A new paradigm of economic regulation

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Abstract: Current regulating policies are aimed at eliminating negative effect of market failures and at controlling macroeconomic stability, but they do not sufficiently facilitate long-term aims of human being. A method of soft economic regulation making use of endogenous nature of preferences is suggested that is aimed at eliminating risks of terminating being of a civilised society in a long-run outlook. The key element of this method is informational control actions, in particular disseminating information about admissible values of strategical commodities, allowing a society to form such preferences of its members that conform the global economic efficiency criterion based on the concept of sustainable development.

The central idea of this paper is the following. Competitive economy may have many different equilibria. Under perfectly competitive market it depends on chance what equilibrium takes place. Different equilibria are associated with different impact of the economy on human values, environment, social situation and, as a result, on the future of the humanity. Current regulating policies are aimed at eliminating negative effect of market failures and at controlling macroeconomic stability. But they, as a rule, do not sufficiently facilitate scientifically grounded long-term aims of human being.

The aim of the paper is to suggest a method (rather hypothetical for the moment) of 'soft' economic regulation aimed at eliminating risks of terminating human being (as being of a civilised society) in a long-run outlook. This method, in author's view, can provide a good starting point for discussions and deeper studies in the field of the problem of institutional development of market economy in order to make it adequate to the challenge of the global and complex world economy.

The structure of the paper is following. The first, the problem is set by means of introducing a new basic model of an economic agent. The model illustrates dependent nature of preferences and brings to light those opportunities of social control over individual behaviour that remain hidden under classical model. The second, opportunities of approaching a global aim of the economy is discussed. The third, a basic algorithm of economic regulation is presented. The fourth, necessary institutional justifications, associated with the proposed approach to economic regulation, are described. The fifth, the difficulties hampering the implementation of the proposed method are brought to light.

In this paper I intentionally avoid dealing with mathematical notations (except Appendices) in order to let as much people as possible to capture the idea. The formal side of the problem is presented in Svetlov (2002) (in Russian).

1. Preferences as an endogenous relation

Every moment the global economy makes a choice that opens it a variety of future development paths and drops many alternative paths making them no longer reachable. What is behind the process of choice? What are the menaces associated with it? Can this process be controlled to make it most favourable for the humanity? To address these questions, it is necessary to enlighten the following three problems that, in my opinion, need to be paid more attention than they are actually paid.

The problem of existence of different equilibria is well recognised in the economic literature since Debreu (1959). Commonly, economists agree that this problem is rather painful for society and it would be better to drop it from a set of the problems of economic theory. A common economic opinion is that actual property rights, when specified, and a price system, when set, remove the uncertainty of equilibria. The economists usually prefer not to discuss the problem how and why the given price system is set and whether it should be different.

Another angle of the problem I would like to set is the following. It is, again, well recognised that the less the transaction costs are and the better the property rights are specified the less market failures like negative externalities and disequilibria we face (Coase, 1991). However, the transaction costs do exist and, in contrast to a positive impact on their amount from widespread of

informational technologies, the greatly increasing number of suppliers and variety of commodities act contrarily. Under increasing complexity of the economy, a precise specification of property rights becomes a very costly arrangement, whose impact can once appear not to cover the expenses. The world economy has already entered the stage when the transaction costs and the costs of property rights likely form the greatest share of total economic expenses, at least in the national economies leading in economic development.

Finally, there is a problem that is scarcely recognised. It is the problem of dependent nature of human's preferences, which has drawn attention of J. Kornai in his recent paper in Russian (Kornai, 2002). This problem is made hidden by a classical representation of an economic agent which is, in brief, following: supremum of the agent's states with respect to some ordering relation subject to its stock, technological capabilities and budget constraint. Thus, the ordering relation (preferences) is assumed to be given and independent on any variable of the economy (also of economic agent's own state). However, this assumption is too restrictive for economic interpretation. It is a common situation that an economic agent is not certain about its own preferences and, in order to get some certainty, consults from other agents or (nota bene!) studies market prices (which, following the classical scheme, should be determined by consumers' preferences). To partially avoid this problem, L. Walras in his model split economic agents into two groups. One of them, consumers, were assumed to have fixed preferences, while other, producers, were permitted to have preferences depending on prices, namely an attitude to maximise profit. This division was inherited from Walras by his successors, namely Wald (1951), Debreu (1959), Makarov and Rubinov (1977) and many others. However, the preferences of consumers also cannot be assumed to be exogenous without hampering economic meaning of the model.

To wholly avoid this theoretical imperfection, the author has studied the models of a market economy consisting of the economic agents that a priori do not have any certain preferences except the idea to increase the level of satisfying their demands. The demands are assumed to be incomparable, so, each demand is maximised independently. To model such behaviour, the proposed model of an economic agent contains a vector criterion representing each demand separately. The rest of the model remains unchanged. The mathematical analysis of the model, based on the

general reciprocity theorem (Lourier, 1966), has shown that in any Pareto optimum with respect to the set of demands the preferences of the economic agent are (in general) defined: actually used opportunities of satisfying demands serve as a sufficient source of information to make the demands (and the commodities) comparable. In Appendix 1 the model of an economy consisting of such agents linked with each other by means of free exchange is presented (introduced in Svetlov, 2002). In Appendix 2 it is shown that such an economy tends to the Pareto optimum with respect to the set of all demands of all the agents. It should be mentioned that this model is analysed by means of very simple mathematics compared to Arrow-Debreu version of Walrasian model and its later improvements.

The interpretation of the analysis presented in Appendix 2 is that preferences of economic agents are determined by the properties of the economy's technological set. Although in reality there are the non-economic factors arranging preferences, they are nowhere near as strong as it is presented in the models by Walras and his successors. Thus, it is something confusing to consider preferences as a criterion for making economic decisions. The fact is that the price system and, consequently, the idea of economic efficiency both depend on the specific technological features of the Pareto optimum chosen at random from the set of an infinity of Pareto optima. Thus, market economy needs help to be able to choose a right development path. In this respect, the idea that markets produce all necessary information for this choice seems to be obsolete.

The general conclusion from all the three angles of the problem – plurality of equilibria, high costs of both transactions and securing property rights, dependent nature of preferences – is that it is groundless to expect in the beginning of the third millennium that the automatic regulation of global economy can meet the expectations of the humanity about sustainable and purposeful economic development that turns the technological and cultural achievements to the use of each individual.

2. How to approach the global aim of the economy

To reasonably choose one of the possible Pareto optima, one should, first, agree about the global aim of the economy and, second, find an opportunity to quantify that aim in order to describe it mathematically and include in a model of the global economy.

A natural universal criterion (see, for instance, Kolmogorov (1993), Svetlov (1996)) is minimising probability of termination of human civilisation within a sufficiently long (desirably infinite) period. In the traditions of the political economy, the concept of the global economic criterion that is closest to the universal criterion is the concept of sustainable development.

As a first approximation of the universal criterion, the following rules can be taken as a base:

- dropping paths of economic development that include critical points (like bifurcation, catastrophe, break points) that are associated with unpredictable behaviour of the economy;
- dropping development paths requiring too fast restructuring;
- dropping development paths hampering environment;
- dropping development paths associated with decreasing level of social achievements (like support of disabled persons, guaranteed access to urgent medical service and basic education etc.);
- within the remaining paths, choosing the path with a reasonably fast, proportional and stable growth (as too fast growth increases the risk of exhaustion of natural resources).

However, this approach may sometimes not work. First, these conditions may be mutually contradictory. Second, these rules are not precisely defined: for instance, meaning of 'hampering environment' is disputable. Third, it is also disputable what 'reasonably fast growth' is.

A more advanced (and promising) approach is to define a set of actual risks the human being can face (by means of expert opinion polling) and then to minimise the probability of appearance of any of the identified risks. The risks should be identified so that each of them would lead to an absolutely unacceptable disaster like world war, global hunger or epidemic etc. If an initially specified set of risks allows too much development paths rather varying with respect to the interests of different individuals, the second-order risks can be considered like the risks of unstable global and regional development. Contradictory experts' opinions about importance of certain risks do not make a problem: an analyst just has to include all the identified risks in the model and to make allowance for the probability of co-appearance of similar risks in further analysis.

Approaching dependence of the risk probabilities on variables of the global economy model is a special problem. There are at least three ways to solve it:

- in many cases switching values of certain variables leading to crash of the economy are well known, so, it is sufficient to estimate the probability of 'over-critical' values of these variables in a given state of the economy;
- in more complicated cases, special models (either econometric or formal) may help in approaching the probability of a certain risk;
- risk probability can also be dealt by means of expert opinion polling followed by an appropriate statistical processing.

Absence of critical points remains to be an indispensable feature of the chosen development path.

Uncertainty of future technologies, considering the idea of minimising risks, can be well dealt with by means of using actual technologies, excluding the technologies that should be cancelled because of exhaustion of necessary resources, as a pessimistic scenario of future technologies.

To obtain a reliable knowledge about the best development path with respect to the global aim of world economy, the procedures of identifying this path should be performed separately by several independent institutions. A result can be acknowledged as a reliable one only when all the estimations give very close results at least for the nearest year perspective. If it does not happen then the analysts, getting informed about the solutions obtained by their rivals, seek for imperfections in the procedures applied by each other. If the result is still contradictory, it would be wise to temporarily leave the idea of pursuing the global aim until the scientists feel themselves able to produce a trustworthy result.

All the procedures should be open to public review and comments.

3. Algorithm of economic regulation of preferences

Since the development path that satisfactory corresponds to the global aim of the economy is identified, the information about it should be disseminated among market agents in such a form that they would be motivated to make economic decisions pushing the economy to the desired path.

Section 1 identifies the sources of uncontrolled uncertainty within market economy. From the cybernetic point of view, the sources of uncertainty are the resources of improving control. The sensitivity of preferences to market information, especially to price information, is theoretically justified by means of analysis of behaviour of an economic agent satisfying mutually independent demands.

The endogenous nature of preferences allows some abstract governor to use informational control actions to form such preferences that conform the global economic efficiency criterion based on the idea of sustainable development.

The increasing importance of information under increasing complexity of global economy and developing telecommunications is today's tendency. Information becomes the major power and the prime value in the economy. Importance of information at the level of interaction of a limited number of agents under specific conditions is deeply studied by means of mathematical models, meanwhile the existing models of market economy as a whole are not adapted well to the task of explaining the informational phenomena at the level of the whole economy. The new model of an economic agent, which is introduced in Section 1, is a good starting point to make progress in this field. The model of market economy based on the proposed formalisation of an economic agent represents market information as a factor affecting preferences and, consequently, the most influential factor in the economy. It is quite natural then to use the capacity of this model in order to make information work in favour of sustainable development.

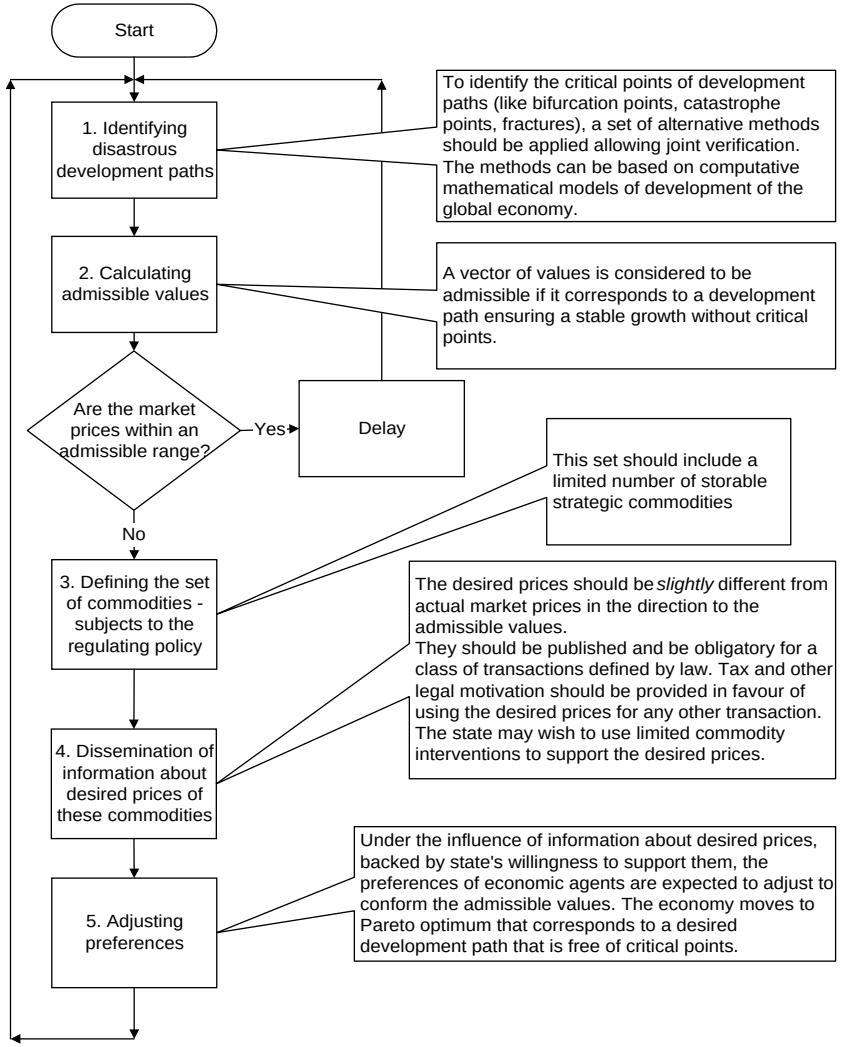

Chart 1. Proposed algorithm of economic regulation

The idea is that economic agents are commonly disposed to positively react (within a finite time horizon) to price information disseminated by official authorities. The typical examples are the reaction of exchange rates to the official exchange rates set by central banks and the reaction of

stock markets to the official forecasts of economic trends. Naturally, markets correct these informational effects soon if the information is false. That is why the informational signals should, first of all, be opened to verification by any economic agent; second, be secured with sufficient resources to hedge an accidental crash of the policy; third, be mutually co-ordinated, so that the price changes, resulting from these signals, would not make losses to a majority of economic agents; in other words, price changes should be jointly compensating; if they are not, other instruments of financial policy should be applied to prevent losses. Seeing that the admissible price system is something reasonable and stable, the economic agents, as expected, would change their preferences. Due to that, the economy is expected to move to the desired Pareto optimum.

The whole picture of the regulation approach is presented at the Chart 1.

The basic feature of this approach is that the control presumes virtually no restrictions to freedom of economic agents. Contrarily to the traditional approaches to regulation, namely restrictions (resulting in expansion of 'shadow economy') and motivations (that is costly), this approach is to supply to the economic agents (for free) a valuable resource that is not very expensive for suppliers, namely information on intended, scientifically justified and governmentally supported macroeconomic value ratios. As this approach directly affects preferences, its importance spans not only economic, but also social and cultural problems. In particular, under a properly tuned regulating policy one can expect shift to the preferred consumption of cultural values (like education, art and sports) rather than material goods. A special factor of effectiveness of this approach is that the preferences are something conservative. So, as soon as the desired value structure is formed, the regulation policy can relax. The preferences, having been adjusted, will keep the economy following the desired development paths themselves, until either new threats of economic instability arise or some informational noise negatively affects preferences.

It is necessary to admit that the Chart 1 does not suggest a replacement to current regulation policies. Instead, it supplements them, pretending to become an important branch in a system of macroeconomic regulation.

Yet, as this approach deals with control over development paths, an important question arises: who (what institution) would control the economy? Another question is: how costly would

be the control? Would its effect be reliably greater than the costs? So, the institutional aspect of the problem is the next subject of our study.

4. What should be an institutional structure of the economy of the future?

Institutions of private property and free markets, given absence of market imperfections, perfectly serve as means of supporting the highest possible 'tension' of an economy with no respect to the result of this tension. An illustrative example is a power plant that tends to work at maximal capacity without taking care of usage of the power: whether it heats air in a building or outside it. Quite similar, the tension of the economy can be used for producing knowledge and cultural values or for material consumption that wastes natural resources without any positive impact to long-term aims of the humanity. The theoretically adjusted dependence of preferences on market information makes it obvious that the willingness of individuals, being dependent on market and thus on production, cannot ensure us that the economy contributes in the progress of the humanity. In short, individuals tend to compete in consumption of those commodities that the economy supplies. Thus, it does matter what the economy supplies.

Hence, the institutional structure of the future economy is a subject for development. The general outlook of this development is:

a) the private property remains being an institution providing competitive environment, high tension of economic life and fast technological development;

b) modern informational technologies serve effective functioning of private property decreasing costs of its securing;

c) as much of market and business information as possible should shift to a public domain in order to reduce transaction costs;

d) the social institutions should be created that produce value information as described in the previous section, using, as a base for their studies, the models of sustainable development paths.

Position (c) clearly contradicts current tendency that is to make information products (databases, software, literature, forecasts, analytics) a purely private commodity. Huge money are spent, from one side, to protect information by means of legal protection, licensing and encrypting,

from another side, to steal it by means of forged licenses, keys and cracks. In future these expenses can hamper the progressive development of informational society. The counteraction to this tendency is to consider, at last, the fact that is obvious to any economist-theorist who is very far from actual private interests: information has all the attributes of a public commodity and should be dealt as a public commodity. The less exceptions (which are necessary in many specific cases) are made to this general rule the greater positive impact on the economy and living standards we shall observe. The leading producers of information should be, in general, three types of institutions:

- private entities selling public information product licenses to the state, which then disseminates the product among consumers at the cost of transaction (it should commonly be the same as the cost of obtaining from any other consumer, plus a small premium for guaranteed quality);
- non-profit organisations;
- state institutions.

As for the position (d), value information is a particular case of an information product. Traditional private consulting farms and social non-profit institutions can bid for the corresponding government order. State research organisations should take part in bidding on common principles. Winners offering the best quality at the lowest price execute the orders independently. Those who lose can keep working at producing value information at the expenses of their own if they expect to find a non-governmental consumer for their product. The information about value, since produced, is disseminated by the customer, that is government, for free and without any limitations. The only pre-condition is that the methodology of calculations should be open to each consumer of this information. That is conductive to true understanding of the precise meaning of the modelled values by a consumer. Observing the variance of the results produced by different suppliers, the consumer is able to measure trustworthiness of these figures, that motivates the bidders to improve methodologies and obtain more reliable results. In addition to the dissemination, the government has to use this information to define and declare the desired prices (see Chart 1) that indicate the governmental choice of one of sustainable development paths, which is approved as a guideline for the economy.

So, the consumer obtains:

- information from private, non-profit and government agencies about the results of their studies of value and about the methodologies applied, which underlies the consequential governmental decision and adjusts its trustworthiness;
- a declaration of desired prices by plenipotentiary governmental institution, which has a restrictive power for a specially defined class of transactions (the contracts with state institutions or natural monopolists can be the example).

5. Is it realistic? Conclusions and discussion

The above presented picture of economic regulation can make an impression of something Utopian (like many other ideas coming from Russia). First, a reader can ask, why should I trust a proposed model of an economic agent, which underlies the whole idea, having a choice of dozens of much wider known alternatives by famous and respectable scientists? Second, what if the author overestimates the flexibility of preferences with respect to market information? Third, what if the new institutions that are necessary to develop in order to run the proposed regulation scheme appear to be too expensive?

The first question is easy to answer. The proposed model is the most general one. It wraps up all the known ‘maximisation’ models as particular specifications: to demonstrate it, one can just attach a particular meaning and a specific functional form to a particular demand variable. The restrictive assumptions are just formal. They are introduced for mathematical simplicity and can be avoided. The condition of cardinality, as it follows from Debreu theorem (Debreu, 1954), is not restrictive. Under cardinality, differentiability is as restrictive as continuity, which is commonly acknowledged. The mathematical conclusions about the model also do not represent any complexity and can be reproduced by any economist who is familiar with mathematical programming. Due to its extreme generality and simplicity, the farm agent model is very handy to analyse but too abstract for the majority of economic problems; yet, it perfectly facilitates the problem discussed in this paper.

The second question is more difficult. The preliminary econometric studies making use of the data of agricultural companies in Moscow Region (see Svetlov, 2001) has corroborated the validity of the model. However, (a) this empirical base is too narrow for certain conclusions; (b) these

studies give very few reasons in favour of endogeneity of preferences, although clearly do not reject this hypothesis. So, before taking this approach as a subject for implementation, wide studies of endogeneity of preferences and their sensitivity to market information are necessary that could corroborate the theoretical expectations. Nowadays, the approach is based on the hypothesis, which is reliably justified theoretically but still needs wider empirical verification.

As for the third question, it subjects to political risk and political art. Unless experience is available, economic theory is not able to address it. If the society (by means of its democratic institutions) agrees to take this risk in view of expected benefits, it can either face a detriment (which is limited to the adopted expenses associated with this policy) or enjoy benefits (which are not limited). The detriment (which is possible) can be attributed to the cost of knowledge, which in long-run will anyway be repaid by having identified the causes of failure, developing and implementing a working approach instead of failed one.

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Appendix 1. Theoretical model of market economy used in this study

Variables of the model ($\mathbf{x} = (x_{jkt}), j \in J_{xkt}$; $\mathbf{n} = (n_{jkt}), j \in J_{nk}$; $\mathbf{s} = (s_{jkt}), j \in J_{sk}$), $k \in K$, $t \in T$ correspondingly mean:

- intensity of production process j controlled by agent k, in time t;
- level of satisfaction of vital demand j of agent k in time t;
- level of satisfaction of non-vital demand j of agent k in time t.

Presume that $x_{jkt} = \text{const}, j \in J_{xkt}, k \in K, t \in \{-1; \tau\}$.

Sets.

- T is a set of integers presenting time moments spanned by the model, such that $\inf(T) = 0$ и $\sup(T) = \tau$.
- J_{xkt} is a set of production processes available for agent $k \in K$ in time t.
- J_{nk} and J_{sk} are the sets of vital and non-vital demands of agent k.
- I is a set of commodities.
- K is a set of economic agents.
- Z_{jk} is a closed set of vectors $\mathbf{z}_{jk} = (z_{ijk})$ representing expenses of commodity i for satisfying vital demand $j \in J_{nk}$ of agent k.

Relations:

♦ $s_{jk}(\mathbf{s}_{kt})$ is a function of non-vital demand j satisfaction level of agent k on vector of actual levels of satisfaction of all the demands $\mathbf{s}_{kt} = (s_{jkt})$;

♦ $v_{ijkt}(x_{jkt})$ is a non-negative function of commodity i input by agent k on the intensity of production process j;

♦ $w_{ijkt}(x_{jkt})$ is a non-negative function of commodity i output by agent k on the intensity of production process j;

♦ $U_{jk}(s_{jkt})$ is a relation of non-vital demand $j \in J_{sk}$ satisfaction level to a closed set of non-negative vectors $\mathbf{u}_{jkt} = (u_{ijkt})$ of inputs, presuming that $U_{jk}(0) = \{\mathbf{0}\}$.

Parameters:

♦ $\mathbf{B} = (B_{ik,t})$ is inflow of commodity $i \in I$ into ownership of agent $k \in K$ in time $t \in T$;

♦ $\mathbf{n}^*$ is a vector of required levels of vital demands $j \in J_{nk}$ satisfaction for each agent $k \in K$ and time $t \in T$;

♦ $\mathbf{H}_s = (\eta_{jkt,t'})$, $\eta_{jkt,t'} = \delta_{t't}$, $j \in J_{sk}$, $k \in K$, $t \in T$, $t' \in T$ и $\mathbf{H}_p = \ = (\eta_{jkt,t'})$, $\eta_{jkt,t'} = \delta_{t't}$, $j \in J_{xkt}$, $k \in K$, $t \in T$, $t' \in T$ are linear operators of aggregating commodity flows induced by production and consumption processes ($\delta_{t't}$ is Kroneker symbol).

The following definitions are used hereafter: $\mathbf{Z} = (z_{ik,jk'})$, $z_{ik,jk'} = \delta_{k'k}\, z_{ikt}$, $i \in I$, $k \in K$, $t \in T$; $\mathbf{U} = (u_{ik,jk't})$, $u_{ik,jk't} = \delta_{k'k}\, u_{ijkt}$, $i \in I$, $j \in J_{sk}$, $k \in K$, $k' \in K$, $t \in T$; $\mathbf{N} = (n_{jk,t})$, $j \in J_{nk}$, $k \in K$, $t \in T$; $\mathbf{V}_p(\mathbf{x}) = (v_{ik,jk't}(x_{jkt}))$, $v_{ik,jk't}(x_{jkt}) = \ = \delta_{k'k}\, v_{ijkt}(x_{jkt})$, $i \in I$, $j \in J_{xkt}$, $k \in K$, $k' \in K$, $t \in T$; $\mathbf{W}_p(\mathbf{x}) = (w_{ik,jk't-1}(x_{jkt-1}))$, $w_{ik,jk't-1}(x_{jkt-1}) = \delta_{k'k}\, w_{ijkt-1}(x_{jkt-1})$, $i \in I$, $j \in J_{xkt}$, $k \in K$, $k' \in K$, $t \in T$.

All the functions are differentiable. The frontiers of sets Z_{jk} in a commodity space are assumed to be representable by means of differentiable functions of some vector of parameters. The frontiers of graphs of relations $U_{jk}(s_{jkt})$ in a commodity-demand space are assumed to be representable by means of a finite number of differentiable functions on s_{jkt}.

The model $M(J_e)$ associated with a given exchange set J_e is defined as follows:

$$\max \mathbf{s};$$

$$\mathbf{n} \geqq \mathbf{n}^*.$$

$$s_{jkt} \leqslant s_{jk}(\mathbf{s}_{kt}),\ j \in J_{sk}, k \in K, t \in T.$$

$$\mathbf{ZN} + \mathbf{UH}_s + (\mathbf{V}_p(\mathbf{x}) - \mathbf{W}_p(\mathbf{x}))\mathbf{H}_p = \mathbf{B},$$

$$\mathbf{u}_{jkt} \in U_{ik}(s_{jkt}),\ j \in J_{sk},\ k \in K,\ t \in T,$$

$$\mathbf{z}_{jk} \in Z_{jk},\ j \in J_{nk},\ k \in K.$$

$$\mathbf{x} \geqq \mathbf{0},\ \mathbf{n} \geqq \mathbf{0},\ \mathbf{s} \geqq \mathbf{0}.$$

Appendix 2. An attribute of exchange opportunity and formation of preferences

The following assumptions are associated with the model specified in Appendix 1: the set of Pareto optima is not empty for each J_e; at least one of non-vital demands does not reach its satisfaction level; there are no transaction costs; free disposal is available.

Under these assumptions, the following theorem is valid.

D e f i n i t i o n . An exchange of i and i' in a proportion r is such an exchange that $v_{ijkk't}(e_{jkk't}) = -r \cdot {}_{w}i'jk'kt(e_{jk'kt})$, where $r > 0$, and $v_{i''jkk't}(e_{jkk't}) = {}_{w}i''jk'kt(e_{jk'kt}) = 0$ for each $i'' \in I \setminus \{i, i'\}$.

T h e o r e m . Presume that J_{e0} includes exchanges of i and i' in a proportion r for each $k \in K$, $k' \in K \setminus \{k\}$, $i \in I$, $i' \in I \setminus \{i\}$, $r > 0$; $\mathbf{p} = (p_{ikt})$ is some vector of Lagrangean multipliers of commodity balances associated with the same Kuhn-Tucker point as a Pareto optimum ($\mathbf{x}^*$, $\mathbf{n}^*$, $\mathbf{s}^*$, $\mathbf{e}^*$) of the model $M(J_{e0})$. Then the following is true:

$$p_{ikt} / p_{i'kt} = p_{ik't} / p_{i'k't}.$$

This theorem does not need the assumptions of convexity. It is valid for any Kuhn-Tucker point, no matter whether the given Pareto optimum is a global or local.

Prove. Assume that for some $(i; i'; k; k')$ the above stated equation is not valid. Denote $e_{jkk't}$ an exchange of i and i' in a proportion r, belonging to the set $J_{ekk't}$, such that

$$p_{ikt} / p_{i'kt} > r > p_{ik't} / p_{i'k't}.$$

Following Kuhn-Tucker conditions, the following equation takes place for exchange $e_{jkk't}$:

$$(p_{ik't} - p_{ikt}) - r \cdot (p_{i'k't} - p_{i'kt}) + \lambda_{jk'kt} = 0,$$

where $\lambda_{jk'kt} \leqslant 0$ is a Lagrangean multiplier for the constraint $e_{jk'kt} \geqslant 0$.

Value r can be represented as $(p_{ikt} - \delta) / p_{i'kt}$, where $\delta > 0$. Then the equation above induces

$$(p_{ik't} - \delta) / p_{i'k't} - ((p_{ikt} - \delta) / p_{i'kt}) \geqslant 0.$$

Hence, $(p_{ikt} - \delta) / p_{i'kt} \leqslant (p_{ik't} - \delta) / p_{i'k't} < p_{ik't} / p_{i'k't}$, that contradicts to the property of exchange $e_{jkk't}$. So, Kuhn-Tucker conditions are not valid in this case and **p** cannot be associated with Kuhn-Tucker point.

According to the theorem, unless some exchange is available, the economy $M(J_e)$ resides in a Pareto optimum. As soon as all the possible exchanges of two commodities are identified and completed, some Pareto optimum is reached and Lagrangean multipliers are defined. In the economic interpretation it means that, as soon as a Pareto optimum is reached:

- the preferences are defined as demands weighted with corresponding Lagrangean multipliers;
- each commodity has a non-negative value.

Each Pareto optimum is associated with a specific set of individual preferences. Value vector, being given, defines a subset of Pareto optima and a subset of individual preferences. Thus, setting values, one shifts the economy to one of the desired Pareto optima and affects preferences.