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Natural Foundations for Management of Balanced Economic Development. Part II. Components of Capital and Prospects of Their Modernization

The attempt of M. Rudenko to build an innovative model of economic balance, based, from ontological perspective, on the principles of even and uneven numbers is analyzed. The thesis that conscious management of balanced economic development in the long run, keeping the balance in economic management in particular, needs to be assured in the industries generating absolute wealth and producing relative wealth is discussed. The components of absolute capital and relative capital are highlighted. It is demonstrated that the fundamental natural principle of economic management is keeping with the energy conservation law, within consideration for the energy distinction between the living and the non-living. This fundamental scientific law is central in sustaining the economic balance and economic development in the long run.

Key words: *absolute capital, relative capital, energy of progress, law of social distribution, management of balanced economic development.*

In Part I of the article it was mentioned that the work of M. Rudenko "Balance of Absolute Wealth and Relative Wealth" contains the formula of capital [1, p. 372]:

$$K = E - F, \qquad (1)$$

where K is capital, E is energy of progress, F is entropy.

It should be noted that M. Rudenko addressed capital in narrower and broader sense. Because E constitutes annual surplus of absolute value, K will be annual surplus of absolute capital. As regards absolute capital, according to M. Rudenko, it includes land "which accumulates solar energy year by year", and crops, or "the value of annual harvest and elevator stocks" [1, p. 372].

The structure of absolute capital can be considered as full, when it includes all the kinds of absolute wealth required for life activities of human societies. To make physical-economic interpretation of the absolute capital structure complete, its above mentioned components like land (given its capacity to increase fertility) or crops (annual harvest of grains and their stocks in elevators) should be added by the following categories of absolute wealth:

• straw, as a form in which new, additional solar energy comes to Earth together with crops;

• livestock, including working animals and ones to meet consumer needs. Given that "instead of working animals, beef cattle and milk cattle is being bred now", increasing of its stock offers "a vast reserve of biological energy" [1, p. 372]. Also, livestock is a unique generator of pus;

• pus, a bioenergy resource with the rare capacity to regenerate the fertility of land.

Therefore, management of absolute capital needs to be interpreted as control over five categories of absolute wealth: land, crops, straw, livestock, and pus. Several important characteristics of this totality should be emphasized. First, each category of absolute wealth has not alternative: it cannot be substituted. If each of them is worsened or lost, the life activities or existence of a human will be affected or even destroyed. Second, all the categories of absolute wealth constitute the organic symbiosis. If this symbiosis is managed in a conscious way, the absolute wealth will self-regenerate, increase and multiply. As demonstrated by M. Rudenko, each category has the capacity for unlimited increase.

The above given algorithm for absolute capital assessment by physical economy principles opens up several theoretical generalities of fundamental importance. It enables for comprehending the physical-economic essence of absolute capital and its most essential difference from relative capital, which, according to S. Podolynsky, follows from the energy difference between the living and the non-living, and, according to V. Vernadsky, from the insurmountable distinction between the living and the rigid.

Also, the algorithm shows the most important factors behind the capabilities for more effective management of the processes involved in the progress energy capitalization. To capitalize the output generated by agrarian sector, crops in particular, is to direct energy of progress on its further increase, and on

the increase of this energy scopes. This opportunity exists only in the sphere of the living. In view of this, energy of progress needs to be directed to the agrarian sector first and foremost.

Also, as follows from the above algorithm, energy of progress can be capitalized by minimizing the entropy. Because the larger is the entropy, the higher is the need to increase the absolute capital by its reduction, the larger are the reserves for progress energy capitalization and the capabilities for their utilization.

Therefore, utilization of the generated energy of progress will be productive once its largest possible part is capitalized and creation of entropy is prevented. Progress energy capitalization needs to be managed along with measures to prevent its losses. Therefore, progress energy needs to be increased and entropy reduced, to generate a larger scope of absolute capital.

Physical-economic vision of bioenergy structure of crops harvest is strategically important in managing the processes involved in progress energy capita-

lization. As shown by M. Rudenko with reference to R. Harst, an American farmer, 60% of fodder units of corn are formed from the grain, and 40% from stalks and heads. Therefore, the bioenergy structure of crops harvest produced annually in the agrarian sector consists of five bioenergy units: three units of crops and two units of straw, capable to ensure the extended reproduction of absolute capital.

As regards distribution of annual harvest of crops by social strata, determined by M. Rudenko according to F. Quesnay, three bioenergy units (one unit of crops and two units of straw) are due to farmers, they remain with farmers and ensure capitalization of the agricultural output. The rest is due to industry and government (one bioenergy unit for each).

By substituting the estimates of absolute capital, progress energy and entropy, measured in bioenergy units, in formula (1), by use of Table 1, the distribution of annual crop harvest can be found, which is favorable for the extended reproduction and capitalization of agricultural products.

Table 1

Balance of production and distribution of crops harvest given extended reproduction

Bioenergy structure of crop harvest	Number of bioenergy units	Social distribution of crop harvest	Number of bioenergy units
Straw	2	Agriculture	2
Grain	3		1
		Industry	1
		Government	1
Total	5	Total	5

Reserves for capitalization of agricultural output are not utilized in this way now because of the lacking physical-economic vision of management in theory and practice. This raises the necessity of finding the essential meaning of the progress energy on the basis of physical economy principles, which, if enlarged, will increase the absolute capital, and the entropy, which, if increased, will have effects for capitalization of agricultural output.

Our distinguished contemporary came to the conclusion that "... government and industry are explicitly entropic bodies of the society" [1, p. 372], with the latter being entropic to the largest extent.

Entropy, therefore, seems to be a sort of "tribute" paid due to the objective need or to defects in economic management. It will be smaller once the annual agricultural output is preserved and capitalized through preventive measures. The character of the entropy's effect for capitalization of the agricultural output can be easily computed by substituting the estimates of capital, progress energy and entropy, measured in bioenergy units, in the above algorithm. This effect has several manifestations.

As shown in Table 2, the first manifestation is the distorted natural laws of social distribution of crops harvest between farmers and government.

Table 2

Balance of production and distribution of crop harvest given the distorted social distribution

Bioenergy structure of crop harvest	Number of bioenergy units	Social distribution of crop harvest	Number of bioenergy units
Straw	2	Agriculture	2
Grain	3		–
		Industry	1
		Government	2
Total	5	Total	5

As can be seen from Table 2, agriculture receives a smaller part of the crop harvest, two bioenergy units of straw, remaining with farmers after the enforced expropriation of crops by government. Industry receives one bioenergy unit of crops, as earlier, whereas government receives two bioenergy units of crops, of which one unit is expropriated from farmers.

The distorted natural laws of social distribution of harvest make effective management of ba-lanced economic development impossible.

An effective management of balanced economic development cannot occur with the distorted natural laws of social distribution of harvest because of the ruined conditions for the extended reproduction of the absolute capital and the total social product. This ruining effect is subsequently aggravated by the af-termath of harvest expropriation from farmers. Being depredated by government, farmers are left without foods and seeds. The seeds given to farmers by government's order from centralized funds can guarantee the harvest of two bioenergy units, but not three. In accordance with natural laws, the output of straw will decrease, too: instead of two bioenergy units, farmers will produce only 1.3. The rest of crop output will be again distributed with preference to industry and government: one bioenergy unit per each, but the calculation basis will be 1/3 lower. Consequently, the social reproduction of the absolute wealth (the absolute capital and the social product) turns from the extended one to the simple one, entailing the respective reduction in the output of crops, with the subsequent malnutrition and famine of the population (Table 3).

Table 3

**Balance of production and distribution of crop harvest
in the conditions of the simple reproduction**

Bioenergy structure of crop harvest	Number of bioenergy units	Social distribution of crop harvest	Number of bioenergy units
Straw	1,3	Agriculture	1,3
Grain	2		–
		Industry	1
		Government	1
Total	3,3	Total	3,3

The latter circumstance has destructive effects for social morals and the statehood per se, as was the case of the USSR, which collapse had been predicted by M. Rudenko. In his address to the soviet power office, made more than three decades ago, he had said that high soviet officials had been incapable or unwilling to realize it. Yet, the same is true with contemporary governments blinded by scientific ignorance and laziness of thought.

According to expert estimates published in 2012 by "Frankfurter Rundschau" journal, to achieve the German level of welfare, the humanity would require the amount of resources equal to 2.5 of the planet. If all the earth men were Americans, 4 planets would be needed [2]. This calls for the impartial assessment of economic management models on which the global economy is built, especially German or American one. Because, as the above figures show, the humanity is on the way to the resource abyss, and the accelerated slipping to it is fraught with self-destruction.

According to M. Moiseiev, the life keeping with the natural circulation of substances requires not less than tenfold reduction in the humanity's total needs (energy ones in the first place) [3, p. 80]. We believe that the needs, especially energy ones, can be substantially reduced by laying physical economy as the basis for functional improvement of economic development, by use of an effective tool for finding reserves as functional and cost analysis in particular [4; 5]. Its use will help to find ways for multifold reduction in the production costs of herbicides, pesticides, other poisonous chemicals, mineral fertilizers etc., which are manufactured by industries with vast energy capacity. Once functional and cost analysis relies on physical economy principles, prospects for modernization of relative capital will be opened.

Apart from critical scientific reviews of existing economic management models, M. Rudenko was investigating the problem of the maximum progress energy over nearly a quarter of a century [1, p. 127, 362]. The thinker pointed out to "the fertile layer of the planet, which could accumulate the unlimited amount of solar energy for millennia", and to the respective capacity to have "unlimited amount of wheat" [1, p. 365, 361], to demonstrate the unlimited nature of energy of progress: $E > \infty$. If the formula (1) is transformed as $E = K + F$, with substituting the estimates from Table 1 and expressing the equation by E, the equation $E = 0,6E + 0,4E$ will be derived.

Entropy F is the expression of the limit for nonproductive consumption of progress energy, which, if crossed, is fraught with danger: $F \leq 0,4E$. Considering that the capital K is fixed by "residual" principle, it has the lower limit, which crossing cannot be accepted: $K \geq 0,6E$.

Therefore, quantification of the limits for progress energy components shows that a deviation from the limits K i F, fixed by laws of nature (if the reasons for

deviations are not considered), will reduce the potentials for economic development of societies.

We believe that the structure of absolute capital, proposed by M. Rudenko, is essential in introducing innovative methods for management of relative capital. In view of this, the above given considerations should be laid as the basis for forecasting, innovation and investment, and modernization of relative capital, with interpreting its structure by analogy with absolute capital. Only then the balance of absolute and relative capital will be meaningful. So, the algorithm modified according to the targets set, takes the form:

$$\Delta K_i = \Delta D_i - \Delta F_i \, , \qquad (2)$$

where K_i is relative capital, D_i is relative added value, F_i is entropy of relative added value.

The simplicity of the algorithm disguises the complexity of the essential meaning of technical development of the humanity in the long run. In fact, each simple (at the first glance) indicator in the algorithm refers to the gains (relative capital K_i) caused by technical and scientific advancement, and losses (entropy F_i) over the historic era of the human civilization development. In view of this, at least a brief physical-economic description of the management objects, which, in the context of the study, are the essential types of relative capital, is required. The development of each reflects the long-lasting process of science and technology advancement of the humanity.

The first object is the type of relative capital, encompassing technical devices and technologies for cultivation of land, gathering of wheat and straw, techniques for cattle-breeding or utilization of pus etc.

The second type of relative capital is techniques and technologies to accumulate and utilize "soft" energy: solar emission, falling water, wind etc., also enabling to cultivate land, gather grain and straw, breed the cattle, utilize the pus and do other agricultural works.

The third type of relative capital include technical means and technological processes to burn the so called extracted energy sources (coal and brown coal, oil shale, peat, oil, gas etc.) for generating thermal, chemical, electric or other energy; the energy generated in this way is used in the above mentioned agricultural works. Technical means and technological processes generating energy due to decay of radioactive elements should also be included, or be classified as the fourth type of relative capital.

The totality of above mentioned "overlapping" facilities, techniques and technologies used in cultivation of land, gathering of grain and straw, cattle-breeding, utilization of pus etc. forms the relative capital of today, capable to develop and improve, in order to lay the basis for innovation and investment driven economic development.

The absolute capital, being in continually complicated interactions with the relative capital, needs to be in the balance, consciously managed and maintained by societies over the longest possible time. Because, as shown by M. Rudenko, on the one hand, a relative added value results from an absolute added value, i. e. from the source of absolute value increase [1, p. 369]. On the other hand, "industry, having impact on agriculture, becomes a progress energy generator". This energy occurs after the invention of steam engine, which invention preceded by extraction of coal. Finding the progress energy background, M. Rudenko concludes that everything depends on whether or not the economy is managed in the conscious way.

Although quantitative characteristics of economic development determine quantitative parameters of progress, respective qualitative characteristics are always primary ones. Both categories of characteristics are subject to management. There exist economic entities capable to maintain the balance, demonstrating in this way the capability of societies for economic management by sustaining its balanced development over the longest possible time. From the perspective of absolute wealth generation, these entities are wheat fields and livestock farms, which, improving for centuries and millennia, are capable to transform into anti-entropic photosynthetic ecological-economic systems, the main generators of absolute capital. When it comes to generation of relative wealth, these are workshops (joineries, metal works or smithies), windmills watermills and sawmills, and stokeholds, steam engines etc. They are supposed to transform into entropic technical-economic systems, anti-entropic non-photosynthetic power generating systems and entropic power generating systems, to be modern generators of relative capital of the above mentioned types.

The balance of absolute and relative capital needs to be consciously managed in building up clusters, cluster networks and infrastructures, which need to harmonically combine self-reproductive and self-sufficient components of the above mentioned systems. It needs to be done by principles of likening the economy to the nature and "fitting" economic management into the environment. On the one hand, absolute and relative wealth, i. e. absolute and relative capital, constitutes the value capable to generate the added value. On the other hand, it is generated by the value added generated before. This problem and the problem of balanced economic growth require a separate study. The algorithms built on M. Rudenko's formula of progress energy, determine the capacities and limits of human's impact on physical-economic balance of economic management in the long run. This balance is manageable, and a human constitutes an active factor in sustaining the balanced economic development.

M. Rudenko keeps demonstrating that the land enriched through interacting with progress energy

is the living engine of the civilization. To illustrate the balance of absolute and relative wealth, the scientist looks at the pattern of interactions between a car battery and a car alternator. The former one is continually fed by the latter one. If the alternator is taken off, a car can be driven for a while by the energy of the charged battery, but it will have to be thrown away after a while [1, p. 372]. The true battery of solar energy, according to M. Rudenko, is the humus layer of the Earth. It can be generated by human work, once it is free. This generator will get out of order once the work is subjugated.

Therefore, the central principles of nature required for the contemporary economic management are keeping with the energy conservation law, on the one hand, and consideration for energy distinction between the living and the non-living, on the other hand. These fundamental scientific theses have critical role in sustaining the economic balance and economic development in the long run. Formulated earlier by French physiocrat F. Quesnay and German naturalist R. Mayer, from 19 till 21 century they were developed by Ukrainian intellectuals, S. Podolynsky, V. Vernadsky, M. Rudenko and others. Yet, the valuable scientific results of Ukrainian thinkers have been overlooked by contemporary Ukrainian and foreign economists, practitioners and theorists.

The provisions determining the structure and balance of absolute and relative capital on the physical economy principles are especially important, because they open up the modernization perspectives, to assure the economic development driven by innovation and investment. At the same time, the potential for combining the innovatory results of Ukrainian pioneers of physical economy with scientific developments in theoretical and applied cybernetics, economic cybernetics in particular, is still underused.

The gains of European science in 18 century and achievements of pioneers of the Ukrainian academic school of physical economy need, therefore, to be incorporated in the contemporary arsenal of theoretical and applied tools of economic development management. Scientific substantiation of economic development management in the long run needs to be based on harmonization of physical-economic and managerial approaches. Taken in totality, they should create fundamental principles of the strategy for management of the innovation-driven economic development, adequate to challenges of 21 century.

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Природничі підвалини управління рівноважним економічним розвитком. Частина ІІ. Складові частини капіталу та перспективи їх модернізації

Проаналізована спроба М. Руденка побудувати новітню модель економічної рівноваги, що з позиції онтології ґрунтується на засадах закону парних і непарних чисел. Розглянуто положення, що усвідомлене управління рівноважним довготривалим розвитком економіки, зокрема дотримання рівноваги у сфері господарювання, належить забезпечувати насамперед у галузях продукування абсолютних благ та виготовлення відносних благ, що перебувають між собою в органічному симбіозі. Наведено алгоритм визначення абсолютного капіталу на засадах фізичної економії. Висвітлено структуру абсолютного капіталу та вказано безальтернативні абсолютні блага, що мають бути до неї включені для забезпечення її повноти. Виконано фізико-економічну інтерпретацію доданків, до яких належать солома, худоба і гній. Охарактеризовано складові абсолютного і відносного капіталів. Обґрунтовано, що основоположними природничими засадами управління економікою є дотримання закону збереження і перетворення енергії з урахуванням енергетичної відмінності живого й неживого. Цей фундаментальний науковий закон віді-

грає визначальну роль у забезпеченні економічної рівноваги та довготривалого розвитку сфери господарювання. Показано, що для забезпечення продуктивного використання енергії прогресу потрібно капіталізувати якомога більшу її частину, вживаючи заходи щодо уникнення її втрат, та запобігати утворенню ентропії. Здійснена параметризація граничних значень складових енергії прогресу. Доведено, що відступ від визначених законами природи меж капіталу й ентропії незалежно від причин відхилень означає скорочення потенційних можливостей економічного розвитку суспільства. Як висновок зазначено, що наукове обґрунтування управління рівноважним довготривалим розвитком економіки належить базувати на узгодженні фізико-економічних та управлінських підходів. Їх органічна сукупність створюватиме фундаментальні засади стратегії управління новітнім типом розвитку економіки, адекватного викликам XXI століття.

Ключові слова: *абсолютний капітал, відносний капітал, енергія прогресу, закони суспільного розподілу, управління рівноважним розвитком економіки.*

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Естественные основы управления сбалансированным экономическим развитием. Часть II. Составляющие части капитала и перспективы их модернизации

Проанализирована попытка М. Руденко построить новую модель экономического равновесия, которая с позиции онтологии основывается на законе четных и нечетных чисел. Рассмотрено положение, что осознанное управление равновесным длительным развитием экономики, в частности соблюдение равновесия в сфере хозяйствования, следует обеспечивать в первую очередь в области продуцирования абсолютных и изготовления относительных благ. Охарактеризованы составляющие абсолютного и относительного капиталов. Обосновано, что основополагающим естественным принципом управления экономикой является соблюдение закона сохранения и превращения энергии с учетом энергетического различия живого и неживого. Этот фундаментальный научный закон играет определяющую роль в обеспечении экономического равновесия и долговременного развития сферы хозяйствования.

Ключевые слова: *абсолютный капитал, относительный капитал, энергия прогресса, законы общественного распределения, управление сбалансированным развитием экономики.*