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BASES OF AXIOMATIC THEORY OF ECONOMIC ANALYSIS. PART II

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Abstract

In the work the development of conceptual approach to the construction of economic analysis theory is given, considered in the first part [1]. The logistics ERC-conception and the TVS-methodology management of *reviving* is formulated.

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1. INTRODUCTION

In the work [1] basic concepts and definitions of axiomatic theory of economic analysis (ATEA), which allowed to give the full type three from five to the registration-analytical forms ERC1 – ERC3 of economic registration certificate (ERC), were introduced. The ERC forming which demand the use of new definitions and formulation of exact assertions will be completed here. The special place in this connection is given to *reviving* – to placing and functioning of the logistics systems in the global chains of financial-production relations.

Denotations, used in [1], we keep in this work.

2. FORMULATION OF TASK

The simple and branching global chains of financial-production relations realize the full cycle "raw material – products – market", here the parameters of consumer demand determine work of all structural elements of global chain. Within the framework of the ATEA axioms we fulfil complete description of this dependence at the level of balance of demand and offer.

3. RESULTS

DEFINITION 1. We speak that in an elementary structure $\{A,C\}$ of the local chain of financial-production relations *the law of sales (LS)* $P(t)$ operates, if:

1. Limited real function $y=P(t)$ of real variable t with a period T is defined on a semiaxis $(0,\infty)$.

2. Function $y=P(t)$ monotony does not decrease on an interval $(0,T]$ and is continuous on the left, thus $P(+0)=0$.

3. Value of function $y = P(t)$ at $t \in (0,T]$ is equal to the amount of raw material Y in products X, sold for the interval of time $(0,t]$.

DEFINITION 2. The value of LS $P(t)$ at $t = T$ is named an optimum reserve and designated

$$M \overset{def}{=} P(t) \cdot \tag{1}$$

Qualitative conduct LS $P(t)$ is shown by Fig. 1.

DEFINITION 4. Derivative $\frac{dP(t)}{dt}$ law of sale $y = P(t)$ (may be in the generalized sense) is named *speed of sales* and designated

$$V(t) \overset{def}{=} \frac{dP(t)}{dt},\ t \in (0,\infty).$$

We suppose that in the moment of time $t = 0$ enterprise A has the optimum reserve of raw material M and process of production and realization of products X begins at $t = 0$ and proceeds on a semiaxis $(0,\infty)$ with the law of sales $P(t)$.

DEFINITION 5. A function

$$R(t) \overset{def}{=} \begin{cases} M - P(t), & \text{if } 0 < t \le T; \\ 0, & \text{if } t > T. \end{cases} \tag{2}$$

is named the remain of raw material Y in the moment of time $t \in (0,\infty)$.

DEFINITION 6. Function (2), resulted to the single reserve of raw material Y,

$$r(t) \overset{def}{=} \frac{R(t)}{M} \tag{3}$$

is named *the normalized function of remain*.

We formulate *the problem of deliveries* in the axiomatic theory of economic analysis: with what speed an enterprise A must buy raw material Y at enterprise B, that at any moment of time $t \in (0,\infty)$ the reserves of raw material to remain unchanged and equal to the optimum amount M at a law of sales $P(t)$?

We give mathematical formulation of problem of deliveries and its decision within the framework of the ATEA.

DEFINITION 7. A function $V(t;r)$, satisfying equality

$$\int_0^t V(t;r)\,dr = \begin{cases} P(t), & \text{if } 0 < t \le T; \\ M, & \text{if } t > T. \end{cases} \tag{4}$$

is named *speed of process of raw material Y renewal* in elementary structure $\{B, A\}$ of local chin of financial-production relations.

Integral in (4) is the Lebeg's integral on an ordinary linear measure on a line.

DEFINITION 8. Function $\omega(\tau)$, given by a formula

$$V(t;r) = R(t-r)\cdot\omega(\tau), \quad 0 \le \tau < t \tag{5}$$

is named *the function of renewal* of reserve of raw material Y.

Taking into account equalities (2), (4), (5), we give the following

DEFINITION 9. Equation of the form

$$M = R(t) + \int_0^t R(t-\tau)\omega(\tau)\,d\tau, \quad 0 \le \tau < t,\ t > 0 \tag{6}$$

is named *the absolute law of saving reserves of raw material* Y in the local chain of financial-production relations.

Passing in (6) to the normalized function of remain (3), we get *the relative law of reserve saving* (law of saving single reserve)

$$1 = r(t) + \int_0^t r(t-\tau)\omega(\tau)\,d\tau, \quad 0 \le \tau < t,\ t > 0\,. \tag{7}$$

Integral equation (7) for the known function $\omega(\tau)$ refers to the class of equations of Bellman's type [2].

DEFINITION 10. Speed of renewal of single reserve of raw material Y

$$v(t;\tau) \overset{def}{=} r(t-\tau)\omega(\tau), \quad 0 \le \tau < t,\ t > 0, \tag{8}$$

where functions $r(t)$, $\omega(\tau)$ are given by equalities (3), (5), is named *the normalized speed of renewal.*

In the terms of the normalized speed of renewal (8) the relative law of reserve saving (7) takes form

$$1 = r(t) + \int_0^t v(t;\tau)\,d\tau, \quad 0 \le \tau < t,\ t > 0 \tag{9}$$

DEFINITION 11. Any droningly increasing sequence of times $\{t_n\}_{n=1}^{\infty}$, $0 < t_1 < t_2 < \ldots < t_n < \ldots$ is named *the control system of renewal process* (7). Moments of time t_n are named *the points of reserve control.*

DEFINITION 12. Control system $\{t_n\}_{n=1}^{\infty}$ is named *base* (BCS), if $t_n = nT, \quad n = 1, 2, \ldots$, where T – parameter of law of sales.

Let t_k – arbitrary point of control $t_k \in \{t_n\}_{n=1}^{\infty}$. Then there is the such whole unnegative n, that $t_k \in (nT, (n+1)T]$ and taking into consideration (7) – (9), equalities are executed

$$1 = r(t_k) + \int_0^{t_k} v(t_k;\tau)\,d\tau, \text{ if } n = 0 \tag{10}$$

$$1 = \int_{t_k - T}^{t_k} v(t_k;\tau)\, d\tau \text{, if } n = 1,2,... \tag{11}$$

For BCS, when $t_k = kT, \quad k = 1,2,...$, it is possible to write down equation (10), (11) in kind

$$1 = \int_{nT}^{(n+1)T} v((n+1)T;\tau)\, d\tau, \quad n = 0,1,2,... . \tag{12}$$

In our subsequent work it is comfortably to formulate the mathematical theory ATEA in language of dimensionless number functions with a dimensionless number argument. For this aim we enter *the standard function of renewal* by equality

$$\omega^{st}\left(\frac{\tau}{T}\right) \stackrel{def}{=} T\omega(\tau). \tag{13}$$

Entering denotation for the function of renewal at each of intervals $\tau \in (nT,(n+1)T], \quad n = 0,1,2,...$

$$\omega_{n;n+1}(\tau) \stackrel{def}{=} \omega(\tau), \quad nT < \tau \le (n+1)T, \; n = 0,1,2,... \tag{14}$$

we write (13) in the form of

$$\omega_{n;n+1}(\tau) = \frac{1}{T}\omega_{n;n+1}^{st}\left(\frac{\tau}{T}\right). \tag{15}$$

DEFINITION 13. A set of function

$$v_{n;n+1}((n+1)T;\tau) \stackrel{def}{=} v((n+1)T;\tau), \quad \tau \in (nT,(n+1)T], \; n = 0,1,2,... \tag{16}$$

is named *the system of base speeds of renewal*.

Using (16), (15), (8), we express *base speed of renewal* through *standard base speed of renewal*

$$v_{n;n+1}((n+1)T;\tau) = \frac{1}{T}v_{n;n+1}^{st}\left(\frac{\tau}{T}\right) \tag{17}$$

where

$$v_{n;n+1}^{st}\left(\frac{\tau}{T}\right) = r((n+1)T - \tau)\,\omega_{n;n+1}^{st}\left(\frac{\tau}{T}\right). \tag{18}$$

Substituting (17) in equation (12), we get

$$1 = \frac{1}{T}\int_{nT}^{(n+1)T} v_{n;n+1}^{st}\left(\frac{\tau}{T}\right) d\tau, \quad n = 0,1,2,... \tag{19}$$

DEFINITION 14. The law of renewal, induced by the base control system (BCS)

$$m_{n;n+1}((n+1)T;t) \stackrel{def}{=} \frac{1}{T}\int_{nT}^{t} v_{n;n+1}^{st}\left(\frac{\tau}{T}\right) d\tau, \quad nT < t \le (n+1)T, \; n = 0,1,2,..., \tag{20}$$

is named *local T-law.*

It is possible to write down local T-law (20) in terms of standard

$$m_{n;n+1}\left((n+1)T;t\right)=\gamma^{st}_{n;n+1}\left(\frac{\tau}{T}\right),\quad nT<t\le(n+1)T,\ n=0,1,2,... \qquad (21)$$

where *the standard law of renewal* is determined by a formula.

$$\gamma^{st}_{n;n+1}(z)\overset{def}{=}\int_n^z v^{st}_{n;n+1}(x)\,dx,\quad n<z\le n+1,\ n=0,1,2,... \qquad (22)$$

DEFINITION 15. Standard $\gamma^{st}_{n;n+1}(z)$ (22) is named *the law of equilibrium* in the local chain of financial-production relations or *local law of equilibrium.*

Functions $\omega^{st}_{n;n+1}(x)$, $v^{st}_{n;n+1}(x)$, $\gamma^{st}_{n;n+1}(x)$, $n<x\le n+1,\quad n=0,1,2,...$, determined accordingly by equalities (15), (17), (22) are universal mathematical objects in ATEA, in terns of which *the problem of deliveries* is solved. In the next work (Part III) the obvious expression for these functions, corresponding to some laws of sales, will be found.

We consider maximal technological extension of l. c. FPR with an indicator $\operatorname{ind} X/Y=\{Y_n,Y_{n-1},...,Y_1,Y,X\}$. We denote M_k – amount of raw material Y in state of Y_k, $k=0,1,2,...,n$, supposing $Y_0\equiv Y,\ M_0\equiv M$, and $m(X)$ – amount of products X, made from raw material Y in an elementary structure $\{Y,X\}$.

DEFINITION 16. If $\operatorname{ind} X/Y=\left\{Y_p',Y_{p-1}',...,Y_1',Y,X\right\}$ corresponds to arbitrary extension of local chain of financial-production relations M *-representation of indicator of products* X in relation to raw material Y is named ordered sequence

$$M-R\left(\operatorname{ind} X/Y\right)\overset{def}{=}\left\{M_p',M_{p-1}',...,M_1',M,m(X)\right\} \qquad (23)$$

where $M_k'\in\{M_i\}_{i=0}^n,\quad n=n_{tec}(Y),\quad k=1,2,...,p$.

NOTE. In view of (23) M-representation of $\operatorname{ind} X/Y$ at maximal technological extension ($p=n_{tec}(Y)$) or at commercial extension ($p>n_{tec}(Y)$) is designated accordingly $M-R\left(\operatorname{ind} X/Y\right)_{tec}$, $M-R\left(\operatorname{ind} X/Y\right)_{com}$.

DEFINITION 17. The quantities

$$\alpha'(k)\overset{def}{=}\frac{M_k'}{M_{k-1}'},\quad k=1,2,...,p,\ M_0'\equiv M \qquad (24)$$

and

$$\alpha'(0)=\frac{M}{m(X)}. \qquad (25)$$

are named accordingly *the coefficient of raw material* Y *change* from the state Y_k' into the state Y_{k-1}', $k=1,2,...,p,\quad Y_0'\equiv Y$, and from the state Y into the state X at arbitrary extension of local chain of financial-production relations with an indicator $\operatorname{ind} X/Y = \{Y_p', Y_{p-1}', ..., Y_1', Y, X\}$ and M-representation of indicator $M - R\left(\operatorname{ind} X/Y\right) \stackrel{def}{=} \{M_p', M_{p-1}', ..., M_1', M, m(X)\}$.

NOTE. By DEFINITION 17 at maximal technological extension

$$p = n = n_{tec}(Y),\ \operatorname{ind} X/Y = \{Y_p', Y_{p-1}', ..., Y_1', Y, X\},$$

$$M - R\left(\operatorname{ind} X/Y\right) \stackrel{def}{=} \{M_p', M_{p-1}', ..., M_1', M, m(X)\}$$

and formulas (24), (25) a kind will be adopted

$$\alpha(k) \equiv \alpha'(k) = \frac{M_k'}{M_{k-1}'}, \quad k = 1,2,...,p,\ M_0' \equiv M \tag{26}$$

and

$$\alpha(0) \equiv \alpha'(0) = \frac{M}{m(X)}. \tag{27}$$

DEFINITION 18. Ordered sets of coefficients of change (24), (25), corresponding to arbitrary extension of local chain of financial-production relations with an indicator $\operatorname{ind} X/Y = \{Y_p', Y_{p-1}', ..., Y_1', Y, X\}$, is named *$\alpha$-representation of indicator of products* X in relation to raw material Y and is designated

$$\alpha - R\left(\operatorname{ind} X/Y\right) \stackrel{def}{=} \{\alpha'(p), \alpha'(p-1), ..., \alpha'(1), \alpha'(0)\}. \tag{28}$$

NOTE. At maximal technological extension of l. c. FPR or its commercial extension α-representation of $\operatorname{ind} X/Y$ is designated accordingly $\alpha - R\left(\operatorname{ind} X/Y\right)_{tec}$, $\alpha - R\left(\operatorname{ind} X/Y\right)_{com}$.

We showed before, that problem of deliveries in l. c. FPR is solved in terms of law of equilibrium (22).

DEFINITION 19. A function

$$\gamma_n(x) \stackrel{def}{=} \gamma_{n;n+1}^{st}(n+x), \quad 0 < x \le 1,\ n = 0,1,2,... \tag{29}$$

is named *the reduction local law of equilibrium* , where $\gamma_{n;n+1}^{st}(z)$ is determined by equality (22). If in (29) $n = 0$, reduction local law of equilibrium $\gamma_0(x)$ is named *supporting*.

DEFINITION 20. A function

$$m_n(t) \stackrel{def}{=} m_{n;n+1}((n+1)T; nT+t) = \gamma_n\left(\frac{t}{T}\right), \quad 0 < t \le T,\ n = 0,1,2,.... \tag{30}$$

is named *reduction local* T *-law* , where $m_{n;n+1}((n+1)T;\tau)$ is determined by equality (20). If in (30) $n=0$, reduction local T -law $m_0(t)$ is named *supporting*.

DEFINITION 21. A function

$$g_{n;n+1}(t)\overset{def}{=}M\cdot m((n+1)T;t),\qquad nT<t\le(n+1)T,\;\; n=0,1,2,\ldots \tag{31}$$

is named the *local law of deliveries*, operating in an elementary structure $\{B,A\}$ of local chain of financial-production relations.

DEFINITION 22. A function

$$g_n(t)\overset{def}{=}g_{n;n+1}(nT+t)=M\cdot m(t),\qquad 0<t\le T,\;\; n=0,1,2,\ldots \tag{32}$$

is named *the reduction local law of deliveries*, where $g_{n;n+1}(\tau)$, $m_n(t)$ are given by equalities (31) accordingly (30). At $n=0$ in (32) $g_0(t)$ is named the *supporting reduction local law of deliveries*.

NOTE. If each of local laws of deliveries $g_{n;n+1}(t)$ operates on the interval $t\in(nT,(n+1)T]$, $n=0,1,2,\ldots$, reduction local law of deliveries $g_n(t)$, $0<t\le T$, $n=0,1,2,\ldots$, extended with a period T on all semiaxis $t\in(0,\infty)$, together with the law of sales $P(t)$ provides an equilibrium in l. c. FPR in that sense, that checking the supplies in control points $t=nT$, $n=1,2,\ldots$ enterprise A always has the optimum amount of supplies raw material Y equal to M.

We consider the simple global chain of financial-production relations, resulted at maximal technological extension of local chain:

$$\{B_n,A*B_{n-1},\ldots,A*B_1,A*B,A,C\} \tag{33}$$

with an indicator

$$\operatorname{ind}X/Y=\{Y_n,Y_{n-1},\ldots,Y_1,Y,X\}. \tag{34}$$

DEFINITION 23. Forming the common merged enterprise with combined functions by m, $2\le m\le N_{tec}$ the successive enterprises in simple global chain of financial-production relations is named *TVS-operation*. Thus for the merged enterprise denotation is used

$$(r1):\ A*B_{k-1;k-m}\overset{def}{=}A*B_{k-1},\ldots,A*B_{k-m} \tag{35}$$

or

$$(r2):\ B_{m-2}(A)\overset{def}{=}A*B_{m-2},\ldots,A*B_1,A*B,A. \tag{36}$$

Brackets above the merged enterprises are named *TVS-connections.*

A simple global chain (33) with TVS-connection (35) has a kind of

$$\{B_n,A*B_{n-1},\ldots,A*B_k,A*B_{k-1;k-m},A*B_{k-m-1},\ldots,A*B_1,A*B,A,C\}. \tag{37}$$

Indicator of s. g. c. FPR (37) is given by equality

$$\text{ind}\,{}^{X}\!/_{Y}=\{Y_n,Y_{n-1},...,Y_k,Y_{k-1;k-m},Y_{k-m-1},...,Y_1,Y,X\} \tag{38}$$

where denotation is determined

$$(r3):Y_{k-1;k-m}\stackrel{def}{=}Y_{k-1},...,Y_{k-m}=Y_{k-m}. \tag{39}$$

For TVS-connection (36) in s. g. c. FPR (33) we get

$$\{B_n,A*B_{n-1},...,A*B_{m-1},B_{m-2}(A),C\} \tag{40}$$

Indicator $\text{ind}\,{}^{X}\!/_{Y}$, corresponding to the simple global chain (40), is equal

$$\text{ind}\,{}^{X}\!/_{Y}=\{Y_n,Y_{n-1},...,Y_{m-1},Y_{m-2}(X)\} \tag{41}$$

where $Y_{m-2}(X)$ is determined by TVS-connection of kind

$$(r4):Y_{m-2}(X)\stackrel{def}{=}Y_{m-2},Y_{m-3},...,Y_1,Y,X=X. \tag{42}$$

NOTE. TVS-connections (35), (36) mean the merged enterprise $A*B_{k-m}$, i.e. $A*B_{k-1;k-m}=A*B_{k-m}$ and accordingly enterprises A, i.e. $B_{m-2}(A)=A$. TVS-connections (39), (42) mean that the "states" of raw material Y type Y_{k-m} and X are formed in the merged enterprises $A*B_{k-1;k-m}$ and $B_{m-2}(A)$ accordingly.

We write M - and α -representation of indicator (34):

$$M-R\left(\text{ind}\,{}^{X}\!/_{Y}\right)_{tec}=\{M_n,M_{n-1},...,M_1,M,m(X)\}; \tag{43}$$

$$\alpha-R\left(\text{ind}\,{}^{X}\!/_{Y}\right)_{tec}=\{\alpha(n),\alpha(n-1),...,\alpha(1),\alpha(0)\}. \tag{44}$$

M - and α -representation (38) of indicator s. g. c. FPR (37) has a kind

$$M-R\left(\text{ind}\,{}^{X}\!/_{Y}\right)_{tec}=\{M_n,M_{n-1},...,M_k,M_{k-1;k-m},...M_1,M,m(X)\}; \tag{45}$$

$$\alpha-R\left(\text{ind}\,{}^{X}\!/_{Y}\right)_{tec}=$$

$$=\{\alpha(n),\alpha(n-1),...,\alpha(k,k-1,...,k-m+1),\alpha(k-m),...\alpha(1),\alpha(0)\} \tag{46}$$

where denotations are determined

$$(r5)\ :\ M_{k-1;k-m}\stackrel{def}{=}M_{k-1},M_{k-2},...,M_{k-m}=M_{k-m}; \tag{47}$$

$$(r6)\ :\ \alpha(k,k-1,...,k-m+1)\stackrel{def}{=}\alpha(k),\alpha(k-1),...,\alpha(k-m+1)=\prod_{i=k-m+1}^{k}\alpha(i) \tag{48}$$

M – and α – representation of indicator (41), corresponding to s. g. c. FPR, are determined by relations

$$M-R\left(ind\,{}^{X}\!/\,Y\right)_{tec}=\{M_n,M_{n-1},...,M_m,M_{m-1},M_{m-2}(X)\}; \tag{49}$$

$$\alpha - R\left(ind\, X\!\!\diagup\! Y\right)_{tec} = \left\{\alpha(n), \alpha(n-1), ..., \alpha(m), \alpha(m-1, m-2, ..., 1, 0)\right\} \quad (50)$$

where denotations are used

$$(r7): M_{m-2}(X) \overset{def}{=} M_{m-2}, M_{m-3}, ..., M_1, M, m(X) = m(X); \quad (51)$$

$$(r8): \alpha(m-1, m-2, ..., 1, 0) \overset{def}{=} \alpha(m-1), \alpha(m-2), ..., \alpha(1), \alpha(0) = \prod_{i=0}^{m-1} \alpha(i). \quad (52)$$

Factors of indicators (38), (41) are obviously equal to $f\left(ind\, X\!\!\diagup\! Y\right) = n - m + 2$.

Using TVS-operations in the commercial extension l.c. FPR it is necessary together with the rules r1 – r8 to follow another – r9: if the elements of type $A * B_i$ and type $C * B_j$ participate in TVS-connection, that the element are combined into larger units $A * B_i$, for example $A * B_p$, to which all the other elements of this type are subjected with liquidation of all intermediary companies $C * B_j$, i.e.

$$(r9): A*B_{k-1}, C*B_{k-2}, ..., A*B_p, ..., C*B_{k-m} = A*B_p. \quad (53)$$

Relations r1 – r9 are named the *TVS-rules.*

DEFINITION 24. The simple global chain of financial-production relations with TVS-connections is named *non-obvious* and designated as s. g. c. FPR(TVS), and indicator of its products X in relation to raw material Y – $ind_{TVS}\, X\!\!\diagup\! Y$.

DEFINITION 25. The non-obvious simple global chain of financial-production relations is named *absolute* and designated $\{A, C\}_{TVS}$, if it has kind

$$\{A, C\}_{TVS} \overset{def}{=} \left\{ B_p, ..., A*B_2, ..., C*B_j, ..., A, C \right\}. \quad (54)$$

Diagram $\{A, C\}_{TVS}$ is shown in a form

$$\circlearrowright\!\!\!\!\bigcirc\!\!\!\!\!\!\!\quad Y \; A \xrightarrow{X} C. \quad (55)$$

DEFINITION 26. Two local chains of financial-production relations $\{B, A, C\}$ and $\{B', A', C'\}$ with diagrams $B \xrightarrow{Y} A \xrightarrow{X} C$ and $B' \xrightarrow{Y'} A' \xrightarrow{X'} C'$ are named *equivalent*, if they are isomorphic as linearly ordered sets and their corresponding laws of sales $P(t)$ and $P'(t)$ are connected relation $P'(t) = aP(t)$,

$a > 0$. Class of the equivalent local chains FPR, generated by some law of sales $P(t)$, is designated $S_{loc}\left[P(t)\right]$.

LEMMA 1. In any local chain of financial-production relations, belonging to the class $S_{loc}\left[P(t)\right]$, the same local law of equilibrium operates (22).

Proof. We consider arbitrary l.c. FPR $\{B', A', C'\} \in S_{loc}\left[P(t)\right]$. For the law of sales $P'(t)$ in an elementary structure $\{A', C'\}$ according to the DEFINITION 26 there is such $a > 0$, that $P'(t) = aP(t)$. If T and M are parameters $P(t)$, corresponding parameters T' and M' LS $P'(t)$ are obviously equal to

$$T' = T,$$
$$M' = aM. \tag{56}$$

We find the normalized function of remain $r'(t)$ for LS $P'(t)$. Using DEFINITION 5 AND 6, we get

$$r'(t) = \frac{R'(t)}{M'} = \begin{cases} 1 - \dfrac{P'(t)}{M'}, \; if \quad 0 < t < T, \\ 0, \; if \quad t < T. \end{cases} \tag{57}$$

Taking into account in (57) the equality $P'(t) = aP(t)$ and the second formula from (56), we have

$$r'(t) == \begin{cases} 1 - \dfrac{P(t)}{M}, \; if \quad 0 < t < T, \\ 0, \; if \quad t < T. \end{cases} \tag{58}$$

Equality (58) means that $r'(t) \equiv r(t)$ and, consequently, for the local chain FPR $\{B, A, C\}$ and $\{B', A', C'\}$ the same relative law of saving of reserve will be the same (7). It proves the statement of lemma, if to take into consideration formulas (13), (14), (17) (22).

Lemma has been proved.

THEOREM 1. Let in an elementary structure $\{A, C\}$ local chain FPR $\{B, A, C\}$ the law of sales operates $P(t)$ with parameters M and T and $\gamma^{st}_{p;p+1}(x)$, $p < x \le p+1$, $p = 0,1,2,...$ – local law of equilibrium. Then at maximal technological extension with an indicator $ind\, X/_Y = \{Y_n, Y_{n-1}, ..., Y_1, Y, X\}$, M-representation $M - R\left(ind\, X/_Y\right)_{tec} = \{M_n, M_{n-1}, ..., M_1, M, m(X)\}$ and α-representation $\alpha - R\left(ind\, X/_Y\right)_{tec} = \{\alpha(n), \alpha(n-1), ..., \alpha(1), \alpha(0)\}$ in any elementary structure $\{A * B_k, A * B_{k-1}\}$, $k = 1, 2, ..., n$ the local law of deliveries

$g^k_{p;p+1}(t) = M_k m_{p;p+1}((p+1)T;t)$ operates, where $m_{p;p+1}((p+1)T;t) = \gamma^{st}_{p;p+1}\left(\frac{t}{T}\right)$, $pT < t \le (p+1)T$, $p = 0,1,2,...$.

Proof. We execute over maximal technological extension

$$\{B_n, A*B_{n-1}, ..., A*B_1, A*B, A, C\} \tag{59}$$

TVS-operation with two TVS-connections of type

$$\left\{B_n, A*B_{n-1}, ..., A*B_k, A*B_{k-1}, ..., A*B_1, A*B, A, C\right\} \tag{60}$$

Then by the TVS-rules r1 and r2 it is possible to write down s. g. c. FPR(TVS) (60) in a form

$$\{A*B_{n;k}, B_{k-1}(A), C\}. \tag{61}$$

Using the TVS-rules r3 and r4 it is easily to find that

$$Y_{n;k} = Y_n, Y_{n-1}, ..., Y_k = Y_k,\quad Y_{k-1}(X) = Y_{k-1}, Y_{k-2}, ..., Y_1, Y, X = X \tag{62}$$

Diagram s. g. c. FPR(TVS) (60) will have a kind

$$A*B_{n;k} \xrightarrow{Y_k} B_{k-1}(A) \xrightarrow{X} C \tag{63}$$

with an indicator

$$ind_{TVS} X/Y_k = \{Y_k, X\}. \tag{64}$$

We write out on the basis of the TVS-rules r5 - r8 $M-$ and α –representation of indicator (64):

$$M - R\left(ind_{TVS} X/Y_k\right) = \{M_k, m(X)\}; \tag{65}$$

$$\alpha - R\left(ind_{TVS} X/Y_k\right) = \{\alpha(k, k-1, ..., 1, 0)\}. \tag{66}$$

From equalities (65), (66) we get

$$\frac{M_k}{m(X)} = \alpha(k, k-1, ..., 1, 0) = \prod_{i=0}^{k} \alpha(i). \tag{67}$$

Taking into account (27), (67) we find

$$M_k = aM, \tag{68}$$

where

$$a = \prod_{i=1}^{k} \alpha(i). \tag{69}$$

Consequently, law of sales $P'(t)$, operating in an elementary structure $\{B_{k-1}(A), C\}$, is related to the function $P(t)$ by relation

$$P'(t) = aP(t) \tag{70}$$

According to equality (70) it is easily to see on the basis of the ***Decision 26***, that l.c. FPR$\{B,A,C\}$ and s. g. c. FPR(TVS) $\{A*B_{n;k},B_{k-1}(A),C\}$ belong to the class $S_{loc}\left[P(t)\right]$ and, in obedience to LEMMA 1, in elementary structures $\{B,A\}$ and $\{A*B_{n;k},B_{k-1}(A)\}$ the same local law of equilibrium $\gamma^{st}_{p;p+1}(x)$, $p<x\le p+1$, $p=0,1,2,...$ will operate. From it, taking into account equalities (21), (22),(31), statement of theorem follows.

A theorem has been proved.

NOTE. It is easily to see, taking into account the TVS-rule r9, that the THEOREM 1 takes place and for the commercial extension l.c. FPR.

The proved THEOREM 1 allows to do next fundamental definition in the axiomatic theory of economic analysis (ATEA).

DEFINITION 27. Vector-function

$$\Gamma^{st}_{n;n+1}(x)\overset{def}{=}\gamma^{st}_{n;n+1}(x)(1,1,...,1),\ n<x\le n+1,\ n=0,1,2,... \tag{71}$$

is named *the global law of equilibrium* in the simple global chain of financial-production relations with a number component, equal to $f_{tec}\left(ind\, X/Y\right)$ or $f_{com}\left(ind\, X/Y\right)$ depending on the character of extension of local chain.

DEFINITION 28. Vector-function

$$M_{n;n+1}(t)\overset{def}{=}m_{n;n+1}\left((n+1)T;t\right)(1,1,...,1),\ nT<t\le(n+1)T,\ n=0,1,2,... \tag{72}$$

with a number component, equal to $f\left(ind\, X/Y\right)$, is named *the global* T *-law*, operating in the simple global chain of financial-production relations.

DEFINITION 29. Vector-function

$$G_{n;n+1}(t)\overset{def}{=}m_{n;n+1}\left((n+1)T;t\right)\left(M'_p,M'_{p-1},...,M'_1,M\right) \tag{73}$$

$$nT<t\le(n+1)T,\ n=0,1,2,...,\ p=f\left(ind\, X/Y\right)-1,$$

is named *the global law of deliveries* in the simple global chain of financial-production relations.

DEFINITION 30. Vector-function

$$\Gamma_{n_1...n_p}(x)\overset{def}{=}\left(\gamma_{n_1}(x),...,\gamma_{n_p}(x)\right),\ 0<x\le 1,$$

$$p=f\left(ind\, X/Y\right),\ n_k\in\{0,1,2,...\},\ k=1,2,...,p, \tag{74}$$

where the reduction local law of equilibrium $\gamma_n(x)$ is given by equality (29) , is named *the reduction global law of equilibrium* in the simple global chain of financial-production relations. If in (74) $n_1=n_2=...=n_p=0$, law $\Gamma_0(x)\equiv\Gamma_{0...0}(x)$ is named *supporting*.

DEFINITION 31. Vector-function

$$M_{n_1...n_p}(t)\overset{def}{=}\left(m_{n_1}(t),...,m_{n_p}(t)\right),\ 0<t\le T,$$

$$p = f\left(ind\, X/_{Y}\right),\ n_k \in \{0,1,2,...\},\ k = 1,2,...,p, \tag{75}$$

where reduction local *T*-law $m_n(t)$ is determined by a formula (30) , is named *the reduction global T-law* in the simple global chain of financial-production relations. If in (75) $n_1 = n_2 = ... = n_p = 0$, law $M_0(t) \equiv M_{0...0}(t)$ is named *supporting*.

DEFINITION 32. Vector-function

$$G^{(p,p-1,...,0)}_{n_1 n_2 ... n_{p+1}}(t) \overset{def}{=} \left(g^p_{n_1}(t),...,g^1_{n_p}(t), g^0_{n_{p+1}}(t)\right),\ 0 < t \le T,$$

$$p = f\left(ind\, X/_{Y}\right) - 1,\ n_k \in \{0,1,2,...\},\ k = 1,2,...,p+1, \tag{76}$$

where $g^i_n(t) = M^{'}_i m_n(t)$, $i = 0,1,2,...,p$, $M^{'}_0 \equiv M$ – reduction local law of deliveries (32) , is named *the reduction global law of deliveries* in simple global chain of financial-production relations. If in (76) $n_1 = n_2 = ... = n_{p+1} = 0$, vector-function $G^{(p,p-1,...,0)}_0(t) \equiv G^{(p,p-1,...,0)}_{00...0}(t) = m_0(t)\left(M^{'}_p, M^{'}_{p-1},...,M^{'}_1, M\right)$ is named *the supporting reduction global law of deliveries.*

NOTE. Taking into account, that branches in the branching global chains of financial-production relations are simple global chains, the question about the global laws of deliveries in them is determined in terms of the last.

In work [1] we pointed the reasons causing extension of local chain of financial-production relations. It can be the reasons of technological order, commercial character and etc. But the use of the logistic systems as a factor of extension of local chains enables complex decision of technological, commercial, administrative and other problems of global chains functioning.

DEFINITION 33. The operation of placing of the logistic systems in the simple or branching global chain of financial-production relations is named *reviving*.

DEFINITION 34. The quantity equal to the relation of factor of indicator at maximal technological extension to the volume of commercial extension of local chain is named *reviving power* and designated

$$\lambda_{rev} \overset{def}{=} \frac{n_{tec}(Y) + 1}{f_{com}\left(ind\, X/_{Y}\right) + 1}. \tag{77}$$

LEMMA 2. The absolute global chain of financial-production relations possesses maximal reviving power, equal to $n_{tec}(Y) + 1$.

Proof. It is easily to get on basis (54), using the TVS-rule r9, that

$$B_p,...,A * B_i,...,C * B_j,...,A = B_p(A) = A. \tag{78}$$

According to equality (78)

$$ind_{TVS}\, X/_{Y} = \{X\} \tag{79}$$

and

$$f\left(ind_{TVS}\, X/_{Y}\right) = 0. \tag{80}$$

Thus, with an account (80), we have $0 \le f_{com}\left(ind\, X/Y\right) < \infty$ and, consequently, on basis (77) $0 < \lambda_{rev} \le n_{tec}\left(Y\right)+1$.

A lemma has been proved.

On the basis of the DEFINITIONS 1, 16-18, 33, 34 the form of the ERC4 economic registration certificate is made (tab.1).

We formulate the system of axioms of theory of economic analysis now.

A1. World economic system (WES) is the disjoint set of simple and branching global chains of financial-production relations.

A2. Production and consumption are the categories functions of the WES.

A3. (Axiom of development). The WES development takes place on the basis of global laws of equilibrium in the simple and branching global chains of financial-production relations in the direction of formation of absolute global chains.

A4. Invariants of the WES development are: demand, economy growing, competition, efficiency.

A5. (R-axiom). Reviving does not increase the degree of commercialization of simple or branching global chain of financial-production relations.

The simple or branching global chain of financial-production relations is *the object of research* of axiomatic theory of economic analysis (ATEA).

One of *the major objects* ATEA is *the logistics systems* in s. g. c. FPR or in b. g. c. FPR. An economic registration certificate (ERC) is the basis of account and analysis of reviving, i.e. all logistic activity in the global chains of financial-production relations. Its last registration-analytical form ERC5, including notions, data in DEFINITIONS 15, 19-22, 17-32, is shown in tabl.2.

We consider here the question related to research of the logistic systems in the conditions of reviving and being in this sense conceptual. According to R-axiom development of logistic activity in the simple or branching global chain of financial-production relations results reduction the degree of its commercialization. However, during forming the structure of global chains the growth of the degree of commercialization is possible, when reviving is accompanied by introduction in the global chains of intermediary companies (tabl.3).

4. CONCLUSIONS. THUS, THE RESUITS OF OUR RESEARCHES ARE FOLLOWING:

- the basic definitions and ATEA axioms are formulated;
- a diagram technique for research of the global chains of FPR is created;
- a method TVS-connections at logistics supply of the global chains of FPR is described (the TVS-methodology);
- an economic registration certificate (ERC) as basis of accounting and analysis of reviving is created (the ERC-conception).

We mark that within the framework of the ERC-conception the detailed consideration of problems of pricing and regulation of coast pricing and also the problems of expenses measuring on reviving functioning, simplification of global chains structure and increase of their coefficient of competitiveness is possible.

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BASES OF AXIOMATIC THEORY OF ECONOMIC ANALYSIS. PART II

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