$

The current strength of the charge carrier is directly proportional to c.d.f. and is inversely proportional to the sum of the costs and benefits.

It can be seen from this formula that a commodity producer, at the same speed of production of goods, is profitable to constantly reduce the cost of costs and thereby increase the cost of profit. Physical meaning c.d.f. lies in the

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43 I.E. Irodov, *Mechanics. Basic laws*, Laboratoriya Znaniy, Moscow, 2016; I.E. Irodov, *Electromagnetism. Basic laws*, Laboratoriya Znaniy, Moscow, 2016.

44 E.F. Borisov, A.A. Petrov, , T.E. Berezkina, *Economics*, Prospect, Moscow, 2020; A.A. Butyrsky, L.N. Nikolenko, N.V. Ivanyuta, I.A. Butyrskaya, Y.V. Kabenok, "Economic Disputes Resolving Models by Courts in the Post-soviet Countries", in *Journal of Legal, Ethical and Regulatory Issues*, 2021, vol. 24, no. 2, p. 1-9.

fact that this value, as a value analogue of the utility charge, determines the value of one commodity. That is, if the utility of one product is: $\mathbf{Q_1 = q_1 \cdot 1pc}$, then the cost of this utility will be:

$$Q_1 = \varphi_1 = \mathscr{E}_1 \cdot 1pc. \tag{44}$$

Energy cost $\mathbf{W_n}$, which the goods carry in quantity **n** – pieces, at the time of sale will be:

$$W_n = A_n = \mathscr{E}_n = I \cdot (R_1 + r_1) \cdot T \tag{45}$$

or in final form:

$$W_n = (1pc./\Delta t) \cdot (R_1 + r_1) \cdot \Delta t \cdot n = (R_1 + r_1) \cdot n. \tag{46}$$

It can be seen from this formula that the energy of a batch of goods of the entire commodity chain is equal to the cost of one good multiplied by the number of manufactured and sold goods. Two (e.m.f) electromotive forces are created in an electric circuit with an electric current source: in the source – e.m.f. separation of electric charges into "plus" and "minus," and in the circuit – e.m.f. as well as movement of charges along the circuit from the "plus" terminal to the "minus" terminal[45].

As previously stated, we accepted the tradition that the commodity producer is solely responsible for the organization, movement, and sale of products. This convention was chosen so that the analogy between a commodities chain and a basic electrical circuit is evident[46]. It is known from "electricity" that if a complete electric circuit contains many current sources and their electromotive forces, the total e.m.f. acting in the circuit is equal to the algebraic sum of e.m.f.[47]. And in the real economy, the entire commodity chain, basically, consists not only of a commodity producer, but also of objects of wholesale buyers, transport companies, markets, etc. with its own driving forces[48]. Total c.d.f (the value of the goods) along the entire commodity chain will be equal to the amount, c.d.f. objects included in this chain. If full calculations are required, sums of various quantities are added and displayed, namely: costs, profits, time, etc. – included in c.d.f. with all objects of the commodity chain.

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[45] I. Kitel, W. Knight, M. Ruderman, *Mechanics*, Nauka, Moscow, 2017.

[46] E. Vikhman, *Quantum physics,* Nauka, Moscow, 1971.

[47] E. Purcell, *Electricity and magnetism*, Cambridge University Press, Cambridge, 2017.

[48] V.M. Rubish, S.M. Gasynets, O.V. Gorina, V.M. Maryan, O.A. Mykaylo, A.M. Solomon, "The influence of heat treatment conditions on the structure and properties of composites", in *Scientific Herald of Uzhhorod University. Series "Physics",* 2021, vol. 41, p. 68-79.

Conclusions

As a result, both the commodity producer and the entrepreneurs of the commodity chain's objects must consider their prices so that the ultimate selling price of the commodities corresponds to the buyer's demand price, i.e. the condition $\varphi_1 = \varphi_2$. In "electricity," one of the definitions of a resistor is that a resistor is an element of an electrical circuit that has a certain electrical resistance designed to absorb electrical energy. That is, if a potential difference ($\varphi_1 - \varphi_2$) exists on the plates of a charged electric capacitor and a resistor is present in the electrical circuit to which the capacitor is connected, the resistor will absorb electricity and the potential difference on the plates will be equal to zero ($\varphi_1 - \varphi_2 = 0$) when the current is turned on. The electric capacitor is then charged from the current source once more, and the process is repeated. The resistors transfer the electric field's energy into the conductor's internal energy (heating). The work done by the entire electric field when the charges move is equal to the change in the conductor's internal energy (the quantity of heat) (for example: electric heaters, etc.).

If we picture an electrical circuit without a resistor, positive charges from the capacitor's "plus" plate will be passed via the circuit to the "minus" plate, compensating for the negative charges on this plate in the perfect scenario. When people use electricity in their daily lives, the link between electricity and the economy is easily traced. At the ends of the power supply company's electrical equipment, a steady electrical potential difference is maintained. Consumers of electricity as a commodity have a need for it on the market. This field has a market potential difference in this regard. Obviously, the market potential difference is a cost estimate of the electrical potential difference. The electrical energy contained in the electrical potential difference is separated into market potentials, which are commodities with their own price (tariff for a particular number of kilowatt-hours) and are sold to consumers, thereby eliminating the market potential difference and satisfying demand. The cost of electricity includes the sum of the earnings of the electric generating and sales firms, in addition to the costs of generating, delivering, and selling it to users (buyers).

Simple commodity chains are networks of public services such as cafes, laundries, and hair salons. They also include the planning of cultural and entertainment events such as concerts, plays, and other performances. A service, as previously stated, is a form of product that can be produced, transmitted, and consumed simultaneously. For instance, a cafe serves dishes that have a positive charge of utility. A café patron places an order for food, waits for it to be prepared, pays for it, and settles his negative charges on the spot.

All of this leads us to the conclusion that the physical principles

governing the movement of electric charges and the movement of items on the market are the same. This allowed for the development of a completely new economic theory, the introduction of relevant definitions and concepts, and the development of new economic calculation methods. Our study, on the other hand, has established the foundation for new approaches to physical science, allowing us to rethink its laws and lay the groundwork for the development of cutting-edge physics. At the end of each published phase of our research, we will provide backward comparisons of new "economics" and "physics".