

**THE ANALYSIS OF THE MACROECONOMIC DYNAMICS AND  
ASSESSMENT OF SMART FACTORS' INPUTS TO THE BALANCED  
GROWTH RATES**

**Akimov. N.**

Candidate of Economic Sciences, Independent Economist.

**Baizakov. S.**

Doctor of Economics, Science Adviser, JC "Economic Research Institute of  
Ministry of National Economy of Republic of Kazakhstan.

**Oinarov. A.**

Candidate of Technical Sciences, Chairman of Board, Kazakhstan's Centre of  
Public and Private Partnership.

**Utembayev. E.**

Candidate of Economic Sciences, Independent Economist.

**(Statement by Kazakhstan's followers of Acad. Aleksandr G. Granberg  
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**Abstract**

This paper explores the alternative ways of revealing the system of just and fair economic laws that may well serve the instruments of discovering the distortions in an economy. They may also serve for the purposes of assessing the impact of regulatory policies on the market-based economic development. The economic model capable of analyzing and assessing the regulatory impacts based on the principle of irreversibility of capital, in the form of money, and capital, in the form goods, has been developed.

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**JEL classification:** F43; C38, F14, F31; O42

**1. The concept as the methodological basis of the three-step analysis of  
the development of market economy by J. B. Clark**

*Introduction.* Having been influenced by the comments made by I.V. Rozmainskii in regard of John B. Clark's book titled *The Distribution of Wealth* one may derive the following conclusions: John Bates Clark, following Karl Marx, back in 1899, had revealed that the existence of fair laws governing the development of market economy is possible [I.V. Rosmainskii, 2000].

Truly, John B. Clark considered that the study and discovery of such laws was in focus of the political not theoretical economy. According to I. Rozmainskii's comments, the laws of market economy are not being applied in current practices, neither in statics nor dynamics. In the same token, the above referred laws are not used in assessing the effectiveness of regulatory policies [I.V. Rosmainskii, 2000].

The study of John B. Clark's book enables us to understand that fair laws of the theoretical economy are yet applied in analyses of social economy. The latter, as the core of analyses, is explored when in statics, statistics, and in the process of development.

In this, the objective of the analysis, according to John B. Clark, is the act of setting up qualitative and quantitative indicators of market economy equilibrium, which proved true for a given moment in time. As for analyzing the macroeconomic dynamics, the act of defining the share of every type of production factors and resources that are involved in generating gross annual product, may be well regarded as the target objective.

In general, the concept of the marginal utility theory, as suggested by John B. Clark, is all the more interesting in the part in which it allows to draw explicit boundaries between the income method of one-dimensional measuring of costs and outcomes (by Adam Smith) and the cost-driven method of two-dimensional measuring (by Karl Marx.)

In John B. Clark's view, the economic theory developed by Adam Smith may serve as the theory base in analyzing macroeconomics in statics whilst the expanded reproduction schemes by Karl Marx may serve the solid theory base for analyzing the macroeconomic dynamics.

*Problem setting according to John B. Clark.* Under the John B. Clark's concept, the regulatory, let us say, empirical assessment of the marginal utility theory may result in that labor will get what it works for, capital owner – what is earned by capital, and land owner – what is given by land.

The principle of marginal utility in wealth distribution is based on distributing the shares of wealth that are commensurate to the efforts, exerted in the production of the final product. The latter had been construed by the author as the 'gross income', defined on the basis of the 'aggregate product less material costs of the interim consumption'.

In other words, Adam Smith, in the process of shifting from the two-dimensional measurement unit to one-dimensional, had gotten rid of the material components of the aggregate product.

From the residual, which is considered to be the 'final product', each production factor is attached its own 'share' and share-owners are financially

rewarded, accordingly. Such was the understanding of the main economic law on wealth distribution, which is substantially different from Karl Marx's reproduction schemes in which the maximum utility theory prevails.

*The strengths of the Clark concept.* The content of solving the set of the objectives has been placed in the three main parts of the book. The explanations, in fact, define the structure of the book. The first part consists of the chapter, dedicated to the theoretical economy, named as the Universal Economic Law, which is designed to explore natural laws of market economy.

The 'common' or 'natural laws' of economy, according to John B. Clark, are the marginal utility laws, the laws of diminishing production of labor and capital, growth of global population and others.

These 'natural economic laws' simply serve for defining the relationship between a human being and the nature. They also serve to define the relations between people. Such relations were construed as the 'laws of social economy', under John B. Clark's theory.

In the third chapter, John B. Clark is explicit in affirming that the theory basis of social economy is vested on natural laws of the Universal Economic Law. The title of the chapter speaks for itself: "*The Principles of Distribution of the Natural Economic Laws.*" The social economic laws, in their turn, are split into two branches: the laws of social economy, in their statics, as the first branch, and the laws of social economy, in dynamics, as the second. John B. Clark did not focus on the study of relations that were related to labor and capital in the process of production, He avoided that since he had derived the social laws from the natural economic laws. Thus, he did not explore the tendencies hidden in the organic structure of the capital to the extent that Karl Marx had done it in great detail.

However, the part of the book titled "Universal Economic Law" has proven the operable instrument of analysis and assessment of all potential regulators of market economy. It has the theoretical, actual, and practical value. It defines the philosophy of the analysis of macroeconomic processes as the scientific framework of analytical researches.

The bottom line of this part of the book lies in the selection of major economic laws and rules as the instruments of carrying out analytical and economic research. The question that arises on whether the tendencies in the development of market economy do exist irrespective of people's will and consciousness in the manner similar to the existence of laws of natural sciences or of nature?

John B. Clark found a positive answer to this question. He confirmed that the marginal utility law serves the fair basis for the distribution of wealth created amongst key production agents. John B. Clark was undeniably right and, therefore,

wrote the book, thus, justifying his core discovery, that is, the law on wealth distribution. His formulated law is the most vivid reflection of the reality and practices of the developed countries because each production factor is being rewarded from incremental shares of the common pie. The level of increments is viewed as a static standard. Without reading the book one may not instantly grasp that John B. Clark was, in fact, not right.

Fair and just economic laws serve the pillars of support in carrying out economic analyses. That is applied to John B. Clark and others also. Thus, I. Schumpeter wrote: "I hope once I will be able to prove, not only from the historical but also logical perspective that the notion of numbers and their quantitative value is of fundamentally economic nature.

They evolve from human economic activity. I also hope to prove that the notion of the equilibrium has been shifted from Economics to Nature, not in the reverse order. The fundamental economic truth may be formulated as follows: all visible changes tend to position themselves vis-à-vis one another or, in other words, they are permanently adapting to constant changes in the data [Schumpeter J.A., 2007].

Milton Friedman did avail of his own regulatory instruments. Thus, in chapter *Rules Instead of Powerful Bodies* of the book titled "Capitalism and Freedom" Milton Friedman wrote the following: "To date, only one method which promises luck has been discovered. We need to try instituting the rule of law not of individuals. We should do it by means of setting the rules that regulate fiscal and monetary policies. Such rules will enable the society to control fiscal and monetary policies with the help of political power. However, the latter will not let the policies to be influenced by whims of politicians» [Friedman Milton, 2006].

Herewith, are his comments on the above subject matter: "At his moment, I would concentrate on the set rule, which prescribes the fiscal and monetary policy makers to ensure the set growth rate of the money mass. In this, I would define the money mass as a sum of money which operates beyond commercial banks and their depositaries. I would authorize that the Federal Reserve System monitor the overall reserve money (as defined above) to grow month after month (if possible day by day) at an "x" percent annual rate, where "x" is any number between 3 and 5. The question of how to define "money" and how to set growth rates is less important compared to the fact that this notion is clear and growth rates have been set" [Friedman Milton, 2006] .

Milton Friedman's thoughts are quiet close, in their content, to the very formulation of natural laws by the Universal Economic Law of John B. Clark. The *Universal Economic Law*, according to John B. Clark, "reflects the theory of what may be called as 'wages' and 'natural interest'. Those will undergo no static tests

and will not look into details of the mechanism through which exchange is performed. These will not contain the thesis relating to money, banks, taxes and political activity, which focuses on influencing the conditions of the distribution” [Clark James.,2000].

If the notion, as Milton Friedman puts it, “has firmly been defined and the growth rates have been set” [Clark James.,2000], such requirements are similar to the act of formulation of major laws that serve the fundamental basis of legal rules and regulations of such laws. These serve the fundamental basis of “fair laws prescribing fiscal and monetary policy makers to ensure some concrete growth rates of the growth of money mass” [Clark James.,2000] .

The name of Milton Friedman is associated with the main formula of the monetary policy. Such policy defines equality of the GDP deflator (pp) multiplied by real GDP (RGDP) with money velocity (V) multiplied by money mass (M). That serves well for the main law on assessment of the split between the indicators of real and financial sectors’ [Clark James.,2000] .

According to John B. Clark, exploring and discovering the very essence of economic laws on the development of production levers of the social progress, the formulaic expression of the social process and the ability to apply the equations on the macroeconomic processes in either their static or dynamic state is itself the scientific approach.

If not, any policy maker who adopts management decisions relating to the labor efforts that are exerted by economic entities would be deprived of the random opportunity to not only understand the concept but also grasp the inherent meaning in the realm of sporadic daily routine.

In effect, there exist the methodological techniques that use mathematical statistics. Those are based on the probability theory. Such techniques may also be applied, wherever needed, in their capacity of the auxiliary techniques. These are more labor intensive and thus more grounded since they are based on the analyses methods relating to static standards. The mentioned methodology is suitable for economic analyses, applicable to the developed countries rather than the developing.

The second part of John B. Clark’s book is dedicated to the analysis of the social and economic systems, in statics. This part of the book may conditionally be referred as the ‘Analyses of Macroeconomics’, in statics. The unique feature of this section of the book relates to the analysis of macroeconomics, when the economy remains undisturbed or, in other words, static. Under such state, it is easier to assess economic equilibrium in the current year against the base year. Thus, under the monetarism model, the equilibrium equation is determined between the nominal GDP (NGDP) and real GDP. Such equation avails of the power of the economic law:

$$NGDP = pp * RGDP. \quad (A)$$

In the equation (A), as above, the nominal GDP is determined in current prices, and reflects the cost of the final product. Based on the economic theory, the cost of the final product is an alternative form of expressing the capital, *i.e.*, in the form of money. In the same equation (A), real GDP is determined in current prices of the base year and reflects the physical volume of the final product. From the perspective of the economic theory, the physical volume of the final product is an alternative expression of capital in the form of goods.

In whole, market equilibrium equation (A) enables assessing the split between the real and financial sectors of the national economy. In so doing, the GDP deflator (inflation) acts as the indicator of measurement of such split between them (in statics.)

Market economy equation (A) which has been described, here, is, in fact, the static state of the economy at a given moment in time. It evolves as the result of competition. According to John B. Clark, "it enables to provide a snap shot picture of the static society in its genuine self." It is not a fiction that has nothing in common with the real world. It is the form and the method of acting in the way the real world does within itself" [Clark James.,2000].

The function, analogous to the above described methods, is attributed to the Keynesian method as well as to that of Mandell and Fleming. These methods reflect the realistic picture of the development of the economy. Such static methods, equipped with their commensurate standards, are helpful in analyzing the impact of major economic laws as well as economic rules and regulations on the market economy. They are also critical in measuring the qualitative and quantitative indicators of the final product at any given moment in time.

These static methods are much needed for analyses of the impact of regulatory policies on the dynamics of static standards of levels of production, employment, income, and prices.

Such levels, according to Karl Marx, tend to change under the influence of five (5) factors of the development of social economics: "the population continually increases, capital augments, the methodologies tend to constantly improve, the process of production undergoes decentralization at large scales and, above all, the demand increases"[ Clark James.,2000 ].

The third part of John B. Clark's book is dedicated to the methods of the analysis of the macroeconomic dynamics given that all five groups of production factors change. What happens to the equilibrium in a static state? How do the standard indicators in equation (A) change provided that the equation holds true for the base year and the changes in the structure of the five groups of factors are to occur parallel in time in the next year?

According to Karl Marx, the answer to this question has been provided by the dynamic theory of macroeconomic analysis. John B. Clark wrote, “It is obvious that all changes entail the two common consequences: first of all, values, wages, and interest will divert from static norms, secondly, the static norms will also change. The end result of the dynamic theory is the ability to explain the direction and parameters of such changes” [Clark James.,2000] .We may highlight here that John B. Clark’s prime focus was mainly on identifying the direction and measurements of annual increments. He ascertained us that harmonization of each particular share in major production factors in the national income is possible by means of the economic marginal utility law.

Whilst analyzing the macroeconomic dynamics, Karl Marx introduced the fourth autonomous factor: ‘growth’ and its concurrent factor – ‘source of income’, which in effect is an incremental profit. This step has been justified.

“In order to illustrate this case, the most suitable type of the dynamic change would be one that is caused by improvements in production technologies. Thus, an invention makes production of any good cheaper. At the beginning, it generates profit for entrepreneurs, then increments the wages and an interest in a manner, described, in detail, earlier. Such process is equal to the creation of a new wealth” [Clark James.,2000]

J. B. Clark named the above mentioned factor as the ‘social progress factor’. That is associated with improvements in the methods of production. The notion of the ‘social progress’ is commensurate to the similar notion that had been customized at ‘ex-soviet times’, *i.e.* – ‘*scientific and technical progress*’. Under the current realities where the development of *High Tech* and Information Technologies that tend to change production processes, we may name the above process as the ‘*science and technology progresses*’.

Within the dynamic process of investing in the production, the development of organizational methods of management, growth of labor productivity and of national income is possible. Such possibility reflects the empirical analysis of all developed countries. It entails positive changes pertaining to the levels of worker wages, interest, and rent.

Thus, a capital owner and an owner of work skill are equally interested in the increase of production and, consequently, their benefits from this process are the same. John B. Clark is unique in his analysis of macroeconomic dynamics. His uniqueness stems from his linking the process of cost generation with the five production factors (not the three). The additional two factors out of the total five have been grouped under the generic name of the ‘social progress’.

Here, the three major production factors have included: labor, capital, land plus the factors regulating the instruments of the development of the most market-oriented economy.

The power of the regulatory impact of these factors is such that under their influence the economic equilibrium of the base year largely undergoes disruptions. Consequently, the macroeconomic dynamic system acquires a new equilibrium state. This new market equilibrium is the power of the 'social progress', which consists of the combination of the 'scientific and technical progress' and 'technology-driven improvements' of production, and also, of organizational skills of individual policy makers.

In the end, under the influence of the above described factors, the set of macroeconomic analyses of the social progress eventually benefits from adding a new economic variable – and that is – an incremental profit (John B. Clark named it as an ('entrepreneurial profit')).

The sources of generation of an incremental profit are the skills and ability of decision makers, *brain power* of instruments and methodologies of economic management. Such cumulative effect, which is associated with the social progress, makes up the core input made by the science, technical and technological potential within the structure of the generic contribution to the growth rates of production.

According to John B. Clark, the incremental profit is part of the macroeconomic analysis and is the result of the implemented technical, technological and organizational restructuring within the production process.

The macroeconomic analysis, in statics, lacks an incremental profit as a measure of an income of individuals who adopt policy decisions, under various scenarios. The latter is in fact is a salary of highly skilled labor.

However, the definition of static indicators of market equilibrium equation of 'A' type rates second in John B. Clark's analysis (in statics.) Its analysis holds second, as per its importance and assessment of its regulatory impact on the development of market economy, upon concurrently establishing its major laws.

As regards the importance of the chapter of macroeconomic analysis dedicated to dynamics, John B. Clark viewed that "irrespective of origins of the mechanics that has been revealed and explained by the dynamics section of the economic science, the laws of statics will always be dominant. Any genuine knowledge of the laws on mechanics depend on the knowledge of the laws on statics." [Clark James.,2000] .

Following the laws on competitiveness, the society, according to John B. Clark, "is being governed by the laws on statics because labor is rewarded at any given moment in time by the rate which is attributed to such state of an economy when all dynamics changes are intact and the outcomes of earlier changes convert to

wages and interest. The dynamics, as a science, explores the deviations of real rates from static norms and intervals. This measure is done for bringing the latter back to their compliance with static norms. It studies the velocity of incremental wages and real wages' rates that follow. Also, it studies the velocity of declining norms of interest rates and the real interest rates, to follow" [Clark James.,2000] .

However, the theoretical approach, which had been initiated by John B. Clark in the chapter of his book dedicated to the dynamics, is no doubt interesting from the perspectives of the analysis of the *smart* management factor, which reflects cohesion of management personnel with their innovative instruments of economic governance. In that chapter, John B. Clark had provided meaningful justification of the input made by science and technology activities and innovation technologies, as implemented in real economy.

In whole, the strengths of the concept of the applied analysis and assessment of the effectiveness of regulatory policies lie in the practical value of the three step system of interdependent economic laws of the Universal Economic Law and the applied laws of social economy, in statics, as well as of similar laws governing the dynamic macroeconomics.

The *niche*, defined for the assessment of the input by the science and technology potential to the development of the real economy, has been placed within the concept (as developed by John B. Clark.) Hereafter, under this notion, we mean the impact of science and technology improvements of production processes in real sector national economy.

Having highlighted the above, the level of the technological development, skills and knowledge may co-exist with labor, capital, and land, in the capacity of the autonomous factors of economic development.

According to John B. Clark's concept, the entrepreneurs have what has evolved from their coordination functioning and management of resource potential of the process of production.

John B. Clark is correct, primarily, in his initiating the *smart* factor which is measured and defined by the size of the incremental profit.

*The weaknesses of the concept.* John B. Clark viewed the incremental profit as the 'gift' created under the influence of the social progress or, in our conventional understanding, – under the influence of the 'science and technology' progress.

His concept is based on the income principle of the monetary dimension (as suggested by Adam Smith) with no account to the labor component. It is therefore impossible to juxtaposition production costs with their final outcomes and to calculate the incremental profit.

As an example, the above concept ignored the possibility of comparing the current year labor productivity with that of the previous. It happens because the indicators are impacted not only by changes in prices on goods and services but also inflation. It means that the entrepreneurial profit (entailing from John B. Clark's concept) may turn out to be the effect of inflation of 'purchasing power of money' or the increases in prices for goods and services.

Thus, it is impossible to assess the true origin of the prime sources of the incremental profit because its concept did not account for the possibility of changing the organic structure of the capital. The latter largely undergoes certain changes under the conditions of market competition.

Besides, money circulation has not also been taken into account; neither has been the turnover of goods and services. The socio-economic consequences of the above measurement have not been studied. No analysis of simple and expanded production cycles has been done.

Further in time, the detailed study of the organic structure of capital in macroeconomic dynamics has been carried out by V. I. Lenin. He analyzed the expanded reproduction schemes (as developed by Karl Marx) and paid due account to the science and technology progress." [Consolidation of Lenin's Theories, 1975] .

*Opportunities.* Nevertheless, the theoretical conclusions, developed by John B. Clark, on the just and fair economic laws and the two principles relating to the analyses and assessment of the impact of regulatory policies on social economy are of great importance. These principles, especially, regarding the interpretation of functional features of the social progress may well be effective for analyzing the macroeconomic dynamics, using the two dimensions.

First, the above said is being reasoned by the fact that John B. Clark revealed the theory of income distribution based on one-dimensional marginal utility theory. The latter theory may be replaced by the dual measuring of costs, labor outputs, and capital (sufficiently justified in Karl Marx' reproduction schemes.)

Consequently, John B. Clark's concept of marginal production enables to reveal the core essence of marginal utility as the theory of macroeconomic analysis in statics, and the labor cost theory of Karl Marx as the theory of analysis of macroeconomic dynamics.

Second, he explained, in detail, the marginal utility theory and introduced the sum of marginal utilities and the methods of their application are: the "cluster of elementary utilities". It means that John B. Clark clearly understood the interconnection that lies between the annual income, as the sum of marginal utilities, and the cost of production, as the 'cluster of elementary utilities'.

Thirdly, the novice of John B. Clark's theory is in his view on the notion of labor production. It means that production margins are defined by the usage of the two-dimensional method of analyses. This approach differed from that of Adam Smith and of the advocates of the marginal approach.

Thus, according to John B. Clark's paradox, any paid labor is productive. The national approach, under John B. Clark, represents the cumulative income of all members of the society. John B. Clark is close to Karl Marx in assessing the annual income by the gross product indicator instead of the national income indicator.

Using simple concrete examples, John B. Clark proved that the salary received by a secretary of a business owner is part of the national income. Further in his example, the business owner marries his secretary. She continues to do the same work, but receives no reward in the form of money for work she does. Subsequently, the national income reduces by the amount of the salary she used to receive.

Clark's paradox plays an important role amongst modern critics of GDP as an aggregate macroeconomic indicator which is calculated by subtracting all material costs expensed for its production. Clark's paradox does not find the solution in the framework of Smith's capital profitability theory, expressed in monetary terms.

However, the solution to Clark's paradox is possible when using the two-dimensional measurements of capital: in monetary and labor dimensions. *In the end, Clark's paradox serves the key for using the principle of reversibility of currency and labor unit, and based on that, for defining the contribution of smart factors to economic growth rates.*

This is the possibility of revealing the link between capital in the form of capital ( $Y=V+M$ ) and capital in the form of goods ( $X=C+V+M$ ). The concept of marginal production of John B. Clark is his major contribution to the economic science. Thomas Picketty with the passage of time of over a century could take the best use of the marginal capital profitability theory.

Thus, in order to assess the shift of production from wealthy to poor countries, Thomas Picketty has already benefited from application of the criteria and made the key conclusions relating to that "*poor countries catch up with the rich upon obtaining the same level of technological progress, skills and knowledge, and not when they fall under their possession.*» [Picketty Thomas, 2015] .

In order to explain the "linkages between elementary utilities" John B. Clark demonstrated a simple example of how the marginal utility of a yacht is created. It starts with marginal utility of the tree which the yacht is made of. The yacht is an on-water means of transportation. It helps a man to stay off-water.

In addition, the yeacht is speedy due wind and sail. Finally, for those who are inside, it helps to sense the comfort level. The sum of all five elementary utilities of

the yacht is the aggregate marginal utility. *Here, we may make a derivation that the sum of price variances for goods and services on all types of economic activities (entailing from labor cost of money is defined as the quality of the national currency unit and its cumulative marginal utility).*

The approach has enormous practical value. The point is that for people with different levels of income the elements of each utility may carry different values. Therefore, the prices for utilities are not determined by propensities of individual customers rather by their groups (poor, wealthy, and others). Here, *John B. Clark demonstrated the possibility of converting market prices for goods and services to labor-drawn estimates of cost of money.*

Reversely, there exists the possibility that the real cost of money may be formed on the basis of market prices for goods and services whilst market prices are disaggregated in the cost of specific production factors and by types of economic activities. Here, John B. Clark's merit is in the possibility that has been provided by his theory of marginal productivity — to reveal the necessary elements in order to match Adam Smith's economic theory and Karl Marx' reproduction schemes.

*Threats.* The concept of John B. Clark irrespective of the sufficiently positive features remains idealistic. First, it is based on Adam Smith's income method of one-dimensional measuring the annual product and thus blocks further development of Karl Marx' two dimensional expense method. In so doing, it serves a single-sided pseudo-instrument of analysis and assessment of regulatory impacts on the development of market economy. Based on it, it becomes impossible to juxtaposition efficiency of use of material labor and financial resources.

Owing to the fact that the concept of John B. Clark (based on the above evidence) uses the income method of one-dimensional measuring of the annual product, it makes it impossible to compare the costs with outcomes. Because of this theory, any costs, expenses of material resources as well as capital are fully justified.

In conclusion, the application of the above described methodological concept in analyses (according to the quotation by Thomas Piketty) derails the development of market economy off the right track and sets it along the opposite track in the assessment of inflation and real economic growth. Hence, the path towards disclosing the genuine truth about the real cost of money and the input by science and technology to the growth rates of countries' economic development remains undisclosed, to date.

2. *Alexandr Granberg, The Analysis of the Macroeconomic Dynamics Using the Economic Models Built on the Reproduction Schemes.*

It is of common knowledge that K. Marx deserved all merit in measuring the economic growth indicators, specifically, on the development of Adam Smith's

scientific inheritance. In this regard, capital profitability measurement, in the form, of money and capital productivity, in the form of goods, has especially been valued. Further, the merited contribution by V. I. Lenin, in the same area, was in the development of the interconnection between capital, in the form of money, and capital, in the form of goods with due account to the ‘scientific and technical’ progress. His contribution was also in the science-based explanation of the surplus value generated by an autonomous source and ‘smart’ factors.

Availing of the two dimensional methodology on identifying labor and capital costs, K. Marx developed a simple and the expanded reproduction schemes. Later, V.I. Lenin further added these schemes with the details of the scientific and technical progress. As a result of such an in-depth science-driven approach, the economic science has gradually acquired the permanent features such as: coherence & continuity. Eventually, an additional impulse has been given to the process of co-measuring labor and capital expenditures and their outcomes.

Such impulse in the form of an autonomous and a ‘smart’ factor of the economic development, under market economy, may, indeed, be named as the level of the science and technology potential of the country. The latter may be deemed to possess its inner sources of self-improvement, in the form of a surplus value. Science and human intellect were taken as key factors of the socio-economic development of any given country and, thus, served as major advantages of the Lenin version of reproduction schemes.

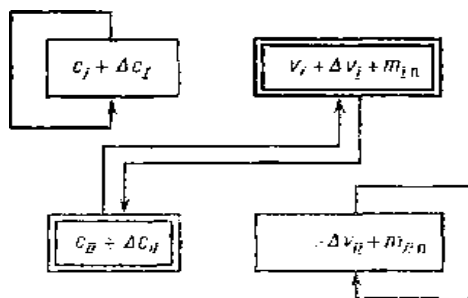
Noteworthy is that V. I. Lenin (in his comments on the book “Accumulations of the Capital” written by R. Luxemburg) insisted on recognizing the scientific and technical progress as a self-sufficient factor of continuous growth of labor productivity. The latter entailed from investments in human development and in the main capital.

Subsequently, the methodology of the analyses of the macroeconomic dynamics in the ex-soviet economic school substantially differed from the western economic schools. The difference was seen in the choice of the methodological base, relating to the assessment of the effectiveness of regulatory policies.

In specific terms, such difference was primarily seen in the need to develop the applied analyses models for the macroeconomic dynamics. The model was based on the two-dimensional measurement of the economic growth, capable of replacing one-dimensional system of economic analyses.

Thus, Alexandr Granberg has explored the Marxian reproduction schemes from the perspective of the opportunities that those provided for setting up the mathematized models — to reflect economic dynamics.

*Example:* while constructing the model of a simple reproduction scheme Aleksandr Granberg has assumed an exchange between the two subsets  $\Delta c_I + \Delta v_I = \Delta c_{II}$  to be the initial source. In the expanded reproduction schemes (with due account to accumulations), he assumed the exchange between the two subsets and within the two, to be in the following ratios:



Scheme 1. The Procedure of Matching the Indicators of the Two Subsets. The Granberg model.

The outcomes of the exchange of products in accordance with the adopted procedure of matching the indicators of the two subsets are: the balanced distributions of outcome products (shown below):

$$\begin{aligned}
 x_I &= \underbrace{c_I + c_{II}}_{\text{Reward of production means}} + \underbrace{\Delta c_I + \Delta c_{II}}_{\text{Accumulations of production means}} \quad (2.85) \\
 x_{II} &= \underbrace{v_I + v_{II} + m_{In} + m_{II n}}_{\text{Non-production consumption}} + \underbrace{\Delta v_I + \Delta v_{II}}_{\text{Accumulations of products}}
 \end{aligned}$$

A. Granberg has pointed out that the specific features of the analyses of the macroeconomic dynamics in the Marxian reproduction schemes are as follows: (a) the reproduction cycle of the main and operating capital equals one year, (b) the organic structure of capital (ratio  $c:v$ ) in both the two subsets remains constant in time, (c) the rates of surplus value (ratio  $m:v$ ) in both the two subsets remain unchanged, and (d) the share of accumulations of surplus value in subset I remains unchanged.

The above assumptions define the dynamics of the two subsets. As a result, starting from the second year, the annual growth rates and key ratios (including between the two subsets) remain constant. That means, - the proximity with the mainstream trajectories of the balanced growth has been observed such that: the annual growth rate  $P_{t+1/t}$  is defined by the following ratio:

$$P_{t+1/t} = \frac{\alpha_I m_I(t)}{c_I(t) + v_I(t)},$$

where  $\alpha_I$  — constant share of accumulation of surplus value in subset I.

A. Granberg has also indicated that the specific feature of the Lenin reproduction schemes lies in the input by the scientific and technical progress. In

addition, K. Marx had attached growth in labor production forces to that, in the organic structure of capital. As regards this subject matter, V. I. Lenin had taken on the dynamic changes in the organic structure of capital as the parameters of regulating the reproduction processes.

In the mathematical model of A. Granberg, the ratio C:V has transformed into an instrument of assessing the share of the regulatory impacts on the rates of economic growth in both the two subsets [Granberg, A.,1985].

The role of the cost ratios is especially critical in the market economy development because the major driving force of the market economy is the social progress, driven by the advancements in science & technology. Further, V. I. Lenin believed that the key regulators of the dynamics between subsets I and II are: the progressive changes in the organic structure of the capital.

A. Granberg upon having studied the reproduction schemes of K. Marx and V. I. Lenin, has developed the linear model with the exogenous dynamics of consumption, suitable for analyzing the macroeconomic dynamics of the interactions between the two subsets.

He has made an assumption (while making a reference to the well known text book on political economy written by N. A. Tsagolev) that “in the process of the macroeconomic planning, the cost ratios are inferior to the ratios, determining materials and things, thereby, these serve the purposes of materialization of the latter” [Granberg, A.,1985]. He also considered that the production volume, under subset I ( $X_1$ ), and subset II ( $X_2$ ), are in accordance with their previous terms, and, thus, fully satisfy the equations of the Marxian reproduction schemes:

$$\begin{aligned} X_1 &= AY - C, \\ X_2 &= C. \end{aligned}$$

A. Granberg has introduced new terms in developing his theory. So, let  $p_1$  and  $p_2$  — be the growth rates of the products in subsets I and II;  $\gamma_1$  and  $\gamma_2$  — the shares in subsets I and II be the growth rates of the gross domestic product ( $\gamma_1 + \gamma_2 = 1$ ), then:

$$\begin{aligned} \gamma_1 &= 1 - \frac{1}{A} * \frac{C}{Y}, \\ \gamma_2 &= \frac{1}{A} * \frac{C}{Y}. \end{aligned}$$

Above all, A. Granberg has had an intention to answer the question posted by R. Luxemburg and V. I. Lenin. That question had, at its times, become the core of the disputes between Luxemburg and Lenin. Their differing views were on whether the reproduction schemes would be suitable for assessing of the contribution made by the scientific and technical progress.

The solution for this problem, according to A. Granberg, has been seen in the close interconnection in the assessment of the ratios between the two subsets.

For the purposes of the study of such interconnectedness, he has carried out the analyses of the three types of economic development that differ in their pre-set growth rates of consumption  $r$  on the trajectory  $c(t) = c(0)e^{rt}$ , and in the dynamics of the rates of production consumption  $\alpha(t)$ . For a start, it has been assumed that the parameters of the macro - technology are: coefficients A and B, and they remain unchanged, in time.

1. The first development scenario. The rate of the accumulation remains constant:  $\alpha(t) = \alpha_0, r = \frac{\alpha_0}{B} = p_0$ .

In this case, because  $p_c = p_y = p_0$  and  $\frac{c}{y} = (1 - \alpha_0)$ ,

then  $p_c = p_y = p_0, \gamma_1 = 1 - \frac{1}{A}(1 - \alpha_0)$ , and  $\gamma_2 = \frac{1}{A}(1 - \alpha_0)$ .

In the above case, the rates of the two subsets remain equal and constant; the shares of the subsets in the gross domestic product remain unchanged, also.

**2. The second development scenario. The rate of the accumulation decreases as the consequence of  $r > p_0$ .**

In this case, the share of subset II increases at the cost of the decrease in the rates of production accumulations:  $p_2 > p_1$ . However, the growth rates of the gross domestic product and the national income fall. At point  $t_1$  these rates nullify. Earlier in the development: under the condition of  $t = \tilde{t}_1 < t_1$  the rates reach the maximum and production in subset I starts decreasing. At point  $t_2$  the volume of national income and of gross national product become zero. Prior to the above point, namely, at point  $t = \tilde{t}_2 < t_2$  — production in subset I also becomes zero. Example: using  $r = 0,08$  we then find that  $\tilde{t}_1 = 3,24, t_1 = 4,98, \tilde{t}_2 = 9,8, t_2 = 11,16$ . The prevailing growth in subset II due to the high levels of consumption has its economic rationale, but that is only at insignificant time intervals.

3. The third development scenario. The increasing rate of accumulations is seen as the consequence of  $r < p_0$ .

In the above case, the share of subset I and the rate in subset I increase due to the increase in the rates of accumulations. The limits of their growth are :

$\lim_{t \rightarrow \infty} p_1(t) = \frac{1}{B} = 0,286, \lim_{t \rightarrow \infty} \gamma_1(t) = 1$ . Example, if  $r = 0,04$  we have  $p_1(5) =$

$0,11, p_1(10) = 0,185, p_1(20) = 0,275, \gamma_1(5) = 0,73, \gamma_1(10) = 0,82, \gamma_1(20) = 0,97$ .

The feature that is common for the obtained trajectories is the constant nature of the rates in subset II.

The overall conclusion is: under all assumptions (particularly, the constant nature of coefficients A and B), the monotonic increases or decreases in the share in subset I may be justified only for the limited time intervals, when the goals are set. These are to rapidly increasing the level of income or production levels.

A special note should be taken of the constancy of coefficients A and B. These are in accordance with the scenario when the economy moves along the trajectory of the balanced economic growth with no changes occurring in the economy in neither progressive nor in recourse direction.

In overall, A. Granberg has studied the influence of coefficients A and B on the dynamics of the ratios in the two subsets. Here, case B is possible, where  $b(t) = b(0) * A e^{\kappa t}$  and  $\kappa > 0$  (i.e. only direct capital intensity increases whilst materials intensity remains largely unchanged).

Then, under the conditions of the constant rates of the accumulation  $a(t) = \alpha_0$ , the ratio of the production volumes in subset I and II remain unchanged (according to the initial data derived from examples set by A. Granberg, these remain at 68% and 32 %), and the rates in subsets I and II decrease in equal proportions. The outcome is positive compared to other alternative conclusions.

If, under the conditions of the unlimited growth in the capital intensity, the rate of consumption is maintained constant, then the share in subset I, at its final time interval, reduces to zero. The macroeconomic dynamics, in this case, moves along the similar trajectory, which accords with constant capital intensity and satisfies the condition when  $r > p_0$ . When capital intensity decreases ( $k < 0$ ) and constant consumption growth rate remains unchanged, then the changes in the dynamics of the ratios in subsets I and II move in opposite directions. In that case, the overall picture does not change in quality compared to the changes in the development, under the condition of constancy of coefficient B and, the condition when  $r < p_0$ .

The changes in coefficient A time-wise impact the dynamics of the two subsets since those cause the subsequent changes in coefficient B (because  $B = bA$ ). In particular, if  $A(t) = A(0) * e^{\sigma t}$ , then, under the condition that  $b(t) = b$  and is constant, we would have  $B(t) = B(0) * e^{\sigma t}$ . At the same time, with all the above changes, the ratios between the gross output and national income do change. The increase in A leads to the additional increase in subset I and its share in the gross product. The decrease in A causes the reversed changes.

Let the dynamics in the two subsets, under the constant rate of production accumulations  $\alpha(0)$  and  $A(t) = A(0) e^{\sigma t}$  be given, where  $\sigma > 0$ . The growth rates in subset II and of the production accumulations tend to monotonously decrease to zero, whilst the growth rates in subset I reaches its maximum. The share in subset II

decreases in accordance with the following formula:  $\gamma_2(t) = e^{\frac{1-\alpha_0}{A} e^{-\sigma t}}$ . The share in subset I increases, accordingly, as in formula:  $\gamma_1(t) = 1 - e^{\frac{1-\alpha_0}{A} e^{-\sigma t}}$ .

When the materials intensity decreases ( $\sigma < 0$ ) the changes tend to move in opposite directions. Thus, if  $\sigma = \pm 0,01$  and the initial data is sustained ( $A = 2,5$ ,  $B = 3,5$ ,  $\alpha_0 = 0,20$ ), then the macroeconomic indicators  $p_1$ ,  $p_2$ ,  $\gamma_1$ ,  $\gamma_2$  are arranged in the following order (Table 1).

Table 1. Comparative Analysis of the Growth Rates of the Two Subsets and Their Ratios.

	$\sigma = 0,01$			$\sigma = -0,01$		
	$P_1$	$P_2$	$\gamma_1$	$P_1$	$P_2$	$\gamma_1$
0	0,072	0,057	0,680	0,042	0,057	0,680
5	0,068	0,054	0,696	0,045	0,060	0,664
1	0,066	0,052	0,711	0,047	0,063	0,646
2	0,060	0,047	0,738	0,054	0,070	0,609

As seen from Table I, when defining the growth rates in subsets I and II, as well as the share of each subsets in the overall output, the key value is being attached to the nature of changes in the materials intensity. In specific terms, under the positive parameters  $\sigma$  of the exponential function  $e^{-\sigma t}$ , the accelerating growth rates would be registered in subset I and, under the negative parameters  $m$ , the accelerating growth rates would be seen in subset II.

Thus, if the annual growth in the materials intensity decreases by 1 %, the growth rate in subset II will increase from 5.7% to 7.0 % per year, and their weights in the aggregate domestic output will increase from 32% to 39.1%, accordingly. Thus, the point relating to the prevailing growth rates in subsets I and II turns out to be having no grounds.

The analysis of the macroeconomic dynamics (based on the above two subsets) that has been carried out by A. Granberg revealed that the growth rates in subsets I and II will be determined by policy makers who adopt the decisions relevant to this subject matter.

The key in this analysis is the decrease in materials intensity of the gross domestic product. However, such decrease in the Granberg model has “greater impact on the dynamics of the two subsets” since the change in coefficient A causes the changes in coefficient B” [Granberg, A.,1985].

The key to the solution of this problem set (as set by A. Granberg) could be found in the additional comments regarding the positive changes in the structure of production costs. Those were written, at times, by F. Engels and were added as the appendices to the book of K. Marx “The Capital”, where F. Engels wrote: “the share of the cost,

originating from raw sources and added materials decreases as the labor production, relating to such materials increases. Reversely, the capital increases in its greater part, - and that is, - more of characteristics relating to the increase in the labor production force since, at the same time, the component of the cost of capital which is shifted onto the goods increases, as the capital decreases in value with the passage of time. For the new production method to increase the volume of production, it should, in the course of capital depreciation, shift that part of its cost, which is smaller than one, saved at the cost of the decrease in the physical labor. In other words, this method should decrease the cost of goods. It is obvious that the above stated should also occur when the cost is created from the added cost, commensurate to the more expensive types of raw resources which increase in quantities. All the additions to the cost should be made equal by means of the decrease in their costs, entailing from the decrease in the physical labor [Pikkety, T.,2015].”

In accordance with those well known comments by F. Engels, the coherence in the ratios of capital indicators, in the form of money ( $Y=V+M$ ), and capital, in the form of goods, ( $X = C+V+M$ ) will become the basis to the solution by A. Granberg of his problem set with the sub-tasks on the decreasing materials intensity of the gross domestic product. In other words, it is necessary to ensure coherence in the indicators of the nominal GDP ( $NGDP=Y$ ), which defines the cost of the final product and the indicators of the gross aggregate product ( $X=C+V+M$ ), consisting of the sum of costs, including materials costs needed for production of the set volume of the final product in the form of the annual income ( $Y=V+M$ ).

Without the analysis of this binary set of indicators, the solution of the Granberg problem set seems to be impossible. The paradox, associated with the the Granberg problem is in the set of indicators and criteria relating to the real growth rates, which until the demise of the former soviet system, still remained disputed. In fact, those indicators tended to change from time to time.

Thus, the so called indicator of “gross product” had served in ex-soviet times as an estimate of economic growth. As with the same discussion topic, the ex-soviet economic school was divided into several groups. It needs noting that amongst the Russian economic scientists the same dispute goes on, until now. The real GDP structure, which has ‘mechanically’ been shown to countries of the Commonwealth of Independent States for using it as a pattern, now serves as the current criterion of economic growth.

However, recently the world has acquainted itself with Thomas Picketty’s book where the notions of inflation (to be construed as the GDP deflator) and real economic growth (to be construed as the real GDP) “have not always been defined correctly” and that the breakdown of the nominal growth into real and inflation-

driven components have been defined arbitrarily, thus, creating plenty of contradictions” [Piketty, T.,2015]. In his book, Thomas Piketty has explained the contradictory nature of the indicators that were reflected in official economic reports for over the past decades in France and in the UK [Piketty, T.,2015]”. That means, A. Granberg’s problem set of constructing the few- sectors’ based model of economic growth remains unsolved not only in Kazakhstan and Russia, but also, in certain developed countries.

Under the contemporary realities, it becomes clear that the solution of the Granberg problem is directly associated with the answer to the question on the origin and nature of the labor cost, value of goods and services, and sources of productivity. All those, in their aggregate, define the urgency for the applicable methods - to measure expenditures and their outcomes.

As a result of the joint researches by the authors of the present statement, the framework for the scientific explanation of those realities has emerged. The answer to the quest what defines the coherence of the labor cost theory of Karl Marx and the marginal utility theory of the Austrian economic school. If, the first theory represents the most in-depth scientific apparatus of the cost, which has been developed in accordance with labor costs, then the second theory is focused on the rational use of the main factors of production (labor, capital, land and etc.) by stimulating their marginal utility responses.

In general, only by means of setting up the main tasks and by solving the concurrent tasks of effective management of limited production recourses that are based on the two dimension principle, enables us to construct the inter-sector balance of using labor resources by types of economic activity and in the reverse order.

In short, the two dimension principle enables the shift of the indicators (as shown in the inter-industries balance sheets and expressed in monetary measurements) to the commodity- and- goods measured indicators and, to compare their dynamics movements, in the dynamics, over a time series of several years.

In turn, the principle of the shift of the matrix of full costs, in monetary form, to the matrix, in the labor cost terms, (measured by the amount of time) enables the turnover of monetary flows and of labor units and, also allows to ensure the mutual complementarity of the concepts of the marginal utility theory and of the labor cost theory for the assessment of monetary flows, as well as, of the labor cost theory, most needed for the assessment of commodity flows.

Subsequently, the change in the current model of the balanced economic growth for a re-visited economic model of assessment of the effectiveness of the regulatory policies is possible by means of according the labor cost theory with the marginal utility theory. That being the case, the theoretical and methodological basis

has been set for resolving the Granberg tasks regarding decreasing the materials intensity of the gross product.

The opportunity will arise, parallel in time, for reviewing of economic models of assessment of regulatory impacts on the economic development of any given country. First of all, the change in economic models is beneficial for the developing countries. That is being explained, primarily, by the fact that almost all developed countries are positioned within the zone of international reserve currencies and, for that matter, such change in economic models is not beneficial for them.

### **3. The principle of reversibility as the method of solving the Granberg problem set on the decreasing the materials intensity of the gross product.**

By analyzing the history of the development of the income method, which based on the theoretical inheritance of one-dimensional measurement of expenditures and their outcomes of Adam Smith, and the expense method of the two dimensional measurement, which is based on the theoretical inheritance of Karl Marx, the methodology of setting up the system of economic models and their coherence between on another, has been set up [Baizakov, S. and Oinarov, A., 2000].

As with the application of this methodology, the intention of the authors of the present research (focused on exploring the instruments that are adequate to modern realities and relate to measuring expenditures and their outcomes) facilitate the solution of the Granberg problem set and, thus, enable identification of genuine parameters of real economic growth.

First, the indispensable instrument for according the labor cost theory and the marginal utility theory has come to be the principle of the two dimensional measurement system. With its help, the solution of the concurrent problems becomes possible, parallel in time. These relate to the monetary and labor forms of measurements. The expenses and outcomes matrices, in accordance with the forms of measurements, serve the basis for the shift of the monetary measurements to labor measurements, and in the reverse order, when the two dimensions principle is applied.

The procedure of the interchangeable shift of one dimension into another (and vice versa) as the methodology of solving the concurrent problems in two dimensions has been reflected, in detail, in the three volume book of N. Akimov "From Capitalism to Capitalism [Akinov, N., 2014]." As highlighted in his book, the algorithm of the change in economic models starts with the inter-sector model by means of scaling the vectors and the matrix parameters (measurements). "Scaling means reflection of the aggregate domestic product as some homogeneous, not multiple component outcome, of the domestic product when both the products are not disaggregated into components yet. Then, instead of the matrix, the coefficient of direct costs of dimension ( $n \times n$ ), if that holds true, then only one coefficient ( $a$ )

will be in effect. It shows how much of the aggregate domestic product vanishes in the course of the interim consumption" [Akinov, N., 2014] The account of the entire procedure, as this, leads to the transformation of the initial model of the inter-sector balance towards the type, - to follow [Akinov, N., 2014] :

$$X = \frac{1}{1-a} Y = bY,$$

where

$$b = \frac{1}{1-a} = (1-a)^{-1}.$$

Further, having skipped the most technical part of the algorithm of the Akimov 'scaling' and, upon referring interested readers to the specific chapter of N. Akimov's book [Akinov, N., 2014], we shall introduce the notations, where  $B = (E - A)^{-1}$  reflects the reverse matrix of full expenditures of the national

economy, defined by the inter-sector model in the monetary form. The 'A' is the technological matrix in it. The matrix is defined by all types of economic activity, and 'E' is the matrix of the specific algebraic units.

In general, the basis of the two dimensions principle of the inter-changeable reversibility of labor measurements to monetary measurements and, in the reverse order, is the following set of equations, describing the mutual interdependencies between the macroeconomic and microeconomic indicators of direct and full labor costs, their price variances for goods and services, and their costs by types of economic activity:

$$T(i)Y(i) - t(i)X(i) = \pm\Theta(i), \quad i=1,2,\dots,n.$$

where  $\pm\Theta(i)$  – the difference between the labor costs and the time, defined by the volume of the final product by type of economic activity ( $Y_i$ ), and the labor costs, defined by production of goods, commodities and services ( $X_i$ ), expressed in man-hours per year, man-days per year, and man-months per year, by the same type of economic activity.

As the result, at the level of the national economy, the sum of prices of all goods and services will equal the sum of their costs:

$$\sum_i^n T(i)Y(i) = \sum_i^n t(i)X(i),$$

where  $t(i) = \frac{L(i)}{X(i)}$  - time, spent by people for a monetary unit, received from sales

of goods and services by type of economic activity, in man-hours per year, man-days per year, and man-months per year, by the same type of economic activity;

$tX=L$  – the national fund of the time of labor, calculated by the output of goods and services (X), defined according to the inter-sector balance sheets, accounting for the time of workers, expressed in man-hours per year, man-days per year, man-weeks per year, and man per year;

$TY=L$  – the national fund of the time spent for labor, defined by the volume of the final product (Y) according to the inter-sector balance sheets of the time of workers, expressed in man-hours per year, man-days per year, man-weeks per year, and man per year;

$T(i)=t(i)*B$  – full time, spent by workers on labor in the monetary unit, received from the realization of goods and services by types of economic activity, expressed in man-hours per year, man-days per year, man-weeks per year, and man per year, and years.

The economic content of this equation has been revealed by the Akimov algorithm, as follows:

since  $T^Y$  represents the labor intensity of the final domestic product, and  $t^X$  – the labor intensity of the gross output, the indicators of labor intensity by types of economic activity may be denoted as  $t_i^Y$  and  $t_i^X$ , which reflect the labor intensity

commensurate to the final gross product of  $i$ -th sector ( $i=1, n$ ), such that  $T^Y$  and  $T^X$  are written as [Akinov, N., 2014]:

$$T^Y = \begin{Bmatrix} t_1^Y \\ t_2^Y \\ \cdot \\ \cdot \\ \cdot \\ t_n^Y \end{Bmatrix} \text{ and } T^X = \begin{Bmatrix} t_1^X \\ t_2^X \\ \cdot \\ \cdot \\ \cdot \\ t_n^X \end{Bmatrix} \quad (1)$$

Having disaggregated  $T^Y$  and  $T^X$ , as in (1), we obtain the system of equations reflecting full costs of physical labor, spent for a unit of the final product in each sector [Akinov, N., 2014]:

$$\begin{cases} t_1^Y = t_1^X b_{11} + t_2^X b_{12} + \dots + t_n^X b_{1n} \\ t_2^Y = t_1^X b_{21} + t_2^X b_{22} + \dots + t_n^X b_{2n} \\ \dots \\ t_n^X = t_1^X b_{n1} + t_2^X b_{n2} + \dots + t_1^Y b_{nn} \end{cases} \quad (2)$$

Thus, full labor costs of production of the final product are defined by 'scaling' of the product of direct labor intensity of the gross output of all sectors and of the relevant columns of the matrix of full costs of the model of the inter-sector balance, in the monetary expression.

The overall result of the analysis and the assessment of the effectiveness of the impact of regulatory policies on the development of economy is (first) the equation, which defines the inter-changeable reversibility of the capital in the form of money and, capital, in the form of goods, and in the reverse order:

$$c \equiv \frac{t}{r} = \frac{Y}{X}. \quad (A)$$

Secondly, the difference between the marginal growth rates of the capital, in the form of money, in macroeconomics, and of the capital, in the form of goods, in microeconomics, are defined as follows:

$$\frac{\dot{c}}{c} = \frac{\dot{Y}}{Y} - \frac{\dot{X}}{X}. \quad (B)$$

Here, the ratio  $\frac{\dot{c}}{c}$  denotes the difference between the marginal growth rates of the final product (as the indicator of capital, in the form of money)  $\frac{\dot{Y}}{Y}$ , and the output of goods and services (as the indicator of capital in the form of goods)  $\frac{\dot{X}}{X}$ . It may be named as 'the marginal utility coefficient of the science and technology changes' since it has emerged as the '*ex mahina*' somewhere from above, under the rigid equality between labor time and capital, spent for production of the final product (Y), in macroeconomics, and the output of goods and services (X), in microeconomics.

Such results entail from INSIDE of most socio-economic systems that are defined by juxtapositioning the solutions of inter-sector economic models of countries development, built in labor and monetary terms. This impact of the science and technology potential of the country, as reflected in the book of J. Clark, relating to the macroeconomic level has been named as 'an entrepreneurial profit' in the expanded reproduction schemes, built with the account for the scientific and technical progress by V.I. Lenin, that is, - the surplus profit.

The measure of this impact, in particular, defines the level of the development of labor production forces and the capital in any given country. The assessment of its level has been revealed in comparing the speed and velocity of movements of key indicators of the macroeconomic dynamics, capital, in the form of money, and capital, in the form of goods.

The unique result of the present research work entails from the fact that the equation reflecting the time, spent for production of the final product (Y) and for the output of goods and services (X), enables the ratio  $\frac{c}{c}$  to be interpreted as the ‘net

input by the science and technology potential’, identified as the difference between the labor marginal utility, by the final product, and the labor production marginal utility, by the output of goods and services.

That is a complete answer to the solution of the Granberg problem, obtained by the scientifically justified co-measuring of expenditures and outcomes.

With the help of the economic models of the analyses of the macroeconomic dynamics, where the indicators of one of the binary pairs are omitted or rather omitted is the capital, in the form of money, or capital, in the form of goods, thus, resolving the Granberg problem set becomes impossible. The mandatory and sufficient condition to such a solution is the availability of the full and complete matrix of the inter-sector balance sheets.

No doubt, not always the development of the science and technology potential results in success and positive achievements. In the same manner, not all vector directions of investments in the development of labor and capital and organizational efforts lead to the entrepreneurial profit. That, if happens, may not occur in all sectors of the economy, as well. Thus, at the level of the national economy, the negative surplus profit occurs often times but not. Moreover, not always the maximum profit is that have been gained from investments prove to be, as expected. On the contrary, the expected profit may turn out to be a loss.

For the assessment of the right choice of the most effective vector directions in investment in labor and in capital, the assessment of the input by the country’s science and technology potential is much needed.

If such contribution by the science and technology potential, at country level, has earlier been largely assessed by hypotheses, the scale of production or the Solow residual, now, an opportunity has arisen, and that is - to assess its substantive content: by means of the actual time of labor, spent for production, by means of the difference between capital profitability, in its form of money, and capital productivity, in its form, of goods.

Thus, having in view, that complete labor intensity of production of the final product is defined by multiplying direct labor intensity of the final product by the technological matrix of full costs, which serve the ‘carrier’ of the science and technology progress, we may formulate the following overall economic law:

***The product of full labor intensity of production and of the costs of the final product equals the product of the direct labor***

In this law, the cost of the output of goods and services enables revealing the macroeconomic origin of the macroeconomic indicators. According to this law, the cost of the output of goods and services is formulated as the sum of overall expenditures of materials, labor and capital and the final product, defined according to costs, is equal to the nominal GDP.

Under the material costs, the replacement of interim materials is meant. Also, under this item, the replacement of other current resources, used in the production of goods and services is meant. Under the labor, rewarding of labor costs of hired work force is meant; and lastly, under the capital – rewarding of the drawn main capital is meant, in this context [Emerson, G.].

As is known, in the process of the exchange of goods and services at the macroeconomic level, the technological line in the cycle of interchangeability of physical measurements of the commodity mass into monetary mass and, of them both, in the reverse order, has clearly been observed.

Thus, we may accept the hypothesis, such that, the annual volume of goods and services, realized by an enterprise, in nature of  $K_T$  of conditional units equals the gross profit of  $K_D$ .

In that case, the price of the good  $U_T = K_D/K_T$ , and the profit from sales  $X = U_T * K_T$ . In this case, the velocity of money circulation by the denomination of the national currency unit will be:  $v_x$ , which is defined under the conditions of **the international consensus, according to the complete reproduction schemes of Karl Marx:**

$$X = v_x * M. \quad (\text{Formula 1})$$

Here:

$$\frac{X}{(v_x * M)} = 1, \quad (\text{Formula 2})$$

or

$$\frac{K_T * U_T}{(v_x * M)} = 1. \quad (\text{Formula 2a})$$

The hypothesis, as admitted, herewith, is accorded with that of J. Clark where any output of goods is represented as the sum of the elementary utilities of materials benefits that have been consumed for the purposes of production of the output of goods sold.

Regardless of the opportunity to assess the effectiveness of the regulatory policies' impact, according to the two dimensions measurements, following formulas 1-3, now, the analogous work is being undertaken by means of the techniques that meet the requirements of one dimensional method of A. Smith. In this case, the nominal GDP is defined by means of deducting the measurement of the cost of materials expenditures (QP):  $NGDP = X - QP$  from profit X. Formula 2, now,

looses its former macroeconomic substance and converts to the equation of the macroeconomic type, not capable of solving the Granberg problem set:

$$\frac{NGDP}{vn*M} = 1, \quad (\text{Formula 3})$$

Where  $vn$  - money velocity.

Formula 3 has none of the physical measurements and thus represents the monetary value, only. A. Smith who affirmed that labor is the sole source of measuring the annual income, herewith, happened to contradict his own self. And also, his followers, in order to estimate the real volume of the final product, now, use the specific parameter, in the form of the GDP deflator, (inflation).

Indeed, the GDP deflator (inflation) in official statistics, as defined on the basis of the index of physical volumes of goods and services (IFO) is a universal economic indicator, necessary for setting the dynamics of market prices on goods and services in real economy. It is also needed for setting the dynamics of the purchasing power of money in the fiscal and monetary systems, parallel in time.

Since the GDP deflator serves the basis of the balance of the nominal and real GDP -  $NGDP = pb*RGDP$ , formula 3 defines  $NGDP = vn*M$ , then we may derive the following:

$$pb*RGDP = vn*M \quad (\text{Formula 4})$$

In Formula 4, money velocity  $vn$  is itself the function which is depended on the money velocity of profit  $vx$  and velocity of money circulation on the interim product  $vz$ :  $vn = \frac{x}{M} - \frac{QP}{M} = vx - vz$  or which is the same as in:

$$vn = vx - vz. \quad (\text{Formula 5})$$

Thus, Formula 5, which links the velocity of money mass circulation  $vn$  with the turnover of the nominal GDP, and with the goods designed for the interim consumption - the indicators of profit  $\Pi_T * K_T$  are then: in the direct interconnection with the indicators of consumption of the interim products  $QP$  and the nominal GDP.

Now, on the basis of Formula 5, an opportunity has again arisen for us to create an able instrument, which transforms real economy into the locomotive of sustainable development, a prices-based GDP deflator (inflation) and the purchasing power of money, i.e. the key indicators of management of innovation-based investing.

In the meantime, as Mr. A. Ulukayev, Minister of Economic Development of the Russian Federation, has pointed out that the level of inflation is being 'prescribed by the impact of the shift of the devaluation'. The inflation, warmed up by the shift of the devaluation, distorts the real growth of the economy and negatively impacts the real wages and incomes. Such distorted situation is created in

the economy where the demand for goods and services surpasses the volume of the final product.

In this connection, the targeting of prices on goods and services, as one of the methods of the anti-crisis management, becomes a serious bottleneck in the way of defining the real growth of the economy. As indicated above, this topic has been explained, in greater detail, by Thomas Piketty.

The price deflator GDP (indicator of inflation) indeed represents a combined factor, consisting of the component that possesses not only the destructive but also developing power in relation to a market economy. The study of its structure may help in analyzing the differences between the rates of implementation of the science and technology, and finance, and social, and political innovations.

The final outcome of such study may be the assessment of the quality of the innovations-based input to the development of national economy. Thus, the assessment of the innovations-based contribution of entrepreneurs is defined by the level of inflation\deflation, production costs. The assessment of the quality of the innovations-driven contribution to finance is defined by the level of depreciation/appreciation of money, national currency (pp). The assessment of the innovations-based input by the corporate management structures, particularly, their decisions making effectiveness, and of public and private partnerships is defined by the quality and the level of the science and technology potential in the country (c).

The Table below reflects the indicators on defining the science and technology potential, based on the example of Kazakhstan for the time series 2000-2010.

Table: The Indicators of the Balanced Economic Growth of Kazakhstan for 2000-2010. (2000 = 100)

Indicators	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP Deflator in year 2000, %	100	107	108	124	158	191	244	290	358	305	364
IFO GFP in 2000, %	100	114	125	136	149	164	181	197	204	206	221
The level of the country's science and technology potential, % (rounded up.)	100	98	105	108	105	105	107	111	109	116	127
The purchasing power of the national currency, Kazakhstan's Tenge, (KZT), B %	100	92	97	87	67	55	44	38	31	38	35
The Index of real	100	114	125	136	149	164	181	197	204	206	221

GDP growth,%											
The Index of nominal GDP growth,%	100	121	135	169	236	312	443	573	729	630	806
The Index of nominal growth of the final product by formula pp*NGDP,%	100	111	131	147	157	171	193	219	223	239	281
The Index of real growth of the final product by formula c*RGDP%	100	111	131	147	157	171	193	219	223	239	281

*Source: The Statistical Committee of the Republic of Kazakhstan*

All the indicators, as listed in the above shown Table are inter-linked amongst them, and with the equations that are set on the basis of the recurrent formulae 1-5. With the application of this set of the equations, the income method of A. Smith is linked to the expenditure method of K. Marx.

Thus, in the above shown Table, the growth rates of the GDP deflator (pb) and the real GDP (RGDP) have been set according to the country's official statistics data and economic indicators, and the dynamics of the levels of the science and technology potential of the country in the percent relative to year 2000, has been defined on the basis of the formula, below:

$$c=Y/X, \quad (B)$$

where  $Y=NGDP$  – the nominal GDP, herewith, represents the final product.

From the above Table, it is seen that irrespective of the fall in certain key indicators in 2001, 2004 and 2008, the growth rates of the science and technology potential of Kazakhstan in 2000-2010 went upward and has been sustained along the ascending scale. This has registered one of the highest outcomes in growth amongst world's developing countries for the same period.

The results of our research has shown that the dynamics of the levels of the science and technology potential of Kazakhstan over the last decade has vividly and objectively reflected the growth rates of production forces in the economy.

The country's annual growth rates have been defined on the basis of the official statistics data. Thus, the ascending trend (as shown in the above Table) is the reflection of the action, taken by the economic law, in its form (B). The law determines the assessment of the regulatory impacts of each economic entity in the development of national economy.

In this connection, it is being recommended, herewith, that permanent monitoring of the dynamics of the changes in the science and technology potential of

Kazakhstan shall take place, to ensure coherence between measurements of expenditures and their outcomes.

The purchasing power of the national currency (pp) in the above Table has been defined in the percent relative to year 2000, according to the recurrent formula:

$$pp=c/pb, (C)$$

where c – the level of the science and technology potential of the country, and pb – the level of the GDP deflator (pb).

As seen from the above Table, the purchasing power of the Kazakhstan Tenge fell to pp=35% over the last decade compared to its level in the base year 2000. The similar trend showing the decrease of the national currency has also been attributed to other developing countries.

The nominal GDP growth indexes (NGDP) have been set by the official statistics data and the real GDP growth rates (RGDP) in this Table, by means of the de-filing have been determined in the certain percent relative to year 2000, according to formula below:

$$RGDP=NGDP/pb. (D)$$

For the period 2000-2010, the growth rates of the real GDP equaled RGDP=221%. The last two rows of the above Table reflect the balanced levels of the real final product - RQ. One of those has been defined as the product of the nominal GDP (NGDP) and the genuine purchasing power of the national currency of the country:

$$RQ = pp*NGDP.$$

In this case, the growth rate of the real final product has equaled RQ =281%. The other of the two has been defined as the product of the real GDP and the level of the science and technology potential of the country:

$$RQ = c*RGDP.$$

The above indicator, in the same extent as the first one, has equaled RQ =281% and, has turned out to be by 1/3 larger than that of the real GDP which has been derived from the official statistics. Such result has been obtained by defining the precise assessment of the growth rates of the science and technology potential of the country.

Thus, the calculations of the growth rates of the final real product on the basis of the GDP of the official statistics data, with the account of the level of the science and technology potential of the country proves the balanced growth of capital, in its form of money, and capital, in its form goods.

Thus, the new model of the balanced levels of production, employment, income, and prices defines the entire set of the pre-calculated GDPs that have been identified by means of the relevant qualitative indicators.

Such results may be obtained by developing the models of the balanced economic growth of Keynes, Friedman, and Mandell - Fleming. Thus, it is not a complicated task to prove the following equations that link your obtained results, shown in the Table, with the equilibrium models of monetarism:

$$vn = \frac{X}{M} * \left( \frac{\mu}{1+\mu} \right) = \frac{NGDP}{M} -$$

where velocity of money mass circulation (M), defined via the nominal GDP which is NGDP (vn);

$$vx = \frac{X}{M} = \frac{1+\mu}{\mu} -$$

velocity of money mass circulation (M), defined via the gross output  $\kappa$ -X (vx);

$$NGDP = \mu QP -$$

the coefficient  $\mu$  is defined by the ratio of the nominal GDP to the interim product (QP);

$$NGDP + QP = X -$$

gross output may be represented as the sum of the nominal GDP and the interim product;

$$vn = vx - vz, -$$

where  $vz = QP/M$  – velocity of the circulation of money mass, defined as the interim product.

However, now, under the modern conditions of the globalization of the world economy, only the revisited currency- and- fiscal system may serve the basis of ensuring the sustainable management of capital, in the form of money, and capital, in the form of goods.

In this regard, not only the theory of the monetary policy, but also other models of economic management fall back behind the practices of measuring the indicators of economic growth, which is used by the three indicators: nominal GDP – NGDP, the real GDP by the purchasing power parity (PPP) of the national currency units of world's countries relative to the US dollar.

If the PPP of national currency units of world countries have been defined for each country as somewhat set, according to market economy laws, then the basis for calculating the SDR may be the following formula, which contradicts the all-methodology principles of the IMF, by the definition of the international reserve currency:

$$pp(CDP, t) = \sum_{i=1}^{i=n} \frac{NGDP(i)}{[pp(1) \bullet NGDP(1) + \dots + pp(n) \bullet NGDP(n)]}$$

where  $n$  indicates the number of countries involved in the external trade zone, and  $i$  is the index of the country.

Under the conditions of the balanced economic growth, all goods and services and national currency units in definite quantities, are equal amongst each other. These, in the equalized manner, may act as world currencies. These could also be the US dollar, and the Russian Rouble, and the Kazakhstan's Tenge, and oil, and energy, and gold, as may be deemed relevant.

All businesses in the world need to make a bold breakthrough in understanding of the principles of irreversibility and the objective need for virtualizing world's currencies. Such measure will help free market economy models from inflexible administrative-and- command methods of targeting the inflation as well as restraining the budgetary, financial, debt, and other systems of life importance, by imposing on them unnecessary norms for setting economic and business indicators.

A special mention should be made on the development of the private sector of the economy of the most developed countries that is restrained with certain regulations, in the same manner as, at its times, was the development of the social sector in the ex-soviet economy, which was bed-ridden by the planned tasks.

The point is about the rigid administrative- and- command system of indicators, mandatory for the accession to the EC membership. The irreversibility principle has become the capable instrument of analyses much needed for the rescue of market economy models from the life threats of various heavy loaded constraints, being imposed on them.

The laws of market economy need to be laid down in the basic foundation of the development of market economy. From the time immemorial, the contradiction in economic interests has been pre-determined. Not by accident, the majority of people see the root cause of the economic and financial crises in the system of distribution of the produced wealth. Plenty of the theories dedicated to the cooperation between different classes and various doctrines of differing economic schools will not be able to eliminate the conflict of interests of creative forces and make the development of market economy sustainable, effective, and societal.

No hand-made system of regulating will be able to remove economic distresses and nullify huge distortions as they now exist in the market.

The modern trends on increasing the chaos and escalation of conflicts do occur under the influence of the objective laws of market economy. Thus, the laws have the rationale to be studied, and universally understood, in order to apply such laws for removing the distortions in the system of the distribution of the created wealth as well as in the system of reproduction of the common good.

We need other principles of measuring the purchasing power of money, price indices on goods and services and the contribution of the science and technological potential to the growth rates of real economy that take use of economic laws of societal development as their pillars of support.

That means, all the agents of production, including the state, participate in the development of real economy, and formulate the regulatory policies that adequately reflect the modern realities.

Effective regulatory policies are being formulated by those who have a tough control of the situation and are in hold of relevant information.

In the end, the situation now is such that the solution to the Granberg problem set is primarily linked to the application of just and fair laws on measuring the genuine cost of money.

First, it relates to the defining of the true cost of world's reserve currency. No matter what is world's major reserve currency is expressed in. It may be in paper, gold, energy, and other forms.

Second, it relates to the true cost of the national currency units of countries. These are being defined not only by the level of the development of the science and technology potential but also by the extent of the impact on them of the world's major reserve currency unit.

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