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About a simple economic reproduction and "Smith's Enigma"

Abstract

Reproduction is infinitely renewable, continuous production process. This means that as a result of production its premises, conditions for continuing production are also reproduced. Without the understanding of this process, cannot be explained the functioning of economy, as an integrity, as a living organism. Neoclassical theory considers the production of goods as a unidirectional process from consumption of primary resources until production of final products. It gives a formal explanation of circular flow for does not explain the process of reproduction of primary resources. But from a purely economic viewpoint the reproduction is completely closed, circular process, in which all primary resources are reproduced through consumption of final products, where there are no non-renewable resources. An original model of a simple economic reproduction is proposed. The lack of a clear understanding of reproduction process caused significant weaknesses of calculation methods of the main macroeconomic indicators of the SNA 2008 (GDP, GNI, etc.). Adequate methodological basis of their calculation is given.

Keywords: *simple reproduction, economic equilibrium, profit, saving, investment, consumption in debt, capital, macroeconomic indicators.*

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One of the major problems of economics needing rethinking is the problem of economic reproduction or the problem of circular flow, as it is called in neoclassical tradition. Since the publication of "Economic Table" by F. Quesnay (1758), during the 250-year history of evolution of circular flow theory, to this problem paid much attention the scholars such as A. Smith, D. Ricardo, K. Marx, W. Bortkiewicz, J. Schumpeter, V. Leontief, P. Sraffa, P. Samuelson, M. Morishima, etc. At that, although the term "circular flow" figures among the concepts of mainstream, but it gradually lost its sense of scientific research program. It stayed only a means to illustrate the "model of circular flows", expounded in the textbooks in chapter on the national accounting. The impression remains that the problem of circular flow (reproduction), like a problem of value, with which it is closely related, not finding a satisfactory solution, is gradually pushed to the periphery of scientific interests and is gradually "forgotten" by neoclassicists. But these are the fundamental problems of economic theory, without solution of which economics cannot overcome the deplorable state in which it is today. However, apart from the purely theoretical value, the problem of circular flow has practical importance and is associated with the construction of foundations of national accounting. Accordingly, the lack of a clear understanding of reproductive process causes serious deficiencies in the System of National Accounts.

In this paper, on the basis of dialectical analysis of production and consumption processes, a new interpretation of reproduction process is proposed. Attempt is made to use it to solve the so-called "Enigma of Smith", which will be discussed below, and which allows to reveal the theoretical failure of calculation methods of macroeconomic indicators GDP and GNI.

Enigma of Adam Smith

According to Smith the value of each individual product is equal to the sum of incomes consisting of wage, profit and rent. He did not acknowledge the capital expenditures as the fourth component of price because they match to the value of previously created products of labor, which in turn is divided into the same three elements as the final product is. Smith's position is quite reasonable: the inclusion of capital expenditures into the price of all goods would lead to the fact that one and the same product would enter the yearly product of society repeatedly. By this approach, Smith avoided double counting in a measurement of annual product. But Smith argued that if the value of each individual commodity falls into incomes, this should apply to the whole mass of commodities, composing the annual product of each country. Therefore, the value of national product should also be equal to the sum of incomes consisting of wage, profit and rent. But the core of the problem is that the part of annual product produced in the country is the capital goods required to replace depreciated capital. For society their value is the costs required for production of annual product. It turns out that the cost of each product individually consists only of incomes, but the value of entire national product, which consists of these products, in addition to incomes includes also the value of depreciated capital. The value of final product turns out to be greater than the amount of incomes. It turns out that the aggregate supply is greater than the aggregate demand; that the entire product cannot be sold inside the country. But economic reproduction is possible only under the condition that all goods will be sold, all the means of production and consumption goods - recovered. Consequently, the crises are inevitable, etc.

A. Smith cut down this "Gordian knot" and just got rid of the problem by introduction of concepts of "gross" and "net" products. But from a purely theoretical standpoint - this is incorrect. Here clearly exists ambiguity which remains so up to this day. This is just reflected not

only in theory, but also in the System of National Accounts. Here's what the authors wrote in the SNA 2008:

2.141 In principle, the concept of value added should exclude the allowance for consumption of fixed capital. ... theoretically, value added is a net concept. ... theoretically, domestic product should be a net concept.

2.142 However, gross measures of product and income are commonly used for various reasons. ... So GDP is broadly used even if it is, on a conceptual basis, economically inferior to NDP. (SNA 2008, p. 34)

The division of national product and national income on "gross" and "net" hides the real problem, creates illusion of its solution and thus conserves the problem. This problem cannot be solved as long as economic theory reaches a clear understanding of how the economic reproduction performs.

Surplus product and surplus resource

1. In essence, the theory of reproduction also is a theory of equilibrium. But it is the theory of equilibrium not between the supply and demand, but between production and consumption. If the economic processes are considered only at the market level and not at the production and consumption level, the search for economic equilibrium loses a "pivot" and the connection with fundamental economic laws, which govern the functioning of economic organism as a whole. Reproduction theory explores the objective economic laws, ensuring the possibility of equilibrium, at a deeper level of economic performance. At the division of labor various branches of economy should bring into accordance the output with one another and exchange their products between one another. At that, not all these proportions of production, distribution, exchange and consumption are equally important for the normal functioning of the economy.¹ But there are some "necessary" proportions between departments of economy (i.e. the groups of economic branches), in case of violation of which, the integrity of economic organism will be violated. There will arise the deficits and surpluses; producers couldn't sell the product, obtain necessary resources; production will reduce or stop. These "necessary" proportions are caused by objective economic laws and are necessary for maintaining a macroeconomic equilibrium. And what is most important, as a result of this process all the necessary *preconditions* for continuation of economic process in the previous regime of dynamic equilibrium are reproduced. It means that the theory of reproduction implies the reproduction not only of final products, but also of primary resources.²

2. To understand the problem of reproduction, you must first reveal the deep inner connection, which exists between production and consumption in general, and between production and consumption sectors of economy - in particular. Production and consumption are the opposites, inextricably linked with each other, are the unity of opposites.³ The process of production itself is a process of resource consumption, and consumption of resources is production of goods. So it's not two different processes, but one and the same process, seen from

1 Many of the products and resources are interchangeable, so discrepancy between production and consumption of some goods, within certain limits, can be compensated by opposite deviations in production and consumption of other goods, so that macroeconomic equilibrium will not be disturbed.

2 At that, these proportions are necessary for harmonic operation not only of market economy, but of any economic system, whether natural, market or regulated economy. Although in all systems the forces, which ensure the preservation of these proportions, are the economic interests of interacting agents, but the specific mechanisms of restoration of "necessary" proportions in the case of deviations from them, differ from each other.

3 "Production as directly identical with consumption, . . . is termed by them productive consumption. . . . Consumption is also immediately production, Consumptive production. . . . Production, then, is also immediately consumption, consumption is also immediately production. Each is immediately its opposite." (Marx/Engels, 1975 - 2005, p. 27)

different points of view. In fact, they are two different aspects of the same process of converting resources into products. In a market economy, where products and resources take the form of commodities, this process takes the form of the "production of commodities by means of consumption of commodities."

3. For production entrepreneurs buy from owners not the production factors (Labor, Land, Capital), but only the rights of temporary use of services of these production factors. Payments for them are wage, interest and rent. And entrepreneurs sell to them (and to each other) entrepreneurial services and make a profit. Primary resources for entrepreneurs are just the right of temporary use of the services of production factors, which they buy from their owners. But if this is so, regardless of whether production factors themselves are reproducible or irreproducible, in all cases, the primary resources as commodities are reproducible goods. Reproduction of primary resources as commodities is reduced to reproduction of life of owners of production factors, only which have the right to sell these "rights of use". For the reproduction of property rights for production factors and their services, reduced to reproduction of subjects of these rights. They sell the services of production factors and keep them as a permanent source of incomes just because they do not sell the production factors themselves. This means that the reproduction of primary resources is reduced to consumption of consumer goods, i.e. of final products, needed for owners' life.⁴ (See Leishvily, 2012)

Of course this is the reproduction of resources not in a physical, but in economic sense.⁵ But after all economics is interested exactly in economic sense of economic processes.

4. It follows that the sphere of consumption of final products is the sphere of reproduction of primary resources and the sphere of production of final products is the sphere of consumption of primary resources. Each of these sectors produces goods that are consumed by the opposite sector. A "resource" of one side is a "product" for the other side. Just because of this contradiction they become necessary for each other, becoming the necessary parts of wholeness. This wholeness, dissected inside into departments of economy, which in turn are composed of individual branches, just dictates the proportions of social production, consumption, distribution and exchange. This whole is a market economy "producing goods through the consumption of goods". And the relations between the production and consumption sectors as the parts of a whole, takes the form of market exchange.

As we see the "products" and "resources" are relative concepts. The economic goods simultaneously are products for their producers and resources for their consumers. Therefore, it is necessary to give a clear criterion for distinguishing these categories. For both production and consumption sectors "primary resource" is a good, which is consumed in given sector, but is produced - in another. The "final product", on the contrary, is produced in this sector, and consumed in another. "Intermediate product (resource)" is produced and consumed in one and the same sector.⁶ This implies also that primary income of one sector is spending of opposite sector for the purchase of goods produced in the first sector. Accordingly, for production sector the primary incomes are incomes from the sale of final products, but for consumption sector - incomes from the sale of services of production factors.

5. At that the exchange ratios (prices) in the market are set so that only part of final product is exchanged for primary resources needed to produce that product. That is, the value of resources, spent in branches of production sector, is equal to the value of only one part of produced product. That part of produced product, which is exchanged for resources necessary for reproduction of whole product, is a *necessary product*. The value of the rest part of created

4 "It is clear that in taking in food, for example, which is a form of consumption, the human being produces his own body. But this is also true of every kind of consumption which in one way or another produces human beings in some particular aspect. Consumptive production." (Marx/Engels, 1975 - 2005, p. 28)

5 Of course, in the physical sense, the amount of reproduced resources (services of production factors) depends on the amount of production factors, but not on the amount of products consumed by its owner.

6 Below in the text to avoid confusion, "resources" and "products" are used commonly called as resources and products for production.

product is *surplus product*, sales of which makes a profit, and which is the reward for entrepreneurial risk.

Similarly, only a part of primary resources is exchanged for final products required for reproduction of these resources (that is, to satisfy the owners' current living needs). This is a *necessary resource*. Accordingly, only one part of resources is necessary for payment of owners' current consumption. The rest part of resources is the *surplus* or *saved resource*, the sale of which generates owners' saving and which is the reward for his abstention and frugality. The more the owners' abstention is the more resources are saved from their current consumption. Because the total amount of reproduced resources depends only on the amount of production factors, which are in owners' possession, but not on the volume of their consumption.

Thus, during the reproduction process the necessary product and necessary resources are exchanged for each other. And as a result of their consumption some branches of economy reproduce surplus product, but other branches reproduce surplus (saved) resources. Thus, in each branch of economy the value of produced commodities is greater than the value of commodities consumed for their production. Within each branch surplus value is created. (See, Leishvily, 2012, 2011).

6. Surplus value is created both in the process of transformation of final products into the primary resources, and in the transformation of primary products into the final products. In the first case - through abstinence, in the second - through entrepreneurship. Producer sells surplus products and makes profit, and the owner sells the surplus (saved) resources and makes saving. Respectively, both, income and saving are the net income of economic subjects, as the difference between incomes and expenditures, which they receive through entrepreneurship and abstinence. In its natural form the surplus product does not differ from the necessary product and it is sold in the market as well and at the same price as the necessary product is. If it had not been sold, it would not be a product at all, would not have value and would not bring a profit. Similarly, in its natural form surplus resource does not differ from a necessary resource. It is sold in the resource market as well and at the same price as a necessary resource is. Due to this saving are formed.

7. Proportions in which the product *prices* are divided into the costs and profit correspond to the proportions, in which the *amount* of produced products is divided into necessary and surplus products. And the proportions in which the resource *prices* are divided into consumption expenditure and saving correspond to the proportions in which *amount* of reproduced resources are divided into necessary and surplus resources.⁷ Ultimately, it appears that consumers pay for the final product more than producers spend for its production, and producers pay for the primary resource more than consumers (owners) spent for its reproduction. But where is the source of payment for surplus product and for surplus resource? Who is their buyer?

8. The source of payment for surplus product, from which the entrepreneurs' profit derives are the entrepreneurs profits themselves. Because entrepreneurs themselves are also the consumers, buying the final products from their incomes, just what their profits are. That is a part of their products they buy from each other as well as all other consumers buy products from them. And the sources of payment of surplus resource, from which the consumers' saving are formed, are their saving themselves. Because saving are those free money resources, which through money market are transformed into credit resources for production investments. And this is the source of payment for surplus resource. That is, surplus resource is bought by entrepreneurs, but they buy them with borrowed monetary resources, which are formed from saving of just the owners of these resources. Thus, the saving themselves, transformed into credit resources for investment, additionally enter the resources market. And the profits of the whole class of entrepreneurs, consuming products, additionally enter the product market. In addition the government buys surplus products and surplus resources. That is, they are paid from the state budget and, consequently, from the taxes that are part of the same profits and saving.

⁷ Since profit is generated from the value of surplus product, the surplus value is a part of the value added. Another part of value added is the value of necessary product, which corresponds to wages, interest and rent.

Physical, human, natural and public capital

1. In the process of reproduction of final products, not only primary resources are consumed, and in the process of reproduction of primary resources not only final products are consumed. There are consumed also capital goods. Various kinds of capital are nothing else than the factors of production. (Walras, 2003) Instead of traditional and vague notions of "Capital", "Labor", "Land", in modern literature are increasingly used the concepts "physical, human and natural capital".

The times, during which the various goods are consumed and reproduced, differ from each other. Depending on whether you need for consumption of goods more or less time than the conditional unit of time (usually a year), the goods are divided into *durable and nondurable goods*. This applies to all branches of economy either of production or consumption sector. Therefore, into durable and nondurable goods are divided the goods of both production and consumption use. Along with the increase or decrease of time unit, some of the durable goods become nondurables or vice versa. That is, the difference between them is conditional and depends on the length of the period considered as the time unit. Distinction criteria between them is only in the fact that during this period nondurable goods are consumed completely, but durable goods in the same period are consumed only partially. The total consumption and wear of the durable goods takes place over a longer period, covering a lot of time periods. Naturally if during the period under consideration the good is not consumed completely and does not disappear along with consumption, we can only talk about its depreciation and services.

2. The durables are worn out during the using of them. They have to be restored. Consequently, the consumption of capital should be distinguished from the consumption of its services. Capital services are consumed and disappear entirely in consumption process, while the capital wears out only gradually over a long period of time. However, while the capital exists and functions, it is able to deliver the services. Therefore, not the services of capital but the capital itself needs physical reproduction. The capital services by themselves do not need the reproduction;⁸ they are reproduced together with the operation of capital. Reproduction of services is reduced only to ensuring the normal operation of capital, which, in turn, needs certain costs. Another matter is a capital itself. For its restoration it is necessary to invest (as depreciation) the part of goods, produced by it, into its reproduction. It follows also that the costs for restoration the capital should be distinguished from the costs for its operation.⁹ These differences between the durable and nondurable goods determine a number of significant features of economic activity.

3. **Physical capital.** As nondurable goods are consumed entirely within the year, then the reproduction of these goods also has to be performed annually. That is, they are reproduced in the same rhythm in which they are consumed. But since the physical capital is consumed during the year only partially, the reproduction and replacement of the old capital by the new one takes place only after full depreciation of the old capital. It should be noted that in *production sector*, as for primary resources, entrepreneur pays only for capital services, but not for consumption of capital itself. But, as was already noted, not only services are consumed in production process, but also the capital itself in the form of depreciation. And entrepreneur has to compensate this depreciation to the owner at his own expense.¹⁰ But it is not possible to determine exactly either what is the share of current depreciation of capital, or after how many years it will be depreciated completely. Therefore, no one compensates, and can not compensate to the owners of capital the

8 Only the right of use of these services needs reproduction which, as noted, is reduced to reproduction of subjects of law (owners).

9 For the functioning of physical and natural capital expenditures of energy, lubricants, fertilizers, irrigation, etc. are required, and for the functioning of human capital consumption of final products, creation of conditions for labor, etc. are necessary.

10 If the entrepreneur is the owner himself, he has to repay that depreciation to himself. Otherwise, his property will decrease.

current expenditures of capital (but not the services). It is possible to compensate only entire capital after its complete depreciation. Replacing of depreciated capital by the new one is just the payment for the capital consumption. Therefore, consumption of capital in contrast to consumption of its services is not a current consumption, but the *consumption in debt*. And in parallel to this depreciation entrepreneurs accumulate money for future replacement of completely depreciated capital. These funds are invested in production of new physical capital. So it turns out that in equilibrium consumption of physical capital in debt should be accompanied by parallel investment in its reproduction.

In consumption sector consumers also, in addition to nondurables, consume durables (apartment, car, household appliances). If consumers and owners of these goods are different subjects, consumers pay for the services of these goods in accordance with market price, which covers the cost of depreciation. In this case, the restoration of capital is performed by its owner. But if the good belongs to consumer, even though he does not pay for its services (pays to himself), but parallel to consumption of this good he has to save and invest money for its replacement after its depreciation. But until the replacement of capital goods by the new one, he consumes it in debt to himself in the sense that if he does not cover the debt, then his property will decrease by the amount of the value of depreciated capital.

4. **The human capital.** For manufacturing of product is necessary not only physical, but also human capital. Human capital is the ability of man to intellectual and physical labor, the ability to perform different economic functions (entrepreneurship, ownership, investment, etc.).¹¹ Due to realization of these abilities a person creates economic values. In other words, human capital is the stock of knowledge, skills, experience, training, health, social relations, etc., by which he is able to perform certain economic functions. All this is not only accumulated during the investment process, but also both morally and materially wears. That is, to the human capital can be applied usual conventional depreciation approach. It is formed by investment in improving the level and quality of human life, including - education, training, health, in development of entrepreneurial, creative and communication skills, as well as in science, culture and art, recreation, living conditions and other components of human capital.

But during the operation this very capital also wears out. The knowledge and experience become obsolete over time, people get sick, temporarily or permanently loses work capacity, when reaches retirement age withdraws from the labor force, etc. Accordingly, it is necessary to renew the knowledge and experience, to restore health, raise and educate the younger generation for the inflow of new workforce, raise the heirs of property, successors of business, etc. All this requires the economic costs and implies consumption of final products above the necessary costs for current consumption of owners of human capital.¹² It is necessary to accumulate funds for education, sickness, to create the insurance and pension funds, etc. This means - to make saving from incomes and, therefore, to limit the current consumption. Some of these savings are used as a kind of "depreciation allowances" for recovery, and some for the net investment in human capital.

5. **Public capital.** Operation of economic subjects is impossible without production and consumption of public goods, such as security, rule of law, health, education, transport and communication facilities, power and water supply, etc. All this is public capital and its services. Public capital is a set of state assets. Public goods are non-excludable and non-rivalrous. So they cannot be paid by private actors, they have no market price. Public capital services are free for society, because the public capital belongs to whole society; the government only manages it on behalf of society and in its interest. Accordingly, in its economic sense taxes paid by economic

11 Frugality, abstinence is a similar form of manifestation of human capital services as the entrepreneurship, physical and intellectual labor. Payment for labor is wage, for entrepreneurship - profit and for abstinence - saving. Human capital as well as physical capital is needed for the operation of both, sector of product reproduction and resource reproduction. Entrepreneurship creates a new value, and abstinence saves it. Only in this way the wealth accumulation and property increase is possible.

12 i.e. excess of the cost for operation of human capital.

subjects are not the prices or payment for public goods. Taxes - are forcibly withdrawn part of incomes, needed for reproduction and functioning of public capital. Taxes also serve for investment in public capital, as well as depreciation - for investment in physical capital. Taxes are paid by both producers and consumers, because they both use services of public capital. Thus, the public capital is the unity of those parts of physical and human capital, which are formed and operate due to forced investment by all members of society, and which is jointly and free of charge consumed by whole society.

6. **Natural capital.** Destruction of nature has reached scales at which the nature cannot recover itself by natural processes and keep the ecological balance. But the costs for restoration of wear of natural capital are insufficient. The environmental crisis just is the intensified "wear" of natural capital. To put it in economic terms, depreciation allowances for investment in natural capital lagged behind the rate of wear of capital.¹³ Like the restoration of physical, human and public capital, the natural capital also must be restored. But no matter from where is funded this process (from the state budget or from international funds), in any case, the economic sense of this process also reduces to investment of some portion of the surplus product and resource in restoration of capital.

Rent, which entrepreneurs pay to the owners of natural capital, is the payment for services of this capital, but not the depreciation on its restoration. Restoration of natural capital is a problem that cannot be solved at the level of individual owner. It requires a coordinated effort at the state and international level. This means that the depreciation expense for restoration of natural capital is mainly made from government or international funds. This, in turn, means that eventually, these funds are generated from the same taxes as the public capital is. Therefore, further in the text, referring to public capital and taxes, we mean also natural capital and investment in its restoration.

Profit, saving, investment and consumption in debt

1. In reproduction of both products and resources, except of nondurable goods, is consumed the physical, human and public capital. But consumption of capital goods, as opposed to consumption of nondurables, is consumption in debt, in which capital wears. For restoration of worn and for net increase of capital, in parallel to consumption, is necessary to set aside from incomes the means for investment in production of new capital. But to put off these means is possible only from that part of income, which is not consumed. Thus, the only source of investment in physical, human and public capital for producers is the gross profit, and for consumers - gross saving. But because they are formed from surplus product and surplus resource, in reality there are invested the surplus product and surplus resources.

2. However, this investment is veiled. The surplus products and resources are bought and sold on the market as well as all the other products. As a result of their sales, profits and saving are generated. But profit and saving, as monetary resources, free from current expenditure, is the formation source for all monetary funds (private, municipal and state budgets, depreciation, insurance, pension funds, etc.). But, in the end, from these funds are bought again the surplus resources and products, just from which are produced the physical, human and public capital.¹⁴ Money itself cannot produce the capital goods. It requires products and resources. Investing just means that part of the products and resources is used not for production and consumption of nondurable goods, but for production and subsequent consumption of capital goods.

¹³ According to Hawken P. and others the next industrial revolution "depends on the . . . investing in natural capital, or restoring and sustaining natural resources." (See: Hawken, 1999), http://en.wikipedia.org/wiki/Natural_capital#cite_ref-nat_1-0.

¹⁴ or are bought directly capital goods. But before we buy them, someone has to produce them. But they may be produced only from surplus products and saved resources.

3. Just as production and consumption of nondurable goods is mediated by their exchange for money, also production and consumption of capital goods is mediated by the formation and use of funds. But if you ignore the "monetary veil", there are invested namely surplus resources and products as goods free from current consumption.

The investment of profits and saving in physical, human and public capital is only a monetary reflection of real investment of surplus resources and products. In this case, for an adequate understanding of reproduction process, it is crucial to realize the intrinsic relationships between gross profit and gross saving, as well as between gross investment and gross consumption in debt.

4. **Profit and saving.** In a market economy the transformation of some products into another takes place. As a result of these transformations and further exchange of goods in production sector remains the profit, and in consumption sector remains the saving. But since the production and consumption sectors are interconnected through market exchange, then also internally interconnected are profit and saving. In fact the alternation of incomes and expenditures takes place in both production and consumption spheres. Producers' incomes are consumers' expenditures, and producers' expenditures are consumers' incomes. Accordingly, the difference between incomes and expenditures takes for them the mirror opposite forms of profit and saving. But that is why the gross profit and saving are internally interconnected. As soon as incomes of some are expenditures of other and vice versa, the profit and saving cannot be independent variables. Changing of exchange proportions between the final products and primary resources (i.e. their relative prices) has effect on the profits and saving in opposite way. Naturally, in conditions of equilibrium prices gross profit and gross saving should match. (See, Leishvily, 2012).

5. It should be emphasized that the depreciation is a part of profit, but not a part of cost of product, which is slowly included into finished products. Depreciation allowance is a purely financial procedure that has very little relevance to real loss of value by fixed capital. The choice of norms and methods of depreciation depends on the economic policy of government, and not on the actual depreciation of capital. In understanding of depreciation there always were disputes. There are two substantial descriptions of depreciation - (1) wearing of property and (2) building of the fund of its renovation. Uniform distribution of amortization during the different periods does not correspond to the actual processes of wear, because the older object is, the faster it wears out. But to determine the adequacy of real wear to depreciation rates is impossible. In addition, any depreciation rate implies the possibility of exploitation of object after its complete normative wear. Setting the depreciation rate, useful life or procedure for calculating depreciation, government regulates the pace and nature of reproduction in the industry. Thus, the depreciation is a part of profit, which is not subject to tax, and from which no dividends are paid, but is not the extended writing off previously incurred expenditures.

6. To be able to carry on business entrepreneurs should not only buy the primary resources, but also invest in their personal consumption. These investments are investments in their own human capital. These are entrepreneurial skills, realization of which is just a service of this capital. Society pays him for entrepreneurial services. Profit is this payment and at the same time, confirmation of social utility of this services. From an entrepreneur's viewpoint his activity is for him a use of belonging to him human capital, which brings him an income in the form of profit. But the human capital exists only in a living person, living and acting in normal conditions. Therefore, the current consumption of final products for supporting conditions of living and activity is a necessary condition for the existence and functioning of this capital. At that, unlike consumption of owners, entrepreneurs' consumption is consumption in debt. For in contrast to owners, who pay for their current consumption out of the previously obtained incomes, entrepreneurs only invest funds from their monetary assets without knowing in advance

whether its consumption expenditure will be compensated by the results of his activity.¹⁵ In this regard the thought of A. Smith is interesting:

"His profit, besides, is his revenue, the proper fund of his subsistence. As, while he is preparing and bringing the goods to market, he advances to his workmen their wages, or their subsistence; so he advances to himself, in the same manner, his own subsistence, which is generally suitable to the profit which he may reasonably expect from the sale of his goods. Unless they yield him this profit, therefore, they do not repay him what they may very properly be said to have really cost him." (Smith, 1977, p.56).

An advance, Smith writes about, is, rather, investment in human capital of entrepreneur.

7. Investment and consumption in debt. As it has already been mentioned, to transform into capital goods (use to produce the capital goods) is possible only those products and resources, which are not used in current consumption. And such are only surplus products and resources. Thus, investment - is an investment of surplus products and resources into production of capital goods. Accordingly, the investor is one, who invests products and resources free from current consumption into production of capital goods. But one, who produces capital goods, consumes these products and resources in debt. Producer of capital goods and investor may be different subjects or the same subject, but in any case production of capital goods and investments - are different, but closely interrelated economic functions.¹⁶

8. In a barter economy investment and consumption in debt are linked with each other as inextricably as selling and buying. In a barter exchange buying and selling of goods are fused into a single process. When money appears as a mediator, buying and selling are disconnected in time and space as two separate acts. However, since the sale is made possible without buying and buying without selling, the delay or acceleration in trade is connected with removal or involvement of money in circulation. Accordingly, the monetary assets increase or decrease. Similar changes occur in the process of investment and consumption in debt of surplus product and resources. With appearing of money the process of investment and consumption in debt also separate from each other. Between them arise additional processes of investment and consumption in debt of money capital. The surplus products and resources first should be sold in the market and get money form of profit and saving. From profits and saving a money capital is formed. That is, part of money income is invested in a money capital, which will then be invested in production of real capital. That is, surplus product and resources will again be purchased for production of capital. Thus, investment in real capital is related to the divestment of money capital.

But between formation of money capital and its transformation into a real capital there is a gap in time during which the money capital can provide a variety of financial services and earn interest. Money capital earns money income and begins an independent life. Moreover, with the development of market economy these processes grow in a complicated world of finance, which functions according to its own laws. There appear the various intermediary financial institutions (banks, credit unions, insurance companies, pension funds, stock exchanges, etc.) with their financial instruments (currency, securities, bonds, futures, options, etc.). And though this world of finance acquires enormous power over the economic life of society, it is based on the processes of real economy. The real and money sectors of economy are a single system. Therefore, if equilibrium is disturbed in one sector between investment and consumption in debt, the equilibrium will be disturbed in other sector too.

15 In its economic sense, consumption of final products, necessary both for operation and for reproduction of entrepreneurs' human capital, is consumption in debt. Whereas, consumption in debt for owners implies only the reproduction of human capital, and its operation (through which the primary resources are reproduced) implies a current consumption.

16 The economic sense of this process is that the investor provides his resources in credit to producer of capital, but the producer consumes these resources in debt. As debt is the reverse side of credit, consumption in debt is the reverse side of investment as well.

9. In a market economy, each subject produces commodities for others and he consumes commodities produced by others. In conditions, when ones produce commodities and others consume them, an imbalance is possible between production and consumption. The same can be said about investment and consumption in debt. In a market economy, some invest commodities (surplus product and resources), and others - consume them in debt. So, imbalance between them is possible, which leads to the disorder of economy.

10. Below is given a diagram of distribution of gross profit and gross saving:

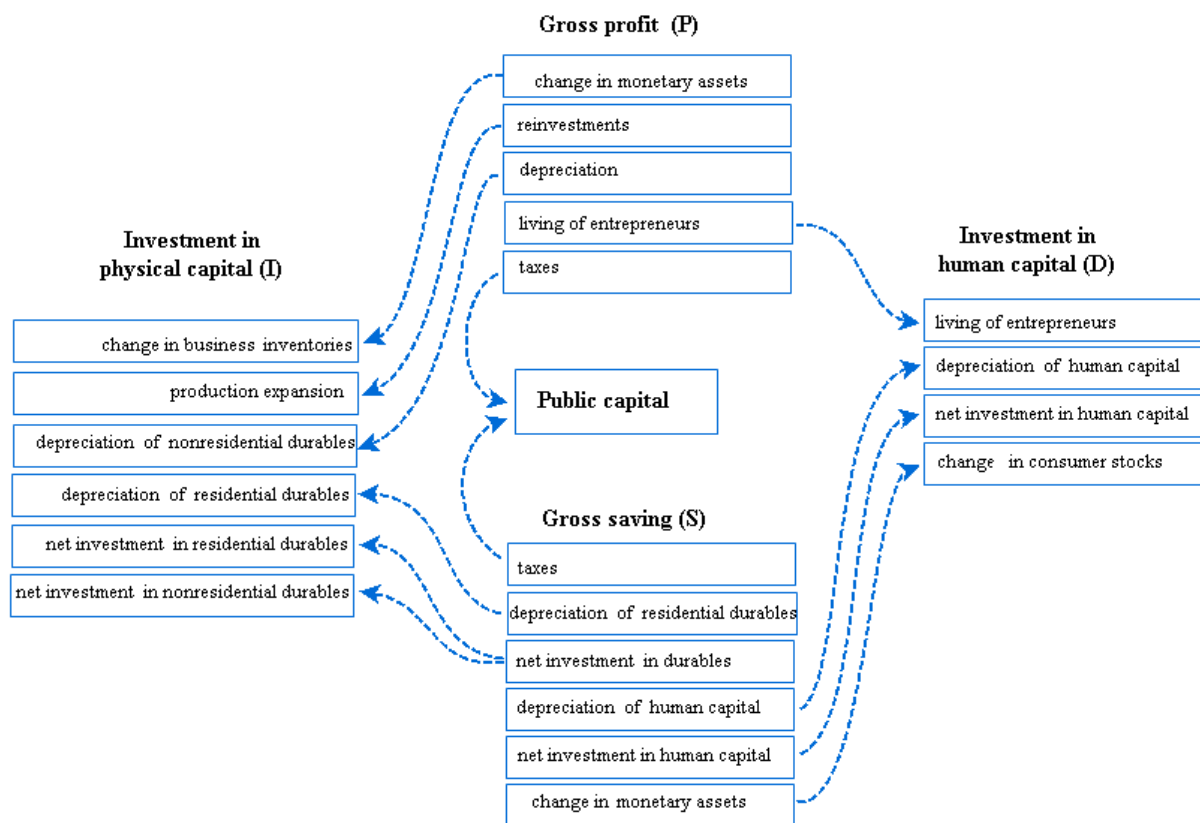


Fig. 1. Scheme of allocation of gross profit and gross saving for investment in physical, human and public capital.

The model of economic reproduction

1. Below is shown a diagram of formation and distribution of economic flows in condition of a simple economic reproduction.¹⁷ We consider a closed economic system. Here is represented the matrix consisting of four quadrants: I - production sector, II - market of final products, III - market of primary resources, IV - consumption sector (reproduction of primary resources). The rows of matrix represent different sectors of reproduction of products, resources, and capital goods, and the columns show their allocation and consumption in various sectors. For example, sector 1 simultaneously shows the transformation process of primary products into final products, and the imputation process of final products to primary resources. The elements of this sector simultaneously reflect the value of services through which the products are produced, and the value of those parts of final product, by which these services are remunerated. Therefore, each element simultaneously shows as value expressed in final products as well the value

¹⁷ For more details this diagram is considered in Leishvily P. (2012) Economic Activity: Teleological Analysis. NY, Nova Publisher Inc., p. 121.

expressed in amount of income, received by some agent of production. I.e. show the imputation of final products to production factors according to their contribution to the production process.

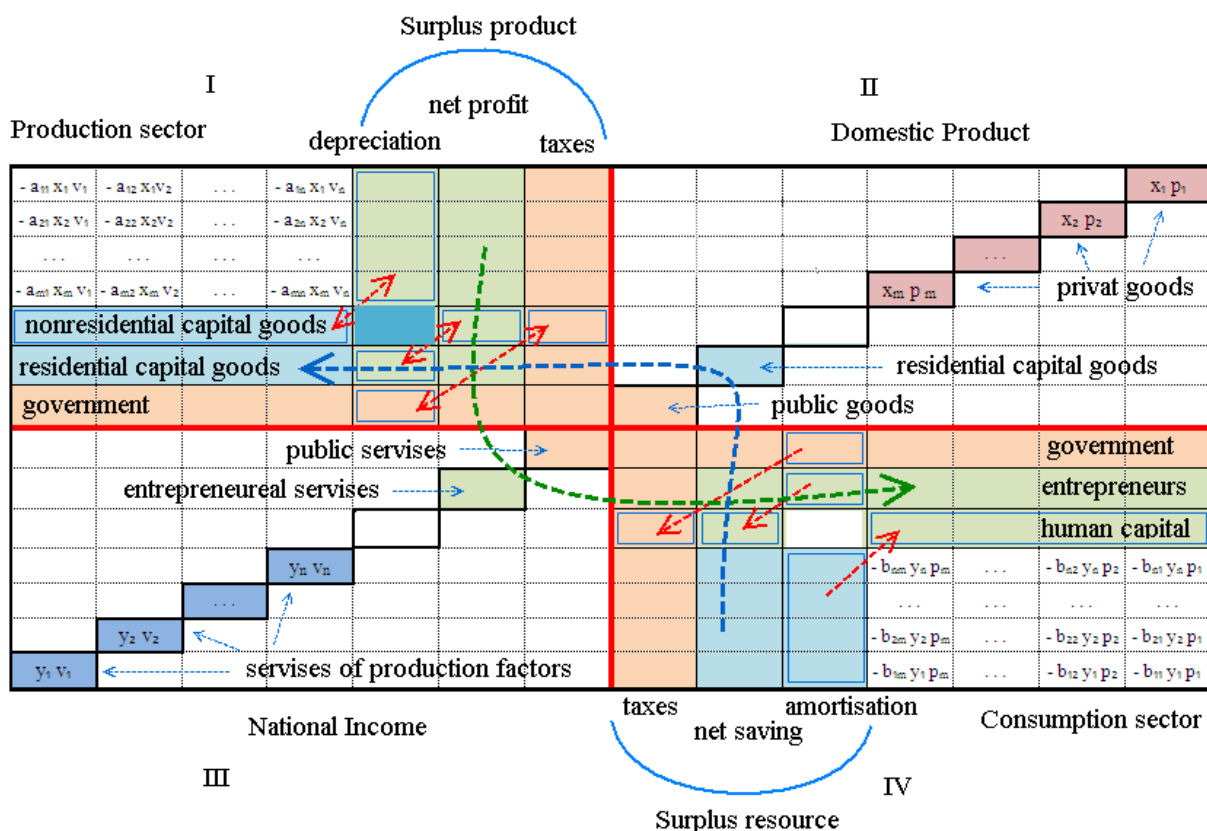


Fig. 2. "Symmetric matrix" of economic flows in closed decentralized economy

During the transformation of primary resources into final products the surplus product is created. The total value of final products (i.e. necessary plus surplus products) is Domestic Product (DP), which is shown in Sector 2. At the same time, the value of this final product equal to incomes that have been created during its production. Sector 3 shows the allocation of value of final product between primary resources, entrepreneurial income and taxes, which add up to National Income (NI). There are empty cells in the diagonals of sectors 2 and 3. In sector 2 this cell indicates that in composition of DP are not considered capital goods, by which has been replaced worn capital because they are not intended for final consumption and are not a final product. And in Sector 3 an empty cell indicates that in composition of NI are ignored the depreciation allowances from profits, for they are not the primary income, although they are a part of gross profit.

In sector 1 red arrows show the exchanged parts of final products of different departments of economy. According to this model, in conditions of simple reproduction the whole product of department, producing nonresidential durables, excluding depreciation of this department, completely replaces the worn-out capital in all other departments of production sector (red arrows). As to depreciation of departments, producing nonresidential durables, the branches, belonging to this department, without residual are sharing that part of their surplus product, which reflects the magnitude of depreciation in these branches.

The columns of Sector 4 show the distribution of final product for reproduction of primary resources, human capital, entrepreneurial and public services. As a result of final products' consumption is reproduced not only a necessary resource, but also a surplus (saved) resource. The red arrows in Sector 4 show the direction of income reallocation, necessary for reproduction of human capital.

Indications of lines:

Reproduction of products (resource consumption):

- I - production of consumer products;
- II - production of nonresidential durables;
- III - production of residential durables;
- IV - production of public goods.

Reproduction of resources (consumption of products):

- V - reproduction of public services;
- VI - reproduction of entrepreneurial services;
- VII - reproduction of human capital;
- VIII - reproduction of primary resources - services of Labor, Capital, and Land

Indicate the columns:

Productive consumption (reproduction cost of final product):

- A - consumption of services of production factors (of Labor, Capital and Land).
- B - depreciation of nonresidential durables;
- C - consumption of entrepreneurial services;
- D - consumption of public services.

Consumption as such (reproduction cost of primary resources)

- E - consumption of public goods;
- F - depreciation of residential durables;
- G - incomes of production factors in the process of reproduction of nonresidential durables;
- H - consumption of consumer goods.

To each element of diagonal corresponds row and column. As we see, diagonals of sectors 2 and 3 are symmetrical to each other, as well as sectors 1 and 4 (except disparity of cells II B and VII G, the cause of which will become clearer below). The symmetry is also found in sectors 1 and 4.

The simple reproduction assumes that the following conditions are met:

1) $I = A = VIII = H$. This means that reproduction of consumer products and primary resources (services of labor, land and capital) equals to their consumption.

2) $II = B = (G - 100) = (VII - 100)$. In conditions of simple reproduction as many nonresidential durables (II) are reproduced, as are consumed (B). Value of products consumed in debt (VII) is equal to the value of incomes received during production of nonresidential durables (G).

3) $III = C = VI = F$. Reproduction of residential durables (III) equals to their depreciation (F), and the personal consumption of entrepreneurs (VI) is equal to the value of entrepreneurial services¹⁸ (C).

4) $IV = D = V = E$. The public goods and services are produced as many as are consumed.

In simple reproduction the changes in production and consumption of stocks and the changes of monetary assets of producers and consumers equal to zero. Also, a net increase of all kinds of capital is absent. There is only a compensation of consumed capital. Therefore, the value of product of department II is equal to wearing of nonresidential durables in the production sector (B):

$$II (800 a + 100 b + 170 c + 30 d) = B (800 b + 100 b + 170 b + 30 b) = 1100; \quad (1)$$

The elements of rows of matrix indicate from what components the value of that or another final product is composed. If the value of these components is expressed through the share of final product, we find that at compensating the worn capital the different fractions of product of department II are exchanged for different fractions of surplus product of departments I, III and IV. Thus, there are kept the following proportions of the value of exchanged products:

¹⁸ i.e. the value of goods, by which society paid for entrepreneurial services .

$$800 \text{ IIa} = 800 \text{ Ib}; \quad (2)$$

100 IIb - остается в подразделении II;

$$170 \text{ IIc} = 170 \text{ IIIb}; \quad (3)$$

$$30 \text{ IId} = 30 \text{ IVb}; \quad (4)$$

Although produced nonresidential durables are fully exchanged for the products of other producers and do not enter into the consumption sector, but the products, for which they are exchanged, are intended for consumption. Therefore, in consumption sector is reflected the redistribution of only residential goods (durables and nondurables). Accordingly, parallel with transposition of lines II into column B in the first quadrant of matrix (as a result of replacing the depreciated capital), column G is transposed into the line VII in consumption sector. Column G represents that part of owners' incomes (800 VIIIg), entrepreneurs (170 VIg) and government (30 Vg), which they receive as payment for their services in production of nonresidential durables. This part of incomes corresponds to the value of final products spent in restoration of human capital. In the end, we find that the final product produced in departments I (7300), III (1410) and IV (290) is completely consumed by all consumers (owners, entrepreneurs and government). Also, all services, provided by the owners (7300), entrepreneurs (1410) and government (290), are completely consumed by all producers. And all that is produced in department II (1100) is used by all producers in departments I, II, III and IV. At that the following conditions are satisfied:

$$\text{NP (9000)} = \text{NI (9000)};$$

That is, the system is in equilibrium and all necessary conditions of simple reproduction are met.

According to the earlier given definition, capital, produced to replace the worn capital, is intermediate product. Because this product is not sold beyond production sector, it is not intended for final consumption of society and is not the final product of society.¹⁹ So it is not included in composition of DP. On the other hand, since the depreciation allowances do not go beyond production sector either,²⁰ then, in accordance with definition given above, they are not the primary incomes. Therefore, depreciation in composition of gross profit is not a part of NI.

3. According to this reproduction pattern, in indicator GDP, in that form in which it is calculated in SNA, the value of consumed capital is calculated twice. Once, as the value of capital goods, by which was replaced depreciated capital and, the second time, in composition of value added of all other goods. When calculating according to the value added method, the indicator DP contains the value of depreciation fund, as a part of gross profit and, therefore, as a part of the value added. Accordingly, into the indicator DP should not be additionally introduced the value of those capital goods, which are paid from this fund. All the more, these goods do not represent the final product. GDP indicator distorts the real value of final product of society and overstates it by the amount of consumed capital. The true indicator of final product of society is an indicator that in SNA is calculated as NDP. However, it should be named simply Domestic

¹⁹ In SNA 2008 is pointed "Intermediate consumption does not cover the progressive wear and tear of fixed capital. The latter is recorded as a separate transaction (consumption of fixed capital)". (SNA 2008, p. 24) But this is wrong, because consumption of fixed capital just is "the using up of goods and services when producing this output (intermediate consumption)". But it should be clarify that this intermediate consumption is *consumption in debt*. So the production of capital goods for replacing depreciated capital is the compensation of this consumption in debt by equivalent investments. Accordingly, in contrast to the net investment, the capital goods, replacing depreciated capital, are not the final product of society.

²⁰ They are transformed into the incomes of agents producing capital goods for replacement of worn-out capital, and only as their income are derived into the consumption sector.

Product and opt out of division this index on "gross" and "net". In economic sense, there exists only one parameter of Domestic Product, which is equal to National Income.²¹

4. Incomes, received in reproduction of depreciated nonresidential durables, are paid from the depreciation fund, therefore, from the profit of all other producers. In natural form these incomes consist of surplus product of all other branches producing residential goods (durables and nondurables). These are those final products, which society sacrifices to those, who were engaged in reproduction of worn-out capital. Value of these products has a dual nature. It is perceived as expenditure for producers of consumer goods, and - as income for those, who reproduces worn out capital. But from the viewpoint of society, this is only a redistribution of value added between producers of different industries. Accordingly, the cost of depreciation is taken into account in DP in the form of depreciation fund, and in NI in the form of income of those producers, who produce the capital goods for recovering the depreciated capital. And as incomes of mentioned producers, ultimately are formed from depreciation funds, the indicators of DP and NI are equal. Therefore, it appears that the DP and NI indicators, calculated by the value added method, simultaneously take into account also a consumed capital without violating the very principle of formation of these indicators.

5. As for the depreciation fund of the department itself, which produces nonresidential capital goods, it does not need special accounting in NI or DP. For the branches, belonging to this department, produce and sell to each other capital goods for replacing worn-out capital. It's like an exchange by parts of surplus products between the branches of this department. So, this part of surplus product does not go beyond this department, do not present a demand for the products of other departments and itself does not become the object of demand of other departments of economy. That is, this is an intermediate product produced and consumed completely within the same department.

6. We studied the conditions of simple economic reproduction. But from the matrix it is easy to understand how to maintain equilibrium in conditions of expanded reproduction. This requires observing of all those proportions between the elements of the matrix, which do not violate the conditions of the internal symmetry between the rows and columns of the matrix.²² Exactly this symmetry is a condition of economic harmony and sustainable development of economy, toward which the market economy always tends. But, because of the spontaneity of market relations, it achieves it only by chance and cannot stay long in it.

Conclusion

1. According to SNA the value of final product is formed on the basis of value added principle. This means that the indicator DP should not include a value of worn-out capital, because "the concept of added value should exclude charges for consumption of fixed capital. ... Last is the newly created value". (SNA 2008, p. 34). On the other hand, during the year the capital goods were produced, by which worn out capital was replaced. If their value is additionally introduced into the indicator DP, it turns out that the value of National Product is greater than of National Income and besides it contains the value of depreciated capital. Accordingly, there arises a discrepancy between the amount of incomes generated during production of final product and the value of that final product, which must be purchased in the markets by these incomes. It turns out that aggregate supply is greater than aggregate demand, therefore, there is inevitable crises, etc. Here are clearly some unresolved theoretical problems. Despite this, division of indicators DP and NI on the "gross" and "net" takes place both in neoclassical theory and in all versions of SNA (including the SNA 2008).

2. Smith has got round this problem by introducing the concepts of "gross" and "net" national products. From a theoretical point of view it's a mistake. A. Smith spread out on

²¹ Accordingly, no "problem of realization" in the economic theory arises.

²² This process is easily modeled in Excel.

incomes the capital expenditures inside the values of separate products in order to avoid a double counting. By this, within the national product and national income, he did not ignore the expenditures of consumed capital, but only expressed them in a different form. This is fully justified from a scientific point of view. But then, not understanding fully the logic of reproductive process, he spread out the mentioned indicators on the "gross" and "net." That is to the mentioned figures, calculated through using a value added method, and which he called as "net", he once again added the value of consumed capital, receiving "gross" figures. But by this, he once again brought into the "gross" indicators the double counting, which he wanted to get rid of.

Today many articles are devoted to shortcomings of GDP, but not enough attention is paid to its main fault, the fact that it contains a double counting and is logically incompatible with the principle of value added. That is, from a purely theoretical viewpoint GDP as a measure of final product of society is nonsense.

3. The value of produced capital goods, replacing depreciated capital, is contained both in DP and in NI. But it is contained in different forms. In DP, it is contained in the form of depreciation allowances included in the value of final products. At the same, time in composition of DP are not the capital goods themselves, which replace the worn capital, because they do not apply to the final products and are not intended for the final consumption. In NI, on the contrary, it is included in the form of incomes generated during the production of capital goods replacing depreciated capital. At that, in composition of NI is not included a depreciation fund, because it is not a primary income. And since the incomes, generated during the production of capital for replacing the depreciated capital, eventually are formed just from the depreciation fund, the values of DP and NI are equal. All this is due to the fact that there has been an exchange of capital goods, replacing depreciated capital, on the part of surplus product of other branches relevant to their depreciation allowances. Thus, both Domestic Product and National Income, each according to its nature and without violating the value added principle, reflect the value of capital goods produced for replacement of depreciated capital.

4. SNA is based on this or that understanding of reproduction process. But the conceptual basis of the 2008 SNA (as well as all previous versions), is a neoclassical theory, which does not adequately understand the reproduction process. Therefore, the 2008 SNA gives a distorted view of real parameters of economic processes. The very division of the main macroeconomic indicators of GDP, NDP, GNI and NNI to "gross" and "net" is fundamentally wrong. It follows that classification and formation methods of many other indicators of the SNA also require appropriate adjustments.

5. The reproduction model shows the "necessary" macroeconomic proportions between the volume of production and consumption of goods produced by various departments (i.e. groups of branches) of economy. Macroeconomic equilibrium is not disturbed as long as these proportions are respected. But within each of departments the relatively small deviations from equilibrium in some branches are compensated by opposite deviations - in others. Such deviations are not reflected on the macrolevel, demonstrating the range of stability of macroeconomic equilibrium toward the microeconomic imbalances. "Necessary" proportions of reproduction assume that at the macroeconomic level in economy is produced only what is consumed and is consumed only what is produced.

In a market economy the real proportions of reproduction constantly fluctuate relative to the "necessary" proportions. Behind these fluctuations of market economy it is difficult to see the "necessary" macroeconomic proportions, which provide full harmony and consistency of economic processes. Nevertheless, these "necessary" proportions exist. They are caused by objective laws. At that they are necessary not only for the market, but also for any economic system. Although the mechanisms to maintain these proportions are different in natural, market and regulated economy. If economic policies would be able to ensure the preservation of these proportions between departments of economy, the economy will be able to completely get rid of cyclical fluctuations and to achieve sustainable growth.

6. In the focus of neoclassical theory is the process of production, but not of reproduction. Reproduction is infinitely renewable, continuous production process. This means that as a result of such production its *premises*, the conditions for continuing production are also reproduced. Therefore, without an understanding of this process it is impossible to explain functioning of economy as integrity, as a living organism.

One of the main conditions, without which production cannot continue, is reproduction of economic subject itself. This already means that it is important to analyze not only production of products, but also their consumption. For consumption of products is reproduction of economic subject and, together with it, is reproduction of economic needs and incentives, which drive the entire economy. It is also important that in the "*consumption of final products*" the theory could recognize the "*reproduction of primary resources*", reproduction of property rights and other necessary conditions of production. For in a market economy, the primary resources are the rights to use the services of production factors, which exist as goods and only owners of production factors can sell them. Therefore, the reproduction of primary resources in a market economy is reduced to the reproduction of property rights on production factors, therefore, to reproduction of subjects of property.

7. The sector of production of final products is the sector of consumption of primary resources and the sector of consumption of final products is the sector of reproduction of primary resources. Each of these sectors produces goods that are consumed by the opposite sector. Therefore, production and consumption sectors are inextricably linked to each other through the exchange of products and resources. Just because of this they are necessary to each other, are necessary parts of a whole. This whole just dictates the proportions of social production, consumption, distribution and exchange. This whole is a market economy "producing commodities by means of commodities" (P. Sraffa).

8. From the viewpoint of reproduction, as a permanently renewable process, profit is the same surplus of incomes over expenditures for current consumption in production sector, as saving is - in consumption sector. Both of them is a leak from the circulation of "incomes and expenditures" of consumers and producers. But for maintaining a balance in circulation it is necessary that income leakage from each of these two sectors should be offset by inflows of invested funds from the opposite sector. Macroeconomic equilibrium condition is the equality of gross profit and gross saving that are fully invested in physical, human, natural and public capitals.

9. In the process of economic reproduction, in addition to the necessary products and resources, in production sector are reproduced surplus products, and in consumption sector - surplus (saved) resources. However, these sectors do not exchange them on each other like a necessary product and resources. They invest them into each other. This means that each of this sectors, not only provides its goods to other sector for consumption in debt, but also itself consumes in debt the goods from the opposite sector. Income and saving are only money equivalent of surplus product and saved resource. In reality, depreciation and net growth of all types of capital are made by surplus product and surplus resource. Hence, it is clear that the economic equilibrium implies equality of such economic flows, as profits, saving, investment and consumption in debt.

10. By the inability to know the essence of economic processes is caused the fact that the neo-classical theory, though fixes the relationship between saving and investment, but is not aware of relationship between saving and profit as well, between investment and consumption in debt. So, it does not realize connections between all of the above mentioned categories (profit, saving, investment and consumption in debt), which exist within a closed economic system. But without this it is impossible to understand how reproduction performs, how a general equilibrium is formed and how economic cycles arise. Consequently, without an understanding of these processes it is impossible to develop an effective economic policy. (See, Leishvily, 2011, 2012).

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