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Section 1. Mathematical and instrumental methods of economics

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THE USE OF NEURAL NETWORKS TO SOLVING THE PROBLEM OF OPTIMAL MANAGEMENT RELATIVE TO THE SET

Abstract. Unlike classical problems, the numerical solution of fuzzy optimal control problems is associated with some mathematical difficulties. These difficulties are mainly due to the fact that a fuzzy number is actually a set and finding a fuzzy function means finding a set. It is also known that it is possible to build a neural network that approximates a continuous mapping to any precision. Using this, we solve problems (1)–(4) using neural networks.

Keywords: neural networks, optimal synthesis, optimal control, input and output data.

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ПРИМЕНЕНИЕ НЕЙРОННЫХ СЕТЕЙ К РЕШЕНИЮ ЗАДАЧИ ОПТИМАЛЬНОГО УПРАВЛЕНИЯ ОТНОСИТЕЛЬНО МНОЖЕСТВА

Аннотация. В отличие от классических задач численное решение нечетких задач оптимального управления связано с некоторыми математическими трудностями. Эти трудности в основном связаны с тем, что нечеткое число фактически является множеством и нахождение нечеткой функции означает нахождение множества. Также известно, что можно построить нейронную сеть, которая аппроксимирует непрерывное отображение с любой точностью. Используя это, решаем задачи (1)–(4) с помощью нейронных сетей.

Ключевые слова: нейронные сети, оптимальный синтез, оптимально управление, входные и выходные данные.

Широкий класс задач практики приводит к изучению изменения формы рассматриваемого объекта или тела относительно некоторого параметра. Примерами таким задачам являются диффузионные процессы, задачи расширения или распрямления тела от тепла, задачи теории упругости, экологические задачи, задача распространения нефтяного пятна на поверхности моря, биологические процессы и т.д.

Изучение задачи в такой постановке связано с некоторыми математическими трудностями. Это в первую очередь связано с определением скорости изменения множества, характеризующей форму тела.

В математическом языке множество $D \subset R^n$ можно определить с помощью ее характеристической функцией $\mu_D(x)$. Если $\mu_D(x) = 1$, это означает, что $x \in D$ и $\mu_D(x) = 0$, то $x \notin D$. Значит характеристическая функция $\mu_D(x)$ получает значения 1 и 0, т. е. любая точка либо входит в множество D, либо нет. Однако бывает, что функция $\mu_D(x)$ не определяется двумя значениями, ее значение менится на отрезке $[0,1]$.

Пусть требуется минимизация функционала

$$J(v) = \|D(T) - Z\|^2 + \mu \int_0^T \|V(t)\|^2 \to \min, \quad (1)$$

при условиях

$$\dot{D}(t) = a(t)D(t) + V(t), t \in [0,T], \quad (2)$$

$$D(0) = D_0. \quad (3)$$

Здесь нормы $\|D(T) - Z\|^2$ и $\|V(t)\|^2$ означают

$$\|(D(T),0) - (Z,0)\|^2 = \int_{S_B} \left[P_{D(T)}(x) - P_Z(x) \right]^2 ds,$$

$$\|V(t)\|^2 = \int_{S_B} \left[P_{V(t)}(x) \right]^2 ds.$$

Класс управлений является область-функция $V = V(t)$, в которой $V(t) \in M$, $t \in [0,T]$, здесь M совокупность выпуклых замкнутых ограниченных множеств в Rn. Другими словами, на класс управлений не налагаются никакие ограничения и предполагаем, что решение рассматриваемой задачи, в указанном классе, существует. В этом случае из условия оптимальности (7.18) получается соотношение

$$c(t)P_{D(T)}(x) + 2\mu P_{V(t)}(x) = c(t)P_Z(x), \quad (4)$$

где $c(t) = e^{\int_t^T a(\tau)d\tau}$.

Таким образом, оптимальная пара определяется соотношением (1)–(4). Как видно, все эти соотношения задаются равенствами. Значит, мы можем предполагать, что при естественных условиях, решение задачи (1)–(3) непрерывно зависит от исходных данных. Также известно, что можно построить нейронную сеть, которая аппроксимирует непрерывное отображение с лю-

бой точностью. Используя это, решаем задачи (1)–(4) с помощью нейронных сетей.

Для этого сначала выбираем многослойную нейронную сеть и определяем ее весовые коэффициенты. Для этого используется в основном два подхода. Первый- аналитический, в котором весовые коэффициенты задаются по каким то формулам и другой, в котором весовые коэффициенты восстанавливаются в процессе обучения. Здесь мы будем использовать второй подход. В этом подходе точность решения зависит от количества входных и выходных данных и способа обучения нейронных сетей. Выбор входных и выходных данных является самым трудным и актуальным этапом при применении нейронных сетей.

Для применения нейронных сетей к решению задачи оптимального управления (1)–(3), нам нужны в достаточном количестве входные и выходные данные для процесса обучения. Как находим эти данные?

Здесь мы будем предлагать схему, для определения в достаточном количестве входные и выходные данные.

Исходные данные для задачи (1)–(3) являются $a(t)$, D_0, μ, Z. Задавая эти данные, определяется решение $V(t)$. Для различных исходных данных решать задачи (1)–(3) является проблематично, так как, нашей целью является найти решение этой задачи именно для конкретно заданного $a(t)$, D_0, μ, Z. Для определения входных и выходных данных применяем «обратный» подход. Константа $\mu \geq 0$ не варьируем, т.е. фиксируем. Возьмем область-функцию $D_1(t) \in M$, $t \in [0,T]$ и непрерывную функцию $a_1(t)$. Подставляя эти данные в уравнение (1) и начальное условие (3), находим $V_1(t)$ и

$$V_1(t) = \dot{D}_1(t) - a_1(t)D_1(t), \quad t \in [0,T], \qquad (5)$$

$$D_1^{(0)} = D_1(0). \qquad (6)$$

Учитывая в соотношении (4), найденное управление $V_1(t)$ учитывая в соотношение (4), имеем

$$P_{Z_1}(x) = P_{D_1(T)}(x) + \frac{2\mu}{c_1(t)} P_{V_1(t)}(x), \ x \in S_B. \qquad (7)$$

Здесь $c_1(t) = e^{\int_t^T a_1(\tau)d\tau}$. Условие (7) можно написать в эквивалентной форме

$$Z_1 = D_1(T) + \frac{2\mu}{c_1(t)} V_1, \ t \in [0,T].$$

Значит, мы нашли входные данные $a_1(t)$, $D_1^{(0)}$, Z_1, в которых решением задачи (1)–(3) является управление $V_1(t)$. Это есть соответствующий выходной данный. Однако, в этом процессе есть две проблемы. Первая, выбранные область функция $D_1(t) \in M$, $t \in [0,T]$ и непрерывная функция $a_1(t)$ должны быть такими, чтобы найденная по формулам (6) область функция, для любого $t \in [0,T]$ была выпуклой. Второе, определяемое по формулам (6) множество не должно зависеть от t. Остается обеспечивать эти условия.

Для этого, например, можно взять в виде
$$D(t) = \beta_1(t)A_1 + \beta_2(t)A_2 + ... + \beta_m(t)A_m.$$

Здесь A_i некоторые выпуклые множества и $\beta_i(t)$, $i = 1,2,...,m$, положительные, непрерывно-дифференцируемые функции. Из условий (5), (7), получим

$$V(t) = \sum_{i=1}^{m} [\beta_i'(t) - a(t)\beta_i(t)]A_i,$$

$$Z = D(T) + \frac{2\mu}{c(t)} \sum_{i=1}^{m} [\beta_i'(t) - a(t)\beta_i(t)]A_i, \ t \in [0,T].$$

Пусть функции $\mu_i(t)$, $i = 1,2,...,m$, такие, что их можно представить в виде

$$\beta_i'(t) - a(t)\beta_i(t) = c(t)b_i, \ t \in [0,T], \qquad (8)$$

где $b_i \geq 0$. Тогда

$$V(t) = \sum_{i=1}^{m} c(t)b_iA_i,$$

$$Z = D(T) + 2\mu \sum_{i=1}^{m} b_iA_i.$$

Так как, $b_i \geq 0$, $c(t) \geq 0$, $\mu \geq 0$, вышеотмеченные два условия обеспечены.

Покажем, что существуют функции $\beta_i(t)$, которые удовлетворяют указанным условиям. Из уравнения (8) находим

$$\beta_i(t) = \exp\left(\int_0^t a(\tau)d\tau\right)[\beta_i(0) - b_id(t)],$$

где

$$d(t) = \int\limits_0^t \exp\left(-\int\limits_0^\tau a(s)ds\right) c(\tau))d\tau.$$

Учитывая, что функция $d(t)$ непрерывна, существует число K, такое, что $d(t) \leq K$, $\forall\, t \in [0,T]$. Тогда взяв $b_i \geq 0$ любые и $\beta_i(0) \geq b_i K$, увидим, что $\beta_i(t) \geq 0$, $t \in [0,T]$.

Таким образом, взяв входные данные $a_1(t), D_1^{(0)}, Z_1$, мы получили выходной данный $V_1(t)$. Взяв аналогично, сколь угодно входные

$$a_1(t), D_1^{(0)}, Z_1,$$
$$a_2(t), D_2^{(0)}, Z_2,$$
$$a_p(t), D_p^{(0)}, Z_p,$$

мы находим выходные данные

$$V_1(t),\ V_2(t),\ldots,V_p(t).$$

Используя эти данные можно проводить процесс обучения нейронной сети и найти весовые коэффициенты. После построения сети можно решать задачи (1)–(3) с любыми конкретными данными. Качество решений и надежность нейронной сети зависит от качества выбора и количества p исходных данных. При увеличении p погрешность приближенного решения уменьшается.

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Section 2. World economy

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SPENDING HABITS, AND ECONOMIC GROWTH EFFECTS IN COMMON LAW VS. NON-COMMON LAW POLITICAL SYSTEMS AMONG DEVELOPED COUNTRIES

Abstract

Introduction: Different law systems often lead to different degrees of economic developments and political systems, which are closely related to the life of citizens. There is a long debate about which law system, Common Law or Civil Law, is better for the economic development of a country. A popular viewpoint is that the Common Law system is superior to non-Common Law systems due to its higher protection for property.

Objective: Our goal is to evaluate which law system is better for economic systems, through data processing and statistical hypothesis testing. The findings can be a reference for further investigation of the advantages of different law systems.

Methods: To develop the model, we use the data from International Monetary Fund (IMF), World Bank, and various government Central Banks' websites). We select 14 variables related to the key field of economic development. We first apply the Shapiro-Wilk test for normality to decide which statistical hypothesis test is appropriate. For normally distributed variables, we employ the parametric independent-samples t-test for mean difference; otherwise, we employ the non-parametric Mann-Whitney U Test. All the tests are done in R.

Result: Out of the 14 variables, we find three (i.e. final consumption expenditure, value-added manufacturing, and GDP growth) to be significant at 0.05 significance level. Common Law countries have significantly higher final consumption expenditure and GDP growth, with lower value-added manufacturing growth, than Civil Law countries.

Conclusions: The results imply that Common Law countries are indeed more helpful for general economic development, while Code Law countries are superior for economic development in manufacturing. These results support the viewpoint that the Common Law system gives people and companies more confidence to participate in the market, and thus, Common Law countries are better for economic developments. It also confirms this report's hypothesis that Common Law countries are better than Code Law countries in promoting economics.

Keywords: Common law, Civil Law, Hypothesis Testing, Economic Development, Shapiro-Wilk test, Non-Parametric Mann-Whitney U Test, Parametric Independent-Samples t-Test.

Introduction

Many studies often preach and support arguments that countries that implement Common Law as their political system will provide better protection of property rights, unbiasedness, and legal rights for their people. Furthermore, it has been argued that excellent protection encourages businesses to invest more, thus encouraging economic growth. This research paper tests the validity and measures the financial impacts of those claims by studying the economic impacts and analyzing households' spending habits in different countries. The main argument is to test Common Law countries' versus Non-Common Law countries' economic performance and evaluate their economic growth effect for the year of study from 1990 to 2015. This study will significantly help readers understand how the political systems of different countries can impact the direction and growth of their economies.

As initial current preliminary perceptions: Common Law would be superior to non-Common Law countries in their economic performance. Strong legal protection for property rights should encourage more vigorous economic activity. However, it is not confident of how Common Law would affect households within each country and what effect this would influence the end consumers. Fourteen data variables from Common law and Code Law countries: Trade in Services (% of GDP), Inflation, Consumer Prices (Annual%), Interest Rate Spread (lending rate minus deposit rate,%), Household final consumption expenditure per capita growth (annual%), Final consumption expenditure, etc. (annual% growth), Exports of Goods and Services (annual% growth), Gross capital formation (annual% growth), Imports of goods and services (annual% growth), Manufacturing, value added (annual% growth), Industry, value added (annual% growth), Services, etc. value added (annual% growth), GDP growth (annual%), GDP per capita growth (annual%), Gross domestic savings (% of GDP).

These statistical datasets were obtained from publicly available sources: International Monetary Fund (IMF) – International Financial Statistics, World Bank – World Development Economic development, and various government Central Banks' websites. Expert opinions and ideas were also read as references from various political journals, economic journals available on the Internet, and a local library's bank of academic journals accessible via the Internet. These fourteen variables will be evaluated to see which factors are significant in this study. Possible explanations would be provided to explain the significant findings, and further study would be recommended.

This paper will examine the fourteen variables of interest to compute the results of their economic performance statistically. The results will be examined and aggregated to compare different developed countries. Great care will be attempted to understand how different developed countries' political systems affect their economies and household spending habits.

Literature Review

Two main camps often preach the superiority of Common Law compared to Non-Common Law political systems: Political and Economic factors. Political factors have supported the argument that Common Law political systems are superior to non-Common Law systems. The Common Law system can tolerate more competition between different parties, and more competitions lead to more significant improvements. For example, in the article Building competition and breaking cartels? The legislative and judicial regulation of political parties in Common Law democracies, Anika Gauja, pointed out that because Common Law countries are less willing to control the activities and organizations within parties, a Common Law political system court in Mulholland was flexible enough that the law system can respond to developments and changes more efficiently.

Economic factors have also supported the argument that Common Law political systems support healthier economic growth on a macroeconomic level. Compared to the Civil Law system, Common Law systems provide more excellent property protection. In Graff Michael's article, Law and Finance: Common-

law and Civil-law Countries Compared, he pointed out that Common Law system countries, like Germany and Scandinavia, have the highest level of protection of property, whereas France, a Civil Law country, has the poorest protection of property, which shows that Common Law System is indeed better for protection of property. This conclusion was backed by rigorous statistical reasoning. Two main camps often preach the superiority of Common Law compared to Non-Common Law political systems: Political and Economic factors.

However, most literature from each camp of the field of studies, political scientists and economists, concentrate their studies strictly on macroeconomic impacts only. They focus strictly on their field of study only, in a more significant overview. It is interesting to see how Common Law may affect individual consumers' purchasing behavior, spending habits, and investment decisions.

Hypotheses, Formulation, and Measurements of Data

The perception of Common Law superiority over Non-Common Law will be evaluated via various economic indicators: Trade in Services (% of GDP), Inflation, Consumer Prices (Annual%), Interest Rate Spread (lending rate minus deposit rate,%), Household final consumption expenditure per capita growth (annual%), Final consumption expenditure, etc. (annual% growth), Exports of Goods and Services (annual% growth), Gross capital formation (annual% growth), Imports of goods and services (annual% growth), Manufacturing, value added (annual% growth), Industry, value added (annual% growth), Services, etc. value added (annual% growth), GDP growth (annual%), GDP per capita growth (annual%), Gross domestic savings (% of GDP).

Table 1.– Description of variables being used

Variables	Description
1	*2*
Trade in Services (% of GDP)	The sale and delivery of an intangible product called services
Inflation, Consumer Prices (Annual%)	The decreasing in purchasing level and increasing in price level, the measurement of inflation
Interest Rate Spread (lending rate minus deposit rate,%)	The interest rate charged by banks on loans minus the interest rate paid by banks to its customers
Household final consumption expenditure per capita growth (annual%)	The market value on all goods and services purchased by households in one year divided by the population of a nation in one year not including the purchase of dwellings
Final consumption expenditure, etc. (annual% growth)	The market value on all goods and services purchased by households in one year divided by the population of a nation in one year including the purchase of dwellings
Exports of Goods and Services (annual% growth)	Trade of good and services from residences to non-residences
Gross capital formation (annual% growth)	The net values spend on fixed assets plus the net chargers in the level of inventories.
Imports of goods and services (annual% growth)	Trade of good and services from non-residences to residences
Manufacturing, value added (annual% growth)	The total estimate of net-output of all resident manufacturing activity units obtained subtracting intermediate consumption.

1	2
Industry, value added (annual% growth)	The contribution of private industries and government sectors to total GDP
Services, etc. value added (annual% growth)	The contribution of intangible products to total GDP
GDP growth (annual%)	The growth of gross domestic product
GDP per capita growth (annual%)	The growth of gross domestic product divide by the population of the country
Gross domestic savings (% of GDP)	GDP minus final consumption expenditure.

Formulation of Countries of Interest:

In this research paper, several criteria were used to limit the countries of interest to study Those criteria include: classified by IMF to fall into the category of having a fully-developed banking system, classified by IMF as developed nations, and classified by World Bank as having minimum GDP of US$19, 000 per year per capita.

As a first-cut approach, refer to Appendix A. The list started with 45 countries as potential candidates of nations. These countries were chosen because IMF and the World Bank categorize them as having robust banking systems. A list in Excel was made, and a comparison of their GNI (Gross National Income) per capita was made to sort out those countries with a minimum GNI of US$19, 000 per capita as of 2002. Furthermore, the countries are then grouped into two groups: Countries that implement Common Law, and Countries that implement non-Common Law. Countries that did not fulfill the three requirements were dropped from observation.

Of 45 countries, 32 were chosen, of which 24 fall into the non-Common Law category, and eight fall into the Common Law category. Each country was then evaluated for its economic performances based on published time-series economic indicators values available through the World Bank from 1990 to 2015. Descriptive Statistics were computed for each variable, then compiled into Table 1.

From Table 1, the assumption of normality is tested for each variable using the Shapiro-Wilk test in R programming. Shapiro-Wilk test is a statistical test used to check whether a population follows a normal distribution with the null hypothesis that the population is normally distributed. With non-normal data, the mean might not represent the most appropriate measure of central tendency. Thus, we considered the non-parametric Mann-Whitney U test for variables with skewed distribution to compare the means.

Mann-Whitney U Test is a non-parametric test used to test whether the difference in mean differs from zero for two independent groups. The null hypothesis for Mann-Whitney U Test is that for randomly selected values X and Y from two populations, the probability of X being more significant than Y is equal to the probability of Y being more significant than X, indicating that the two populations have the same mean. For normally distributed variables, we applied the parametric independent t-test to assess the mean of Common Law and non-Common law countries. The independent t-test also assesses whether the means of the two groups are statistically different from one other. In this test, the null hypothesis is that the means for the two populations are equal.

Non-Parametric Mann-Whitney U Test Results

A Mann-Whitney U Statistical tests were conducted unto eight variables. The results of the Mann-Whitney U test are as follows:

Table 2. – Descriptive Statistics for Common Law and Code Law, and Need for Non-parametric Test

Measurements	Mean	Me-dian	Skew-ness	Kurto-sis	SE	Common Law					Shap-iro-Wilk statistic	P-Val-ue	Use Non-paramet-ric Test?
						Mean	Median	Skew-ness	Kurto-sis	SE			
Trade in Services (% of GDP)	25.27	15.56	0.93	–1.01	8.63	25.57	17.37	3.99	15.4	7.72	0.4670	0.0000	Yes
Inflation, Consumer Prices (Annnual %)	2.87	2.54	1.29	0.28	0.41	4.73	2.5	3.48	12.27	1.35	0.4560	0.0000	Yes
Interest Rate Spread (lending rate minus deposit rate, %)	3.34	3.68	–0.52	–1.56	0.38	6.11	4.76	3.45	11.98	1.49	0.4655	0.0000	Yes
Household final consumption expenditure per capita growth (an-nual %)	2.05	1.92	1.03	–0.46	0.18	1.83	1.23	1.35	0.62	0.27	0.8375	0.0002	Yes
Final consumption expenditure, etc.(annual % growth)	3.17	2.76	0.66	–1.13	0.4	2.2	1.78	1.1	0.22	0.23	0.9064	0.0090	Yes
Exports of Goods and Services (annual % growth)	5.51	5.19	0.89	–0.68	0.6	5.51	4.92	1.06	0.47	0.4	0.8917	0.0038	Yes
Gross capital formation (annual % growth)	3.82	3.37	1.22	0.19	0.53	2.71	2.2	0.71	–0.43	0.47	0.9572	0.2302	No
Imports of goods and services (an-nual % growth)	5.74	5.29	0.64	–1.16	0.58	5.41	4.41	0.91	–0.7	0.44	0.8607	0.0007	Yes
Manufacturing, value added (an-nual % growth)	0.98	0.67	0.69	–0.61	1.05	2.76	1.93	0.82	–0.59	0.47	0.9186	0.0216	Yes
Industry, value added Services	1.88	1.43	1.1	–0.28	0.82	2.03	1.5	0.7	–0.6	0.37	0.9018	0.0080	Yes
Services, ets. value added (annual % growth)	3.44	3.1	0.86	–0.7	0.6	2.6	2.25	0.77	–0.56	0.25	0.9168	0.0195	Yes
GDP growth (annual %)	3.36	2.89	0.83	–.75	0.5	2.38	2.01	0.83	–0.55	0.26	0.9193	0.0199	Yes
GDP per capita growth (annual %)	1.95	1.6	0.9	–0.86	0.3	1.91	1.5	1.06	–0.22	0.25	0.8442	0.0003	Yes
Grooss domestic savings (% of GDP)	25.77	23.41	1.28	0.34	3.81	26.25	26.21	0.88	1.88	1.34	0.8854	0.0027	Yes

Table 3. – Mann-Whitney U test Results

Measurements	p-value	Mean Rank	
		Common Law	Code Law
Trade in Services (% of GDP)	0.6852	15.25	16.92
Inflation, Consumer Prices (Annual%)	0.9490	16.25	16.58
Interest Rate Spread (lending rate minus deposit rate,%)	0.0940	13.5	17.5
Household final consumption expenditure per capita growth (annual%)	0.0515	22.15	14.62
Final consumption expenditure, etc. (annual% growth)	**0.0135**	23.5	14.17
Exports of Goods and Services (annual% growth)	0.8146	17.25	16.25
Manufacturing, value added (annual% growth)	**0.0378**	12.5	17.83
Industry, value added (annual% growth)	0.6945	16.88	16.38
Services, etc. value added (annual% growth)	0.1267	22.16	14.62
GDP growth (annual%)	**0.0328**	22.62	14.46
GDP per capita growth (annual%)	0.5935	18.12	15.96
Gross domestic savings (% of GDP)	0.3345	13.62	17.46

A Mann-Whitney U test was conducted on thirteen variables of interest. Of the thirteen variables, only three were found significant: The final consumption expenditure, Manufacturing, value added, and GDP growth. These results suggest three things:

i) Countries that have Common Laws tend to have higher final consumption expenditure growth in a higher percentage from 1990 to 2015.

ii) Countries with Code Laws tend to encourage manufacturing as value added in their economic engine growth from 1990 to 2015.

iii) Countries that have Common Laws tend to have higher GDP growth in annual percentage from 1990 to 2015

Parametric Independent-Samples t-Test

An Independent-Samples t-Test was conducted on one variable. The results of the Independent-Samples t-Test are as follows:

Table 4. Independent-Samples t-Test Results

Measurements	t-test			95% Confidence Interval of mean difference		Mean	
	t Value	df	p-value			Common Law	Code Law
Gross capital formation (annual% growth)	−1.56	18.95	0.13	−2.597	0.376	2.705	25.269

An Independent-Samples *t*-test was conducted on one variable of interest. As the p-value was found to be greater than the significance level, we failed to reject the null hypothesis, and the difference in Gross capital formation (annual% growth) between Common Law and non-Common law countries was not found to be significant.

Discussion of Results

In this research paper, 32 countries were chosen as test samples: Twenty-four countries implement non-Common Law, and 8 implement Common Law

Political Systems. As can be seen from the different non-parametric Mann-Whitney U test and parametric Independent-Samples t-Test conducted on the different countries, three significant findings were found regarding economic performances between countries that implemented common-law and countries that implement Code Law as the country's law system.

Manufacturing, value added (annual % growth) seems to be much higher for countries that implement Code Law Political Systems (Mean Rank =

=17.83) than countries that implement Common Law Political Systems (Mean Rank = 12.5). This is an exciting finding because the rigidity of Code Law may have affected many companies that operate in Code Law Political Systems to have difficulty in hiring and firing employees, inflexible labor-contract agreements, and inability to adapt to fast changes in the world economic environment quickly.
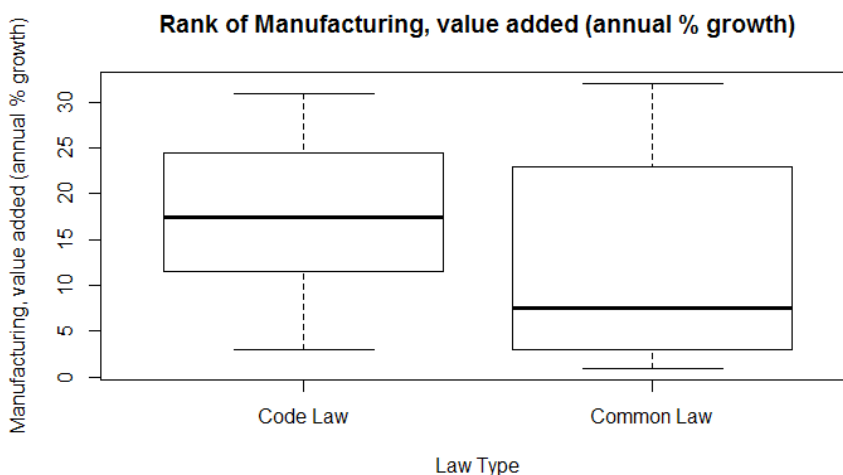
Figure 1. Rank of Manufacturing (value-added) of Code Law and Common Law Countries

GDP growth (annual%) seems to be much higher for countries that implement Common Law Political Systems (Mean Rank = 22.62) than for countries that implement Common Law Political Systems (Mean Rank = 14.46). This result confirms the general perception and suggestion by many experts that Common Law Political Systems tend to be superior in promoting faster economic growth for their citizens. The more robust property protection gives people more incentives to invest due to less risk of losing their property since GDP comprises investments, and the greater the willingness to invest leads to the greater the value of annual GDP growth. Furthermore, the Common Law system allows firms to hire and fire employees more actively. The flexibility allows entrepreneurs to invest in their projects more bravely, and they can fire employees who are not capable of the job more efficiently, eliminating the dead weight loss of the firm.

Figure 2. Rank of GDP Growth of Code Law and Common Law Countries

Final Consumption Expenditure, etc. (annual% growth) tend to suggest that countries which implement Common Law (Mean Rank = 23.5) have higher consumption annual growth that countries

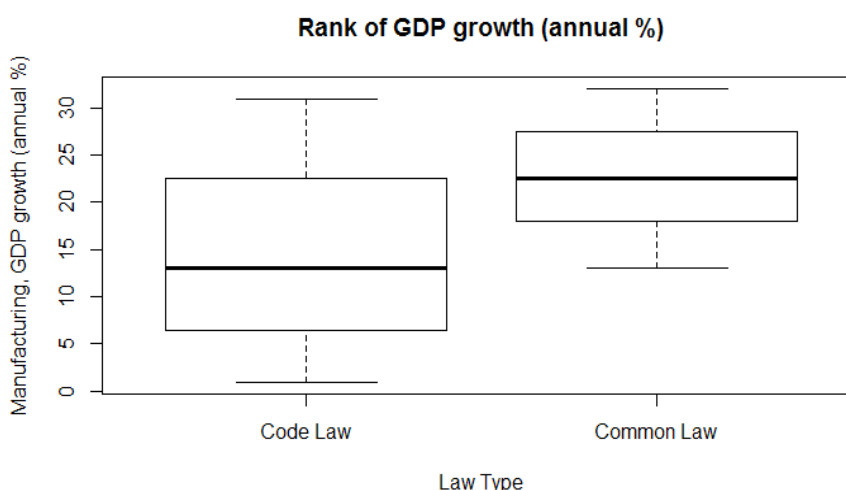which implement Code Law (Mean Rank = 14.17). This finding also suggested that the Common Law system is better for economic growth. Since Common Law system provides more robust protection of property and allows people to react to economic environments more effetely, consumers worry less of losing their properties, which gives them more incentives to spend their money.
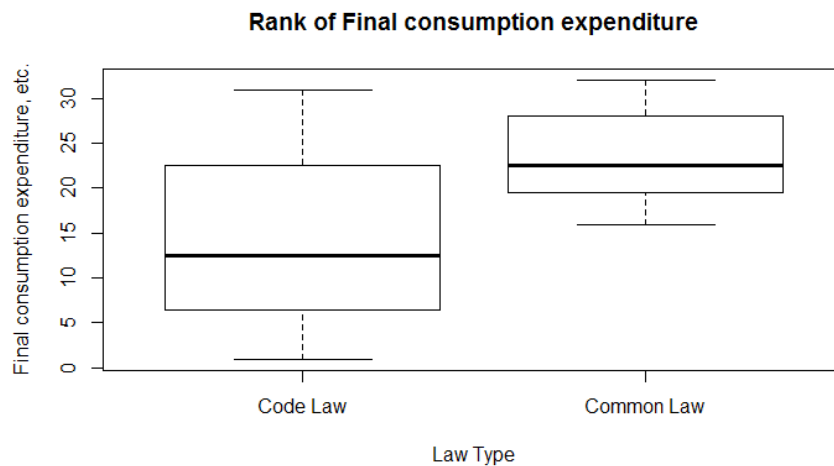
Rank of Final consumption expenditure

Figure 3. Rank of Final Consumption Expenditure of Code Law and Common Law Countries

Summary and Conclusion

The main objectives of this project is to prove the validity that the Common Law political system encourages more vigorous economic growth in developed countries and to see how it affects the spending habits of its inhabitants. In the literary review, some articles demonstrated their opinions on comparing Common Law and Civil Law. Most articles claim that Common Law systems have political and economic advantages. Fourteen variables are observed, measured, and evaluated to see how they affect countries that implement Common Law political systems versus countries that implement non-Common Law (mainly Code Law Political Systems). The results seem to agree and support that Common Law does indeed help invigorate the economic aspects of those countries, as Common Law provides better protection for personal property rights, unbiasedness, and better legal rights for its people.

The results obtained from this study are enlightening because three statistically-significant variables are found: the annual growth of final consumption expenditure, the annual growth of added manufacturing, and the annual GDP growth. The annual growth of value-added manufacturing suggests that Code Law countries are superior for economic development, even if Common Law countries have many incontinences. The other two results suggest that Common Law countries are more helpful for economic development. These results support that the Common Law system gives people and companies more confidence to participate in the market, and thus, Common Law countries are better for economic development. It also confirms this report's hypothesis that Common Law countries are better than Code Law countries in promoting economics. The experience in conducting this research study can help readers understand how different political systems can significantly affect the economic performance in different countries and how they can affect and influence the spending habits of their inhabitants.

There are also some limitations of this research. First of all, our finding indicates that the mean growth of manufacturing (value added) for Code Law countries is higher than that for Common Law countries. One possible reason is that in Code Law countries, governments generally have more power and thus can maintain relative independent fiscal and monetary policies. In situations where the government evolving is helpful, Code Law countries' economies may react bet-

ter than Common Law countries' economies. Another limitation is that due to the lack of the most recent data sources, the data used in research might be outdated and thus may not reflect the most current economic, industrial, and consumption situation in Common Law and Civil Law countries. Lastly, since the variables are not entirely independent, the conclusions drawn in this study might not be sufficiently firm. For example, we observe a significant difference among Common Law and Civil Law countries in the annual percentage growth of both GDP and value-added manufacturing output. However, the two observations might not be independent since manufacturing output is also one of the GDP components, and it is logically natural to observe a high GDP growth, given a high manufacturing output. Therefore, it might be meaningful for future studies to control independent variables to obtain more accurate and refined conclusions.

Appendix A: List of Countries to Choose From

COUNTRIES	Population, Mid-Year (millions)	GNI per capita @ 2002 (in US$)	GNI (US$Billions)	FAIL (if less than 19000)?
1	*2*	*3*	*4*	*5*
Austria	8	23860	192.1	
Belgium	10.3	22940	237.1	
Denmark	5.4	30260	162.6	
Finland	5.2	23890	124.2	
France	59.5	22240	1362.1	
Germany	82.5	22740	1876.3	
Greece	10.6	11660	123.9	X
Iceland	0.28	27960	7.9	
Ireland	3.9	23030	90.3	
Italy	57.5	19080	1100.7	
Liechtenstein	NOT AVAILABLE BY IFS nor WB			
Luxembourg	0.44	39470	17.5	
Netherlands	16.1	23390	377.6	
Norway	4.5	38730	175.8	
Portugal	10.2	10720	109.1	X
Spain	40.9	14580	596.5	X
Sweden	8.9	25970	231.8	
Switzerland	7.3	36170	263.7	
United Kingdom	59.2	25510	1510.8	
Vatican	NOT AVAILABLE BY IFS nor WB			
Israel	6.6	16020	105.2	X
Taiwan		15056.32	341.04	X
ii) Other				
Australia	19.7	19530	384.1	
Canada	31.4	22390	702	
Japan	127.2	34010	4323.9	
New Zealand	3.9	13260	52.2	X
United States	288.4	35400	10207	
OFFSHORE CENTRES				
Aruba	NOT AVAILABLE			

1	2	3	4	5
Bahamas	NOT AVAILABLE			
Bahrain	0.7	10500	7.3	X
Barbados	0.27	8790	2.4	X
Bermuda	NOT AVAILABLE			
Cayman Islands	NOT AVAILABLE			
Gibraltar	NOT AVAILABLE			
Guernsey	NOT AVAILABLE			
Hong Kong SAR	6.8	24690	167.6	
Isle of Man	NOT AVAILABLE			
Jersey	NOT AVAILABLE			
Lebanon	4.4	3990	17.7	X
Macau SAR	NOT AVAILABLE			
Mauritius	1.2	3860	4.7	X
Netherlands Antilles	NOT AVAILABLE			
Panama	2.9	4020	11.6	X
Singapore	4.2	20690	86.1	
Vanuatu	0.21	1070	0.22	X

Appendix B

Ranks				
	Group of Countries	**N**	**Mean Rank**	**Sum of Ranks**
Trade in services (% of GDP)	Common Law	8	15.25	122.00
	Code Law	24	16.92	406.00
	Total	32		
Inflation, consumer prices (annual%)	Common Law	8	16.25	130.00
	Code Law	24	16.58	398.00
	Total	32		
Interest rate spread (lending rate minus deposit rate,%)	Common Law	7	10.86	76.00
	Code Law	24	17.50	420.00
	Total	31		
Gross capital formation (annual% growth)	Common Law	8	21.00	168.00
	Code Law	24	15.00	360.00
	Total	32		
Manufacturing, value added (annual% growth)	Common Law	7	9.71	68.00
	Code Law	24	17.83	428.00
	Total	31		
Industry, value added (annual% growth)	Common Law	7	14.71	103.00
	Code Law	24	16.38	393.00
	Total	31		
GDP growth (annual%)	Common Law	8	22.63	181.00
	Code Law	24	14.46	347.00
	Total	32		
Gross domestic savings (% of GDP)	Common Law	8	13.63	109.00
	Code Law	24	17.46	419.00
	Total	32		

Appendix B – Continued

Test Statistics[a]								
	Trade in services (% of GDP)	Infla-tion, consum-er prices (an-nual%)	Inter-est rate spread (lend-ing rate minus deposit rate,%)	Gross capital forma-tion (annual% growth)	Manufac-turing, value added (annual% growth)	Industry, value added (annual% growth)	GDP growth (an-nual%)	Gross domes-tic sav-ings (% of GDP)
Mann-Whitney U	86.000	94.000	48.000	60.000	40.000	75.000	47.000	73.000
Wilcoxon W	122.000	130.000	76.000	360.000	68.000	103.000	347.000	109.000
Z	−.435	−.087	−1.701	−1.567	−2.079	−.425	−2.132	−1.001
Asymp. Sig. (2-tailed)	.663	.931	.089	.117	.038	.671	.033	.317
Exact Sig. [2*(1-tailed Sig.)]	.685[b]	.949[b]	.094[b]	.124[b]	.038[b]	.695[b]	.033[b]	.334[b]
a. Grouping Variable: Group of Countries								
b. Not corrected for ties.								

Appendix C

Group Statistics					
	Group of Countries	N	Mean	Std. Devia-tion	Std. Error Mean
Household final consumption expenditure per capita growth (annual%)	Common Law	8	2.0487	.51313	.18142
	Code Law	24	1.8266	1.33610	.27273
Final consumption expenditure, etc. (annual% growth)	Common Law	8	3.1704	1.12516	.39781
	Code Law	24	2.1958	1.10789	.22615
Exports of goods and services (annual% growth)	Common Law	8	5.5121	1.68549	.59591
	Code Law	24	5.5139	1.97272	.40268
Imports of goods and services (annual% growth)	Common Law	8	5.7433	1.62793	.57556
	Code Law	24	5.4088	2.16144	.44120
Services, etc., value added (annual% growth)	Common Law	7	3.4434	1.59058	.60118
	Code Law	24	2.6012	1.20793	.24657
GDP per capita growth (annual%)	Common Law	8	1.9537	.85414	.30198
	Code Law	24	1.9135	1.22916	.25090

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F.	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Household final consumption expenditure per capita growth (annual%)	Equal variances assumed	4.489	.042	.455	30	.652	.22206	.48821	–.77499	1.21911
	Equal variances not assumed			.678	29.122	.503	.22206	.32756	–.44775	.89187
Final consumption expenditure, etc. (annual% growth)	Equal variances assumed	.025	.875	2.147	30	.040	.97462	.45395	.04753	1.90172
	Equal variances not assumed			2.130	11.878	.055	.97462	.45759	–.02352	1.97277
Exports of goods and services (annual% growth)	Equal variances assumed	.366	.550	–.002	30	.998	–.00174	.77958	–1.59385	1.59037
	Equal variances not assumed			–.002	13.966	.998	–.00174	.71921	–1.54464	1.54115
Imports of goods and services (annual% growth)	Equal variances assumed	1.014	.322	.400	30	.692	.33454	.83667	–1.37417	2.04325
	Equal variances not assumed			.461	15.966	.651	.33454	.72521	–1.20310	1.87218
Services, etc., value added (annual% growth)	Equal variances assumed	.257	.616	1.512	29	.141	.84223	.55689	–.29673	1.98118
	Equal variances not assumed			1.296	8.128	.231	.84223	.64978	–.65207	2.33652
GDP per capita growth (annual%)	Equal variances assumed	1.237	.275	.086	30	.932	.04024	.47055	–.92077	1.00124
	Equal variances not assumed			.102	17.467	.920	.04024	.39261	–.78642	.86689

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Section 3. Regional economy

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GEORGIA AND THE FUNCTIONING MARKET ECONOMY: EVOLUATION IN THE PRISM OF "COPENHAGEN CRITERIA"

Abstract. In the presented paper, we aim to determine Georgia's compliance with the economic sub-criterion of the "Copenhagen criteria", such as a functioning market economy, comparative analysis of the relevant economic indicators of Georgia and the candidate countries for EU membership (as of 2020) and determination of the main directions for ensuring these criteria.

Keywords: Economy of Georgia, Accession criteria, Copenhagen criteria, Economic criteria.

"Copenhagen criteria". To become a member of the European Union, a country must meet political, economic and institutional criteria ("Copenhagen criteria"). The aforementioned criterias were established by the European Council in Copenhagen (Denmark) in June 1993 ("Copenhagen criteria"), and were subsequently clarified by the European Council in Madrid in 1995. This is:

- Political criteria: stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities;
- Economic criteria: a functioning market economy and the capacity to cope with competition and market forces;
- Stability of institutions and guarantee of democracy: administrative and institutional capacity to effectively implement the acquis and ability to take on the obligations of membership [1].

The compliance with the functioning market economy criterion is thus evaluated against the following five sub-criteria: high quality of economic governance; macroeconomic stability (including adequate price stability and sustainable public finances and external accounts); proper functioning of the goods and services market (including business environment, state influence on product markets, and privatisation and restructuring); proper functioning of the financial market (including financial stability and access to finance); proper functioning of the labour market [2, 2].

Georgia and the "Copenhagen Criteria". Management of the economy. During the analysis period Georgia's state debt was characterized by an increasing trend, The COVID-19 pandemic that started in 2019 made the problem even worse and if the share of government debt in GDP was 40.4% by 2019, by 2020 it has already crossed the critical threshold

and amounted to 60.2% of nominal GDP. There is a similar dynamic in relation to the nominal GDP of the government's external debt, which was 32% in 2019, by 2020–47.6% [8]. The mentioned rate in Georgia is similar to that of the candidate countries for EU membership – North Macedonia and Serbia, and somewhat better than Montenegro (11%).

Macroeconomic stability. After relatively high growth in the first decade of the century, the GDP growth rate has somewhat slowed down, and in the background of the global pandemic of COVID-19, it experienced a significant decline. In particular, by 2020, real GDP has decreased by 6.8% compared to 2019. By 2020, compared to the previous year, exports decreased by 12%, imports decreased by 15%, and foreign turnover decreased by 14%. The rate of investments also decreased. In particular, in 2019, direct foreign investments amounted to 1.3 billion USD, and in 2020–0.6 billion. The share of direct foreign investments in GDP was 1.2%. The share of total capital formation in GDP experienced a slight decrease from 26.3% to 23.9% [7]. The rate of current account deficit was also characterized by growth, whose share in GDP reached 12.6% by 2020 from 5.7% in 2019. As for consumer prices, in the last three years there is a trend of its growth, the said trend, which started with the pandemic, was further deepened due to the Russia-Ukraine war, and by 2021, inflation has reached 9.2%. In addition, its increase on a number of products is significant and noticeable. The level of unemployment is also high, reaching 18.5% in 2020 and 20.6% in 2021. During the analysis period, the tax system worked properly, there was a slight decrease in the share of tax revenues in the GDP, and the mentioned figure is 22.3%.

If we compare the indicators of Georgia with the indicators of the candidate countries for EU membership (Albania, Montenegro, North Macedonia, Serbia, Turkey), we'll notice that by 2020 the GDP reduction was approximately at the level of these countries (in Montenegro it was 15.2%). In terms of the share of foreign debt in GDP, Georgia had a somewhat bet-

ter index than Montenegro (105%), Albania (76.1%), Serbia (57.3%), North Macedonia (51.2%). In terms of current account deficit share in GDP, Montenegro had a negative situation (26%), Turkey (12%) in consumer price index [2, 17; 30; 44; 60]. Among the indicators presented in this group, Georgia has an unambiguously low level of real GDP per capita in relation to the candidate countries for EU membership. In particular, this indicator in the candidate countries, in relation to the EU-27 average indicator, is on average about 45%, and in Georgia – 12.5%.

Proper functioning of the goods and services market (including the business environment, state influence on product markets, privatization and restructuring). *business environment.* It should be noted that Georgia is one of the leaders in the world in terms of ease of business registration. Online business registration and tax payment systems greatly simplify this process and minimize the possibility of corruption. Further simplification of business registration and licensing procedures is currently underway in the country. During the last decade, an average of 50.000 new business entities are registered in the country per year. Inconsistency of declared and real conditions, suspension of large projects and exit of investments from these projects, low pace of privatization, informal impact on business.

Privatization and reconstruction. Despite the fact that privatization was carried out in several stages and sometimes had an aggressive form, after 2009 the rate of privatization somewhat decreased, the share of state ownership is still high in the country. In 2015–2019, the income received from privatization amounted to 1.3 billion GEL. 36.1% of which is income from privatization of buildings, 32.8% of land, 30.4% of other natural resources. The operation of state-owned enterprises is mostly inefficient, the share of employees in the public sector is high. The share of state property in the ownership of agricultural and non-agricultural lands is also high (60%).

Proper functioning of the financial market (including financial stability and access to finance). It is

worth mentioning that the financial system of Georgia showed a fairly high level of stability, mostly successfully responded and overcame the shock caused by the COVID-19 pandemic and continued crediting the economy without interruption. At the same time, traditionally present financial stability risks, originating from the foreign sector, remain at a high level. A significant challenge for sustainability is the increasing debt burden for companies and households in the context of reduced economic activity amid the COVID-19 pandemic. During the crisis, the regulations adopted by the National Bank and the government somewhat reduced access to finance, although the total volume of loans increased (both for individuals and business entities). The analysis of the stress tests presented in the financial stability reports of the National Bank provides a reason for optimism.

Proper functioning of the labor market. The trend of reducing the workforce in recent years continues, while the number of employees is also decreasing. Although the unemployment rate decreased from 21.9% to 18.5% by 2020 compared to 2015, it increased again the following years and reached 20.6%. During 2015–2020, the number of economically active population decreased by more than 150.000 [7]. Despite the fact that the main problems of the population are low incomes and unemployment, the labor market is functioning quite well. In addition, the existence of low-qualified personnel, the discrepancy between the relevant document and the acquired knowledge among persons with professional education and higher education is still problematic.

Thus, the reforms carried out in Georgia, the dynamics of economic processes, the progress achieved, the sustainability and stability of the economy in the conditions of the COVID-19 pandemic, as well as the comparative analysis of the main economic indicators of Georgia and the candidate countries for membership of the European Union, give us the basis to conclude that Georgia is compatible with membership in terms of economic criteria with the candidate countries (this opinion is supported by the granting of candidate status to Ukraine and Moldova in 2022). At the same time, the current growth rate is insufficient and it is necessary to strengthen the positive dynamics in all areas of the economy. GDP per capita, high share of public debt in GDP, informal influence on business, inflation, investment level, current investment environment, access to finance, foreign trade indicators, pace of privatization and restructuring, high unemployment, labor market are still problematic. Preparation of competitive personnel corresponding to the requirements. In addition, in each of the mentioned directions, there is an established strategy, the implementation of which is real and will create a solid basis for joining the European Union.

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Section 4. Economics, organization and management of enterprises, branches, complexes

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THE WORLD WINE MARKET AND GEORGIA – DEVELOPMENT OPPORTUNITIES

Abstract. Georgian wine is one of the oldest wines in Europe. The existence of winemaking in Georgia is indicated by the earliest signs of about 8000 years ago, which gives Georgia the status of the homeland of wine. Winemaking has been a priority for Georgia since time immemorial. In the conditions of global competition, it is necessary to implement the standardization and branding of the unique methods of making Georgian wine. Although winemaking occupies a small place in the world market today, Georgian wine has a great future. Georgian wine is distinguished by its ancient history and production methods, which makes it unique. According to scientists, Georgian wine production will make a significant contribution to the world economy, which will create the foundations for a significant change in the Georgian economy.

Winemaking played and continues to play a special role in the national economy of Georgia. Recently, significant activities have been observed in the Georgian wine market, which increases the interest in this field. Part of the activities is expressed in the promotion of wine through exhibitions and conferences held in different countries of the world, which leads to the growth of its area of awareness.

Georgian wine business has great potential for development, but this is possible only in the case of quality wine production. Despite the existing problems, it is necessary to thoroughly study the exporting countries, to produce wine of appropriate quality and price, to export it and to establish oneself in foreign markets.

Keywords: world market, wine business, competitiveness, quality, price.

Introduction. Georgian wine is unique in its types and production; it has already taken its place on the world stage. This is evidenced by the interest expressed in it by consumers from different countries. 8000-year-old history, which is confirmed on the basis of ancient archeological excavations. We can safely say that Georgian wine has a continuous history with its unique methods, variety of varieties (more than 500 endemic varieties are known) [1].

Pitcher winemaking is very popular among winemakers who prefer natural and organic winemaking methods. In 2013, the ancient, traditional Georgian method of making "Kvevri" wine was granted the status of a UNESCO intangible cultural heritage, which indicates the uniqueness of this method and sends a message to the whole world that wine is an integral part of the ancient Georgian culture. The state's role in wine production is manifested in the subsidization of viticulture. Based on official data, the state allocated 270 million GEL in various forms to support the viticulture and wine industry in 2013–2014. Since then, this interest has been growing. 2018 was the first year in the last ten years, when the state completely left the grape subsidy regime, the harvest was completely based on market price conditions, and the entrepreneur and the farmer agreed on the price of grapes independently, without the intervention of the state. In 2022, the state again decided to subsidize in the amount of 150 million GEL. The wine industry plays an important role in the economic development of Georgia. In recent years, vineyard plantations have been growing, new and old wine enterprises have been created, international standards of quality management and wine production have been introduced, and the incomes of winegrowers have increased.

Discussion. The Georgian wine market always attracts attention, because our country has a great potential for wine production. According to State Department of Statistics, 2017 data, wine ranks fourth among the largest export products, which makes the importance of the wine market for Georgia visible. Despite the successful functioning of the Georgian wine market, there are many obstacles that prevent the full realization of its potential.

Before the "Covid-19" pandemic, there was an increase in exports to Europe, the USA, Asia and other traditional markets, such as: Belarus (429%; 233220 liters), Japan (230%; 53160 liters), Great Britain (98%; 37740 liters), France (71%; 24248 liters), Kazakhstan (85%; 877494), Czech Republic (68%; 18888), Latvia (61%; 412626), Netherlands (46%; 21993), Germany (38%; 136222), Ukraine (36%; 1771928), Poland (32%; 740922), Estonia (28%; 120246), Russia (28%; 11511830), Israel (24; 52722), USA (3%; 68620), and others.

The wine was exported by 134 companies.

Many foreign wine experts believe that among Georgian grape varieties, the variety and wine with the greatest potential are Saperavi. Saperavi must be dry, especially wine from a jug – "qvevri". The fact that Saperavi is the most successful product on the international market. Another unique variety is Rkatsiteli, followed by Khikhvi, Kisi, and Green, which, unfortunately, were forgotten in Soviet times because they were low-yielding varieties compared to others and were not paid attention to.

Also one of the important and rare varieties is Ushelouri, which almost does not grow in other regions except Lechkhumi. It comes from the highlands and therefore the wine is produced in limited quantities. Wine from Usakhelouri, as well as Khvanchkara from Alexandrouli and Mujuretuli grape varieties, are semi-sweet wines. These wines were quite famous in the Soviet period, so they were more popular in the Russian market [2]. In countries with high wine culture, semi-sweet wines are less interesting and drier wines are preferred.

It is worth noting the fact that making wine in qvevri is a Georgian tradition and adds to our competitiveness in the international market. The image and popularity of Georgia are associated with this ancient technology. Qvevri is an earthen vessel buried in the ground. Most modern wines are prepared as follows: the grape juice is quickly separated from the skin and pits, according to the old method, the liquid, grape skins, stalk, and pits are collected in a fermentation jug. The result is a dark, dry luxury wine [3].

Despite the foregoing, the dominance of bottled and homemade (often falsified) wine on the local market is visible even to the "naked" eye.

The wine export promotion policy should be coordinated with the improvement of the invest-

ment climate, which is achieved through the improvement of the financial system (the emergence of long-term financing channels) and the simplification of tax and customs activities. One gets the impression that the wine export promotion policy is not a set of one or two tools, but a set of tools.

In addition to the policy of export subsidies, Georgia already uses almost all types of export promotion instruments to a greater or lesser extent. Those instruments that are relatively more effective in terms of promoting exports are declared a priority in Strategy 2020. These include: removing trade barriers, improving the overall investment climate (eg improved transport and logistics networks), and providing information on export markets.

Significant steps have been taken in recent years to remove technical barriers. An association agreement has been signed with the European Union, which will facilitate the export of goods to European markets. Negotiations are underway on free trade with China. It is important that these priorities, as defined by the 2020 Strategy, remain unchanged and that types of measures such as export subsidy policies (export credits, tax incentives, etc.) are not initiated. As practice shows, such a policy is ineffective and depends on the efficiency of the bureaucratic system and the qualifications of the program executors.

The National Wine Agency plans to develop winemaking in Georgia and promote Georgian wine products on the international market outside its borders, raise awareness and further increase export supply. In order to promote wine, in 2017 international and local tastings, competitions, international wine conferences, exhibitions and presentations were held both within the country and in 12 countries around the world. Also, media-campaigns, commercials and various market researches, planning and implementation of representative and cultural events and measures aimed at promoting and increasing the consumption of high-quality Georgian wine on the international and local markets were carried out [4].

According to many studies, the demand for wine in Georgia is quite high. These studies show the development trend of consumption of local wine at home (in Georgia). Therefore, it is possible that it is not at all unpromising that local wine producers, who are busy exploring the growing wine markets in the world, will also pay some attention to the utilization of domestic resources. In a country with a millennial history of wine consumption and valuable prerequisites, even a small stimulus can be enough to raise wine awareness, develop a consumer culture, and increase wine consumption.

In addition, it is necessary to further increase the awareness of the Georgian wine brand outside the borders of Georgia and promote it through various types of events. For all this to work, it is essential to reduce barriers as much as possible and sign trade agreements with even more countries/groups of countries in order to increase the wine export rate to the maximum level.

The development of wine tourism will play an important role in the diversification of the viticulture-wine industry. In this regard, it is necessary to reveal the perspectives of wine tourism and brand development.

The development of wine tourism can solve economic and social problems, for this it is necessary to increase the involvement of the state and the private sector. As we know, Georgia is not only distinguished by unique grape varieties, but also has an important geographically favorable location, where the features of the terrain are expressed. It is especially important for the population of Georgia to assess the potential of wine tourism. Wine tourism will not be the only solution, although it can play a crucial role in improving the living standards of the population.[5]

Conclusion

Georgian wine successfully passed the most important and difficult stage of its establishment on the world market, this history was preceded by a rather difficult stage. Georgia has done important work, the results are confirmed at international wine

exhibitions and other promotion opportunities. This is also impressive with the great interest of foreigners in Georgian Kvevari wine.

The share of Kvevari wine from the exported wine is still small, however, the share of Kvevari wine in exports will increase in the future, because in Georgia, along with new technologies, the restoration of the old is gaining an active character.

Great importance is attached to qualification improvement. Due to unqualified approach, inconsistent policies create additional challenges between the state, partners and companies.

In the production of Georgian wine, it is necessary to develop and implement innovative technologies so that it meets the standards of the world market. In this direction, financial support from the state is important for wine producing companies.

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Section 5. Economic security

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RESEARCH OF THE QUALITY AND SAFETY OF GOODS DURING CUSTOMS CLEARANCE

Abstract. The article describes the safety of consumer goods transported across the customs border, as well as consumed directly in the domestic market, as an integral element of national security, and in this regard, an analysis of the work carried out by customs authorities in this direction today is presented. At the same time, opinions were expressed on the implementation of the experience of foreign countries in ensuring the quality and safety of goods into the national practice, and proposals were developed for the improvement of activities.

Keywords: safety of goods, customs border, national security, high-quality customs control, safety of goods, counterfeit goods, intellectual property, identification of counterfeit goods, customs authorities.

I. Introduction

The safety of goods transported across the customs border, as well as directly consumed by citizens, is an integral element of national security.

As a result of the rapid development of the business sector in the Republic of Uzbekistan, large competitive firms and enterprises are being established in the country. However, there is an increasing risk of products of these firms and enterprises coming in at a low price from abroad.

Customs bodies play an important role in ensuring high-quality customs control in the territory of our country, regulating the circulation of goods, developing foreign trade, and at the same time protecting the domestic market from low-quality and counterfeit products.

At present, legal documents do not define the concept of "ensuring the safety of imported goods". However, ensuring the safety of imported goods can be understood as a set of measures to prevent the entry of goods that are dangerous for public health, the environment, flora and fauna into the domestic market, and to determine their safety.

Today, the number of product safety violations is increasing year by year, despite the fact that many state regulatory bodies are monitoring.

There is no real opportunity to quickly and effectively determine the safety of goods in trade. The situation is aggravated by deficiencies in logistical support and insufficient personnel of border control bodies, which to some extent creates conditions for the introduction of dangerous products into the

customs territory. For this reason, cases of violation of the rights of an intellectual property owner, such as ensuring the safety of goods being transported through the customs border, applying brands directly to other goods by copying them without the permission of the right holder, or production similar to or exactly at a similar level to a well-known brand in order to distract.

Most people understand counterfeit goods as low-quality goods. Usually, counterfeit goods are of lower quality and cheaper than the real ones. But in practice, a counterfeit product can be of good quality. That's why experts consider this term only a concept related to the violation of intellectual property rights.

Counterfeiting is the use of the same or similar symbols displayed on other manufacturers' well-known, consumer goods without the consent of the right holder, and in this way, with the purpose of deceiving and misleading the buyer, and seeking profit.

As a result of not giving up the purchase of counterfeit and low-quality, and low-priced goods, goods that do not meet safety requirements can harm the health of consumers, and in some cases cause death. The fight against counterfeit goods should not be done only by one country or one body, but by joint action. It is precisely in the protection of intellectual property objects that the role of customs authorities is significant.

The purpose of activities in this area is to protect the interests of copyright owners, to ensure the income of payments to the state budget, as well as to protect the rights of consumers, to put an end to the circulation of goods that are dangerous for public health.

II. Literature review

Today, it is possible to see the sale of fake products manufactured under the name of well-known company names and brands occupying the domestic market. When identifying counterfeit products, it is necessary to pay attention to its price. Due to the large number of products in the market area, there is a mix of fake products among the products of different companies. Today, we can see counterfeit goods in the products we eat, the medicines we take, and the clothes we wear. In the process of production and sale of fake and counterfeit products, it poses a serious threat to the state economy. It also leads to tax payments not coming to the state budget.

The Commonwealth of Independent States (CIS) experts – V. O. Bronnikov ""counterfeit" is a fake under a famous brand or trademark, i.e. use of another trademark without property rights", and according to the definition of V. S. Mirolyubova and V. Ya. Semen, "a counterfeit product is a violation of intellectual property rights expressed the opinion that it is a circulation of economic relations in relation to any object" [1].

It can be said that the product can be made with low quality even by its real owner. In this case, the term counterfeit or substandard product can be used for such a product.

But in this case, it would be wrong to use the term counterfeit. Because, under the term of counterfeit, first of all, there is a violation of intellectual property rights in the actions related to the production, sale or other way of putting the goods into circulation. That is, who performs these actions is considered as the main factor.

For example, if the mark present in the product is confusingly similar to the protected trademark, such a product is considered to be infringing the right to the object of intellectual property. Such similarity of trademarks is called "look-alike" in international practice. In this case, if the trademark for which this trademark is legally protected is compared with an existing trademark, their manufacturers are different enterprises, and the trademarks may have identical letters and drawings to the extent of confusion.

As mentioned above, the Law of the Republic of Uzbekistan "On trademarks, service marks and place of origin names" it can be seen that Article 27 directly reflects the concept of counterfeit goods. However, the procedural mechanism of their implementation has not been fully resolved in any regulatory legal documents.

It should be said that most of the counterfeit products produced in the world today are products

related to the trademark. At the same time, it remains an almost impossible task to determine how many other types of counterfeit goods, in particular those related to trademarks, enter our country from abroad. The reason is that customs authorities protect intellectual property objects based on the requirements of Chapter 56 of the Customs Code of the Republic of Uzbekistan. According to it, the customs body takes measures to stop the export of goods infringing the right to intellectual property objects within 10 days based on the application of the right holder. The purpose of the customs authorities to take such measures is to give the right holder an opportunity to apply to the court authorities in the case of the situation. If the owner of the right does not apply to the customs authorities, he cannot act. Customs authorities protect intellectual property rights in a "passive way", that is, the customs authorities do not detect violations on their own initiative, but take actions based on the right holder's application.

In global practice, customs authorities expose goods infringing intellectual property rights on their own initiative; this action is defined in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and is called "ex officio".

Article 26 of the Law of the Republic of Uzbekistan "On trademarks, service marks and place of origin names" provides for unauthorized preparation, use, import, offering for sale, sale, and sale of a trademark or goods marked with this symbol. It is established that putting them into civil circulation in such a way, or keeping them for this purpose, or marking goods of the same kind that are exactly similar to them to the extent that they are confused with them, is recognized as a violation of the exclusive right to a trademark [2].

III. Analysis and results

At the same time, an in-depth analysis of the path of development of our country, today's world market situation has changed dramatically, and the competition is becoming more and more intense in the conditions of globalization. Requires the development and implementation of a completely new approach and principles.

It is necessary to further increase the effectiveness of the ongoing reforms, create conditions for comprehensive and rapid development of the state and society, modernize our country and implement priority directions for liberalization of all spheres of life. Today, one of the most important priorities planned for 2022–2023 is the drastic simplification of customs procedures, the radical reform of cargo clearance at customs offices. Also, to establish customs complexes that meet modern requirements and operate on the basis of the "Single Window" principle in all regions of our country, to create favorable conditions for economic entities in the implementation of foreign economic activity, to optimize and simplify the administrative methods of regulating foreign trade, one of the urgent tasks is to implement systematic reforms in the customs sector in order to eliminate bureaucratic obstacles. In fact, together with these, preventing the entry of low-quality goods into the territory of the country is also a direct duty of the customs authorities. Protection of the country's population from counterfeit, low-quality and dangerous goods is the responsibility of the customs authorities. In this regard, if we look at the following information:

According to the World Health Organization, 600 million people on our planet are poisoned by poor-quality food products every year.

In the production of low-quality goods, fake company names and brands are often widely used. Counterfeit drugs are drug products with illegally copied names and are the most profitable sector of the world trade, and the financial loss caused by them is 217 billion US dollars per year. These types of drugs harm or kill millions of people around the world, and seriously damage the brands and sales of major pharmaceutical manufacturers.

According to the information of "Uzstandart" agency, as a result of state control activities on product quality, in 2021 it was found that 256 types of imported products worth 45 billion sums did not meet

the quality requirements. 87% of it is food products, which are mainly imported from Kazakhstan, Georgia, Pakistan, Turkey and Russia [3].

Also, in 2021, the State customs committee found food products worth 391.2 million sums (candy, tea, chocolate, etc.) worth 391.2 million sums, whose packaging did not have an expiration date, in 22 cases worth 411.3 million sums worth of drugs were prevented from being illegally brought into the territory of our republic.

This information alone shows that protecting our population from low-quality food, substandard drugs and counterfeit goods is an important strategic task.

16465 in 2018, 21671 in 2019, 24121 in 2020, and 31794 in 2021 were conducted by the customs examination departments of the State Customs Committee and regional administrations [4].

From the above information, we can see that the Central customs laboratory of the State Customs Committee is conducting examinations in order to determine the Commodity nomenclature of foreign economic activity (CN FEA) code of the goods. This is definitely having its effect, the circulation of low-quality goods that are dangerous for human life is being stopped at least partially.

Food products imported into the territory of the Republic of Uzbekistan must comply with the requirements of the norms and regulations specified in the Law. Compliance of the quality and safety of any imported food product with the norms and regulations is determined by the special control bodies of the state and together with the customs authorities. For state registration, the supplier of food imported from abroad shall submit the documents of the manufacturer and the body specially represented by the exporting country confirming the safety of this product, and samples of the food product when it is necessary to carry out an appropriate examination. This indicates that imported food products, technologies and equipment must be certified in accordance with the law. From the production and sale of food products that have ex-

pired, are of poor quality, and are deemed unfit for food by the bodies of the state sanitary control and the state veterinary service according to the results of sanitary-hygienic expertise, laboratory tests and veterinary, veterinary-sanitary expertise and certification tests removed and must not be used for its intended purpose, recycled or destroyed [5].

Identification of counterfeit goods is directly related to the protection of intellectual property objects. When foreign experiences are studied in this regard, signs of violation of rights to intellectual property objects in the international practice of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the normative legal documents of the CIS countries, that is, Armenia, Ukraine and Moldova on customs legislation a temporary restriction on existing goods, i.e. it is possible to suspend the exit of goods for a certain period of time.

Based on this, in the customs sector of most countries, including the USA, customs officers identify counterfeit goods and decide the fate of the goods themselves. Identified counterfeit foods and drugs that harm public health will destroy the products themselves. But their goods that can be used in other social life, such as clothes, household appliances, and new appliances, are handed over to orphanages or old people's homes in the country, removing the labels. In European countries, counterfeit or low-quality products are detected by the customs at the border and immediately sent back [6].

Pursuant to Article 4 of the Law of the Republic of Uzbekistan "On protection of consumer rights", consumers:

– getting correct and complete information about the product, as well as about the manufacturer (seller);

– free choice of goods and their quality;

– product safety;

– full compensation of material damage and moral damage caused by the goods with dangerous defects for life, health and property, as well as the illegal action (inaction) of the manufacturer (seller);

– has the right to apply to the court and other competent state bodies for the protection of their violated rights or interests protected by law [7].

Counterfeit imported to our republic illegally medicines pose serious health risks to consumers. Unfortunately, they may contain harmful chemicals. Their presale is also a factor in the production of counterfeit products. It is prohibited to import low-quality, forged, unregistered medicines and medical supplies, as well as illegal copies of medicines registered in the Republic of Uzbekistan.

Identification of counterfeit goods by the customs authorities of foreign countries is carried out through various procedures. In particular, what should be important in stopping counterfeit goods in the US with the help of Customs and Border Protection officers. They focus on destroying goods sold online while protecting branded goods. Many countries have established administrative and criminal liability for trademark violations of counterfeit products. In particular, in the Criminal Codes of the Russian Federation, Belarus, Kazakhstan, Tajikistan and Armenia, the above activity is recognized as a crime. Due to the fact that the system for combating the import of counterfeit products related to the trademark has not been established, it also has a negative effect on the decrease in the revenue of customs fees.

In addition, the lack of a system for combating the import of counterfeit products related to the trademark has a negative impact on the development of investment activity for the Republic of Uzbekistan and the increase of the country's reputation in the international arena.

In the US, trademark protection is maintained by the Customs and Border Protection (CBP) system, a division of the Department of Homeland Security. In the US, all intellectual property owners register their property in the IP system. Any goods and vehicles trying to cross the US border through the CBP system have the opportunity to receive information about the cargo being transported. If they detect counterfeit goods, they have the authority to seize and confiscate them. When counterfeit goods are detected and confirmed, an intellectual property (IP) owner usually has 2 ways to protect their product: destruction of the goods and legal action against IP infringers [8]. The advantages of these actions are that the entry and sale of counterfeit and low-quality goods that are dangerous to human life are prevented.

By submitting all information to the Intellectual Property Agency to protect legitimate goods, the chances of identifying and contacting those responsible for counterfeit goods can be increased. In the EU, goods suspected of infringing trademark IP are detained at the border and product inquiries are sent to border controls. UK Border Force and Customs work together to tackle counterfeit and substandard goods at the UK border. Intellectual property rights at the Canadian border are administered by the Canada Border Services Agency. The owner of the intellectual property rights of the brand may apply for assistance. Export is permitted after proper registration with the Canadian Intellectual Property Office. This service is provided free of charge.

To cooperate with Chinese customs authorities, brands must provide up-to-date information on IP, including descriptions of products and packaging, photographs and samples. Also, in China, a list of authorized brand representatives in the country has been formed, and citizens are advised to contact the customs authorities in cases of suspected illegal transportation across the borders. As with customs authorities in other countries, China has the authority to destroy counterfeit goods. Interestingly, these items can also be donated or auctioned [9].

The Australian Border Force (ABF) is responsible for preventing the entry of substandard goods and combating counterfeit goods in Australia. Every trademark or copyright owner who wishes to protect the border submits its documents to the Australian Border Force. These documents provide the ABF with the ability to seize any goods suspected of

infringing the IP. At the same time, this document is an agreement confirming that the IP is responsible for the costs of implementation at the border. This means that intellectual property rights holders who want to stop counterfeit goods from entering Australia must pay the costs of transporting, storing and destroying the seized goods [10].

Importing and selling counterfeit goods is a huge problem in Venezuela. In recent years, the state has introduced mechanisms to combat counterfeit goods. However, these efforts are not enough due to the fact that the sale of counterfeit goods is increasing around the world, and new methods of distribution of goods are being devised by manufacturers of fake and low-quality products. In Venezuela, law enforcement agencies use the following laws to combat counterfeiting and piracy against those engaged in the importation and sale of counterfeit goods: Constitution, Paris Convention, Berne Convention, Rome Convention, Agreement on Trade-Related Aspects of Intellectual Property Rights, Customs Laws, Anti-Smuggling Crimes law, Administrative Provisions, Criminal Code, Business Regulations, Industrial Property Law, Copyright Law, Copyright Law and Special Law against Computer Crimes. This Convention and laws provide for the prevention and cessation of import, storage and sale of goods, as well as compensation for damages and fines in case of violation of the rights of property owners [11].

In Venezuela, all individuals are advised to work closely with law enforcement to obtain information on legitimate goods and clear guidance on identifying counterfeit goods. It is recommended to keep a close eye on e-commerce websites. Master classes are regularly organized by bodies that help distinguish counterfeit goods. Also in Venezuela: monitoring online sales; determine the prevalence of a particular brand in a market or on a particular website; the practice of counting the number of low-quality products on the market and more effective prosecution of criminals has been established. Cooperation between the property owner and the customs authorities is very important. Because the removal of fake or counterfeit goods leads to both ensuring the rights of the property owner and stopping the circulation of low-quality and counterfeit goods through the customs border [12].

Today, before investing in a country, companies that produce goods are familiar with whether or not a mechanism for protecting intellectual property has been created in that country. No investor wants to bring his goods from abroad at a low price and sell them in that country. In particular, the fact that the share of the main goods entering the territory of the Republic of Uzbekistan corresponds to the share of the Chinese state makes this situation even more complicated. The basis for this is the fact that the Chinese state today produces more than 74% of counterfeit goods in the world.

It is known that today the Republic of Uzbekistan needs to take its place in the foreign market, to release competitive goods to the foreign market and to cooperate closely with the World Trade Organization in order to further develop international economic cooperation. However, it is no secret that the lack of a system to combat the import of counterfeit goods has a negative impact on it.

The Republic of Uzbekistan is studying the issues of becoming a member of various international organizations, including the World Trade Organization and other prestigious international organizations, in order to bring its products to the world market, increase its export potential, and increase the share of imports of quality products. In this regard, improving the position of the Republic of Uzbekistan in international rankings and indexes, protecting intellectual property rights in ensuring freedom in economic activity, and solving some existing theoretical and practical problems in this direction is one of the urgent tasks.

IV. Conclusion and discussions

Today, the effectiveness of the measures used by the customs authorities in the fight against counterfeit products shows the need for continuous cooperation with consumers. High-quality material and

technical support of customs authorities gives good results in identifying counterfeit and low-quality goods. The provision of technical means to the employees of the customs authorities performing customs control serves to ensure the quality of the control. Today, huge profits from the production and distribution of counterfeit and low-quality goods lead to an increase in crime, the financial strengthening of criminal groups, and the legalization of illegal income. First of all, this poses a serious threat to the economic security of the countries, the security of the society, the health and life of people.

In conclusion, it can be said that the increase of goods that can be competitive in the world market in Uzbekistan, the state policy of attracting foreign investments in our country, the increase of the prestige of Uzbekistan in the world, and putting an end to the circulation of counterfeit and low-quality goods are a number of tasks that we have to carry out in front of us.

The Customs Code not only creates more favorable conditions for the development of business and entrepreneurship in the field of foreign economic activity, but also plays an important role in ensuring effective customs control in the territory of our country, regulating the circulation of goods, developing foreign trade, and protecting the domestic market from low-quality and counterfeit products. It is necessary to fully and effectively use modern information technologies in customs activities, as in all areas, and to avoid subjective factors in customs clearance, to fully form the legal basis for protecting counterfeit goods that harm public health, damage to trademark owners, and copyright to products. Currently, in the field of consumer protection, it is necessary to carry out comprehensive measures, including in the purchase of goods of acceptable quality that are safe for the life and health of people, as well as in obtaining accurate information about the goods and their manufacturers, and to fight to reduce the volume of illegally circulating, low-quality, counterfeit and counterfeit products. All of us must fight against violations of laws that harm the lives and health of

citizens, lead to unhealthy competition and harm the state budget of the Republic of Uzbekistan.

According to the data of the bulletin of the State Statistics Committee of the Republic of Uzbekistan on the export and import of goods and services prepared at the end of January-September 2022, the total amount of goods was imported to our country equal to 21973 117300 US dollars. Of this amount equal to 4768 152520 US dollars was imported from China. It is clear from this that the acceleration of the import of goods from the state of China to the territory of our country may lead to an increase in the import of counterfeit goods related to the trademark and, as a result, to an increase in the risk of serious damage to the economic security of our country.

Based on this, the following can be included as suggestions:

1. Today, the number of trademarks in the register of intellectual property objects maintained by the customs authorities is not coordinated with the register maintained by the Intellectual Property Agency under the Ministry of Justice. This, in turn, can create a number of problems in practice. Based on this, we believe that it is appropriate to combine the register maintained by the customs authorities and the Intellectual Property Agency under the Ministry of Justice.

2. Based on foreign experience, when customs authorities detect counterfeit goods related to the trademark, it is necessary to create an opportunity to take measures independently without waiting for an application from the real owner of these goods. That is, based on the requirements of the TRIPS agreement, it is necessary to maintain a customs register for the protection of intellectual property objects, in particular, trademarks, and to fight against counterfeiting of trademarks in the register.

The above information shows that violations of Intellectual Property and entry of low-quality goods into domestic markets pose a serious threat not only to the economy, but also to the health of the population. Therefore, one of the urgent tasks is to further improve the current legal framework of the system of protection

of intellectual property objects in Uzbekistan, to ensure the joint activities of state bodies and interested organizations, and most importantly to systematically promote theoretical, legal knowledge about the sphere among various segments of society, especially young people, participants in foreign economic activity.

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Section 6. Economic theory

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CALCULATION OF MANAGER'S BONUSES AND SHAREHOLDER'S DIVIDENDS

Abstract. A method is proposed to encourage managers working for the overall result of the firm, using which the firm will achieve the greatest profits and a "size", proportional to income. A method for calculating dividends on shares is also proposed for discussion. Calculation formulas are given. The method was developed on the basis of reasonable recommendations of Nobel laureates [3].

Keywords: Profit, income, costs, manager, shareholder.

Problem statement. The problem generally trivial. It is necessary, knowing the current salary of the manager, to evaluate his efforts in money, according to the given target function and the results of the company's activities. If we take a one-time payment based on the result of the activity as an estimate, then how to calculate the amount of the "bonus" that would further stimulate the employee? Is it possible to apply the results obtained to the shareholders of the joint-stock company, who (to their money) perform the functions of "exogenous" managers?

Analysis of publications. Of the Nobel laureates, Jean Tirole [1] dealt with this problem most "tightly", Richard Thaler [2] dealt with it somewhat less, but there is no solution to the problem. Here are their statements on the topic, which are almost all trivial, but taken out of context cause confusion. Jean Tirole:

– "chief managers remain responsible for all activities… so that incentive mechanisms for managers can be more closely approximated to actual execution" [1, 30]. What is the incentive mechanism; and why only it can come close to execution; and what is the peculiarity of actual execution; and besides the actual, what and how many types of executions are found in the mechanisms, is not clear.

– "farms with insufficient managerial talents are considered" [1, 28], but how to find out or how to measure the level of managerial talent and its sufficiency or insufficiency – Jean criterion does not lead.

– "The firm is led by a manager who chooses between two levels of effort: high ("work") and low ("shirking")" [1, 57]. A manager who shirks work. Where is this possible? Why such assumptions? Why won't he be fired?

– "The manager's salary should grow with the growth of the profit received" [1, 60]. To the question: "and in what proportion to profit?", we read: "a reasonable prediction… of a $1 increase in profit leads to an increase in the manager's salary in the range from $0… to $1" [1, 86]. "Predictions" are such that do not need to go to a fortune teller. Weather forecasters' forecasts are even more accurate;

– "profits are a very distorted criterion of a manager's activity… For example, profitable investments reduce current profits, without at the same time testifying to the laziness or stupidity of managers"? [1, 64]. So, it is necessary to welcome unprofitable

investments, which, according to the "logic" of constructing the phrase, can only increase profits. Or did I misunderstand something?

"In general, the remuneration of managers can be built on the basis of the average industry rate of return" [1, 67]. And where are the formulas for calculation? There are no formulas. Let the average rate of return be 6.9%. And to what extent will Jean reward managers? There was no such "equalization" even in the USSR;

"Competition in the market... can create incentives for managers who already have an advantage from their monopoly position" [1, 645]. So, managers have a monopoly advantage. Competition creates incentives (a synonym for the whip), and that's fine, but it also deprives managers of their monopoly advantage, which Jean did not mention here, because both monopoly and competition cannot be on the market at the same time, just as morning and evening cannot be at the same time. (Note that economists have a concept of "monopolistic competition", which differs in that: "1. Every firm faces a decrease in demand. 2. None of the firms makes a profit" [1, 452]. And it does not occur to anyone that when demand decreases, it is necessary to indicate the lower limit of this decrease, which is not zero. Otherwise, there is no point in studying "monopolistic competition". The lack of profit is also a complete absurdity). But return to "monopolist managers".

– "managers of monopolies can be lazy (lead a "quiet life"), they may not gain anything from it" [1, 114]. I am wondering in which area of economic activity can idlers win and in what exactly? Lazy people always lose to hardworking people.

– "the manager's activity depends on the assets they inherited" [1, 67]. The bigger the inheritance, the more active the manager, or what? But here is Jean's clarification: "the threat of rent loss can make managers be less lazy" [1, 68]. How can become less lazy, for example, for a manager who: "...at the beginning of his career, he may work even harder than is socially optimal" [1, 70]? And where would find out

what this "social optimality" is in diligence, and what will happen if, before retirement or leaving for another company, the manager reduces diligence below this level? Suddenly, I have worked harder all my life than it is socially optimal, and received a salary below its socially optimal level? After all, Jean does not exclude: "the possibility that the manager will leave the company" [1, 70], but at the same time states that if there is: "The possibility of obtaining good prospects outside the company where he is currently employed, just as receiving remuneration inside the company, of course, gives an incentive to the manager to work satisfactorily" [1, 70]. And since when have satisfactory employees been rewarded? But not only material incentives, Jean noted. Managers are also pressured by shareholders who: "can choose... the level of effort they want and impose it on the manager (with the threat of a large punishment if he disobeys)" [1, 58], because only: "direct monetary incentives... can reduce... the caution of managers" [1, 55], and this is undesirable, and therefore, the above-mentioned power is necessary: "control of managers... of the company by shareholders" [1, 23]. And the fact that such "forceful pressure" can cause the "diligence" of the manager to be much higher than the socially optimal level for some reason Jean stopped worrying. Interestingly, there are a lot of shareholders, there are also a lot of levels of effort that they can impose on the manager, the shareholders do not know each other in person, nevertheless, they have no disagreements regarding the choice of the level of effort, as there are no disagreements on a level of bigt punishment.

"Managers of management firms, if they do not react very strongly to monetary incentives, use every opportunity to stretch the work" [1, 74]. All this is true if by "management firms" we mean state institutions that respond to "monetary incentives" not in the form of salaries, but in the form of bribes;

"The potential disadvantage is that the manager can bear all the risk. This, however, does not matter, because the manager is risk-neutral" [1, 83]. If

someone carries a risk, it is not a disadvantage, but a virtue. How can you carry something and be neutral to the "load"? But if it doesn't matter, then why mention it at all?

Can almost agree with this: "the salary of each manager depends on the activities of another manager as well as on his own" [1, 65], if we exclude the option of mutual responsibility, when everyone is responsible for the blunder of one. But where the formula of this "depends" is not clear. And with this: "If higher profits really reflect higher efforts, then compensation to managers increases with the growth of observed profits" [1, 85]. There is no formulas for calculating this increase either. And it is doubtful that: "the remuneration of managers of one company can be made dependent on the activities of managers of competing companies" [1, 67], since you will not find these formulas of dependence in Jean's. But this dependence can be "direct" and "reverse". Can be more specific? In the sense of how to choose the reference company on which competitors depend? Jean did not understand the question, because he gave a particular example, according to which: "…it seems natural to base the remuneration of "Ford" managers on the achievements of "General Motors" managers" [1, 114]. We do not focus on the problem of "direct" and "reverse" rewards for competitors' achievements. But here is the thought of his colleague Richard Thaler [2]: "I cannot recall that experts considered "General Motors" to be a company with reasonable management" [2, 64]. Two opinions of the laureates, and who is right – think for yourself, because it is unnatural to reward someone for the "achievements" of competitors;

– "the effectiveness of management (whatever you stimulate it with – **V. Sh.**) does not change much over time" [2, 251]. And with this phrase, Richard multiplies by zero all attempts to stimulate the work of managers, although he received the "Nobel" precisely for methods of correcting the behavior individuals in the right (it is unclear to whom) direction, and for developing methods of stimulation;

"One of the… tasks that company managers had to solve was to convince their managers of the need to take on risky projects if a sufficiently high profit was expected" [2, 35]. Or, Richard has managers who do not comply with the decisions of the "bosses", and thay should convince managers… to take up work. In normal companies, all the risk falls on the "bosses", not on the staff. And here his recommendations: "In order for managers to be willing to take risks, it is necessary to create conditions in which encouragement would be intended for the decision itself aimed at maximizing profits" [2, 200]. And colleague Jean Tirol thinks differently (I repeat): "direct monetary incentives… can reduce… the caution of managers" [1, 55], they will take risks and, therefore, additional administrative control by shareholders is needed over them. How many laureates – they have so many opinions on the topic. But in general, Jean does not associate the risks of managers with the level of their remuneration, but attributes everything to their characters. He has: "the risk averse side" [1, 57], it happens: "that the manager becomes infinitely risk averse" [1, 62], it happens: "The manager is somewhat risk averse" [1, 66], there is also: "risk-neutral side" [1, 57], but there is also: "situations of high risk disposition" [1, 296]. And the final "conclusion" of Jean: "Managers, however, may have different attitudes to risk" [1, 624]. How to determine the "psychotype" of a manager in relation to risk, how the risk–neutral side differs from the risk-averse side – the laureate does not specify how the risk-averse one differs from the infinitely risk-averse one, too. But the risk can lead to failure and even to the collapse of the company, and according to his observations: "When the future of a company is at stake, managers tend to trust their intuition" [2, 301], and everything developed by the laureates of their incentive theory and "scientific formulas", that do not exist in reality are ignored.

Speaking of risk. There is no precise and unambiguous definition in the economic and other kind of literature. There are no "formulas" for its calculations

in specific situations. Nevertheless, the phrases: "reduce the risk" [1, 30], or: "the risk is insignificant" [1, 44], or: "the least risk" [1, 55], or: "all risk" [1,83], "high risk" [1, 162], it is unclear what: "part of the risk" [1, 299], "high and low risk" [1, 230] (without specifying the threshold of "separation" of the degree of risk) and even: "moral risks" [1, 174], and many others – are found everywhere.

The purpose of the article. To derive unambiguous formulas for monetary bonuses for managers, if it is known that they alone are responsible for profits and losses, and the company has a certain "target function" for the implementation of its activities, but the economic interests of shareholders and managers may differ. ·To consider the possibility of applying this general methodology of awarding and for calculating payments of "bonuses" on shares in joint stock companies (**JSC**). At the same time, the derivation of formulas should be based on the thoughts and ideas of Nobel laureates.

Presentation of the main material. Consider a company under the management of its owner-the head, who is subordinate to a group of managers. Let the economic results of the company's work be calculated periodically, once a month (or quarter), and for each period, by comparing its results with the previous period, the remuneration of managers is recalculated, as a result of which bonuses or fines are accrued. Taking into account the fact that: "the salary of each manager depends on the activities of another manager as well as on his own" [1, 65], and considering the erroneous opinion when: "the remuneration of managers of one company can be made dependent on the activities of managers of competing companies" [1, 67], consider a firm consisting of which managers work for the overall result. We introduce notation for the key economic parameters of the company (all dimensions are [$/month])

X_J – the required salary of the J-th manager according to the results of the current period;

X^0_J – salary of the J-th manager for the previous period;

$Y \equiv \sum X_J$ – the desired "fund" of the salary of managers of the company;

$Y^0 \equiv \sum X^0_J$ – "fund" salaries of managers of the company for the last period;

$P = (D - S - Y)$ – the company's known profit for the current period, where:

S – expenses of the company excluding managers' salaries;

D – the company's known income at the end of the current period;

D^0 – the company's income based on the results of the previous period;

P^0 – the company's profit based on the results of the previous period.

Since there is no reason not to trust the opinions of Nobel laureates, who have: "chief managers remain responsible for all activities" [1, 30], then consider the form of remuneration for managers with the target function that reflects the direction of the firm's "movement". Jean writes that although: "firms maximize expected profits… in practice, managers have other goals (for example, maximizing the size… of the firm" [1, 54], and the "size" of the firm determines its income D. And in confirmation of this, we read Jean's correct thought that: "the growth of a company can be desirable for managers not only for their own comfort, but also because it allows them… to get great opportunities for promotion" [1, 55]. And most importantly: "The remuneration of managers… must be considered in a broad sense. Such rewards may be monetary… but may… consist in promotion through the ranks" [1, 56]. But, according to Jean: "The salary of the manager should grow with the growth of the profit received" [1, 60], therefore we will accept identical: both the target function of the movement-the development of the company, and the "aspirations" of the J-th manager in the form of his salary

$$X_J = \lambda_J \times (D \times P)^{0.5}, \qquad (1)$$

where: λ_J is a scale factor. The dimensions of the left and right sides of the equation are the same (which provides the square root of the right part); the left

part the salary X_J and is the evaluation of the manager's work; the right part in the form of the product of the company's profit P by income D (reflecting the "size" of the company) as a whole is the mathematical record of thoughts of the laureates. In principle, instead of the square root in (1), you can take any exponent, because at the position of the maximum of the product $D \times P$ (if there is one) it won't affect. But there will be "problems" with the dimension and interpretation of the parameter λ_J… Since equation (1) is also true for the previous period, then

$$X_J^0 = \lambda_J \times (D^0 \times P^0)^{0.5}. \qquad (1')$$

Excluding the unknown parameter λ_J from (1) and (1'), and recording the company's profit in an expanded form, we obtain a system of equations for calculating salaries of each manager

$$X_J = X_J^0 \times [(D/D^0) \times (D - S - Y)/P^0]^{0.5}. \quad (2)$$

Summing up all the equations (2), after the transformations we will get

$$(Y/Y^0)^2 = (D/D^0) \times (D - S - Y)/P^0, \qquad (3)$$

from where the "fund" of managers' salaries will be based on the results of the current period

$$Y(D, S) = \tfrac{1}{2} \times Y^0 \times (D/D^0) \times B_Y \times$$
$$\times \{[1 + 4 \times (1 - S/D) \times A_Y]^{0.5} - 1\}, \qquad (4)$$

where dimensionless parameters are entered:

$$A_Y = P^0 \times D^0/(Y^0)^2 \text{ and } B_Y = Y^0/P^0.$$

Substituting $Y(D, S)$ from (4) to (2), we find the salary of each J-th manager.

As you can see, the new salary X_J is proportional to the previous salary X_J^0, and the proportionality coefficient $[(D/D^0) \times (D - S - Y)/P^0]^{0.5}$ is determined by the previous (D^0, P^0) and the present (D, P) results of results of company's activities.

Note that, although the salary was optimized to the maximum of profit and income\size of the company, only its income D and costs S were included in the formula, and the initial salary X^0 is chosen from "endogenous" considerations: education, qualifications, work experience, initiatives, etc.. The very cost reduction of S, as a necessary factor for profit growth of P, was noted by the laureate Paul Samuelson when he said: "Producers can… maximize their

profits only by minimizing their costs (in this case, it's S – V. Sh.)" [4, 35].

It is proposed to discuss the possible calculation of optimal total dividend payments to shareholders using a formula similar to (4) and their "division" between them according to a formula similar to (2), if the variable X_J^0 is understood as income from the shares of the J-th shareholder, and the cost level S is not understood as the "net" costs of the company, but costs firms plus payments to managers. This is all the more justified, since all the "employees" of the company create profits. Suppose there are many shareholders, and each has shares worth N_K [\$] with the "expectation" of a share p of earnings per share. Formulas for calculations will take the form

$$(p \times N_K) = (p^0 \times N_K^0) \times [(D/D^0) \times$$
$$\times (D - Z - W)/(P^0 - Y^0)]^{0.5}, \qquad (5)$$
$$p(D, Z) = \tfrac{1}{2} \times p^0 \times (D/D^0) \times B_W \times$$
$$\times \{[1 + 4 \times (1 - Z/D) \times A_W]^{0.5} - 1\}, \qquad (6)$$

where: p^0 is the "share percentage" of payments on shares in the previous period;

$p(D, Z)$ – is the percentage of payments on shares in the current period;

$W = p(D, Z) \times \Sigma N_K$ – the contribution of virtual "labor" to the income of shareholders of JSC in the form of dividends paid by them on shares,– as a complete analogue of the real contribution of labor managers, estimated the total salary of Y;

W^0 – the same as W, but for the previous period;

$Z = S + Y$ – costs of the company, taking into account payments (4); and coefficients are introduced: $A_W = (P^0 - Y^0) \times D^0/(W^0)^2$ and $B_W = W^0/(P^0 - Y^0)$. At the same time, we assume the number of issued shares to be unchanged $\Sigma N_K = \Sigma N_K^0$.

Since the salary of managers "goes" first (4), at relatively low costs S, and share payments are second, when the costs of the joint–stock company equal to $Z = S + Y$ (and grow by the managers' salary fund Y), the dollar contribution from the managers' salary will be higher than the dollar contribution of shareholders in $k = \{[1 + 4 \times (1 - S/D) \times A_Y]^{0.5} - 1\}/ /\{[1 + 4 \times (1 - Z/D) \times A_W]^{0.5} - 1\}$ times.

Let us turn to the formula (1) of the relationship of the manager's salary with the "target aspirations" of the firm $X_J = \lambda_J \times (D \times P)^{0.5}$, which can be written in a generalized form, but with an extra degree of freedom (parameter $0 < T < 1$).

$$X_J = \lambda_J \times D^T \times P^{1-T}, \qquad (1'')$$

the right part of which resembles the "famous" Cobb-Douglas function, which was aptly expressed by V. V. Leontief: "Cobb-Douglas functions. Theorists questioned the arbitrary form of the function, and statisticians questioned the methods of fitting it to the data, but despite all the criticism expressed, the familiar… equation appeared again and again" [5, 348]. If the Cobb-Douglas formula establishes an alleged connection between labor and capital costs, then in this case we have some (like Cobb-Douglas, but) functions expressing the dependence of the "purpose of the company's agents' activities" on its micro-indicators: income and profit, functions that mathematically combine "into one", often contradictory the interests of the participants.Here, the appearance of the function is justified. At $T => 1$ we have $X_J \sim D$ and managers are rewarded for the growth of the "size"-profitability of the company, otherwise at $T => 0$ – for the growth of profits. The same value of T is chosen by the owners of JSC, based on "their" considerations. In this case, equations $(4, 6)$ will be written (for iterations) easier

$$Y_{n+1} = Y^0 \times (D/D^0)^T \times [(D - S - Y_n)/P^0]^{1-T}, (4')$$
$$p_{n+1} = p^0 \times (D/D^0)^T \times [D - Z - W_n)/(P^0 - Y^0)]^{1-T}, (6')$$

the latter is taking into account the connection $W = p \times \Sigma N_K$, and their solution is iterative. To do this $Y_0 = Y^0$, is assumed in the zero approximation, which is substituted into the right part $(4')$, getting the 1st approximation Y_1, which is again substituted into the right part $(4')$, getting the 2nd approximation Y_2, etc., until the desired accuracy is achieved. Equation $(6')$ is solved similarly with recalculation of $W_n = p_n \times \Sigma N_K$.

Remark. The parameters T in formulas $(4')$ and $(6')$ should not be equal at all. On the contrary, it is reasonable to accept them as "opposite". Since managers can have more influence on profits, and

shareholders (by buying shares) – on the "size" of the company, then T from $(6')$ should always be greater than T from $(4')$, which can be provided for a given T from $(4')$, such a record of equation $(6')$
$$p_{n+1} = p^0 \times (D/D^0)^{1-T} \times [D - Z - W_n)/(P^0 - Y^0)]^T, (6'')$$
but the method itself still needs further verification and comprehension, because, as it was shown above, the opinions of the laureates expressed by them only in words in their "works without formulas", in the form of private "ideas on the problem" – are ambiguous.

If the company assumes the growth and expansion of markets, then it is reasonable to take the results and data of the last period as parameters p^0, D^0, P^0 and Y^0, otherwise the results for any fixed period will be suitable, the one that the firm considers the most "ideal" for working at that market.

Example. Let the sum of the shares of JSC $\Sigma N_K. = = 50$, and the results of last month $S^0 = 20$; $D^0 = 50$; $Y^0 = 5$; $P^0 = 25$; $p^0 = 0.1$. Let the current month be successful in the main indicators $S = 18 < S^0$ and $D = 55 > D^0$. Then from $(4', 6'')$
at $T = 0.10$ we have $Y = 6.107 \approx 1.22 \times Y^0$, and $p = = 0.1107 \approx 1.11 \times p^0$;
at $T = 0.30$ we have $Y = 5.983 \approx 1.20 \times Y^0$, and $p = = 0.1121 \approx 1.12 \times p^0$;
at $T = 0.50$ we have $Y = 5.853 \approx 1.17 \times Y^0$, and $p = = 0.1136 \approx 1.14 \times p^0$;
at $T = 0.70$ we have $Y = 5.717 \approx 1.14 \times Y^0$, and $p = = 0.1153 \approx 1.15 \times p^0$;
at $T = 0.90$ we have $Y = 5.574 \approx 1.12 \times Y^0$, and $p = = 0.1171 \approx 1.17 \times p^0$.

As you can see, with the growth of the parameter T, the relative additions of managers to the salary fall, and in the shareholders grow.

If the current month is "unsuccessful", e.g. $S = 22 > S^0$ и $D = 45 < D^0$, then
at $T = 0.10$ we have $Y = 3.886 \approx 0.78 \times Y^0$, and $p = = 0.0893 \approx 0.89 \times p^0$;
at $T = 0.30$ we have $Y = 3.998 \approx 0.80 \times Y^0$, and $p = = 0.0879 \approx 0.88 \times p^0$;
at $T = 0.50$ we have $Y = 4.122 \approx 0.82 \times Y^0$, and $p = = 0.0863 \approx 0.86 \times p^0$;

at T = 0.70 we have Y = 4.260 ≈ 0.85 × Y^0, and p = = 0.0847 ≈ 0.85 × p^0;

at T = 0.90 we have Y = 4.415 ≈ 0.88 × Y^0, and p = = 0.0829 ≈ 0.83 × p^0.

And here, too, with the growth of the parameter T, the relative losses of managers in wages are falling, and the shareholder's are growing. It turns out that an increase in the parameter T increases the interest of shareholders in the work of the JSC, because the volatility of dividends increases, as well as a decrease in T, on the contrary, increases the interest of managers in the work of the JSC, because the volatility of their salaries increases, at the same time (it is like "sensitivity" to the results of the work of the JSC).

Thus, the parameter T can be used to "regulate" the relative interests of managers and shareholders in the results of the JSC's work. We have, as it were, a certain "uncertainty ratio" not in quantum mechanics, but in economics: the more active managers are, the calmer shareholders are and vice versa, for objectively, the growth of the activity of some is compensated by the growth of the indifference of others... One can only welcome the foresight of Jean Tirol, who formulated half of this provision without any mathematical calculations, studying the activities only of management firms: "If managers react significantly to monetary incentives, a large proportion of entrepreneurs (read, shareholders – V. Sh.) increases laxity in management firms" [1, 75] (текст в оригинале: "Если менеджеры существенно реагируют на денежные стимулы, большая доля предпринимателей увеличивает расхлябанность в управленческих фирмах" [1, 75] – В.Ш.), this phrase in its finished version should have the following text: "If managers in joint-stock companies actively respond to monetary incentives, then shareholders, on the contrary, equally increase laxity and vice versa".

Consequently, the formulas for calculating bonuses to managers (4') and dividends to shareholders (6") correspond, at least, to the qualitative observations of Jean Tirol on employee relationships in firms of some kind.

Conclusions. Based on the analysis of the recommendations of Nobel laureates in economics J. Tyrol and R. Thaler [3] in the field of economic stimulation of the activities of managers of firms, a model for calculating the remuneration of managers and dividends of shareholders of JSC is proposed for discussion according to the principle common to all participants in production: taking into account the labor costs of managers of firms and shareholders, – according to the principle that does not contradict the condition of maximizing both profit and income at the same time in the company (or JSC).

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INCOME AND ECONOMIC INEQUALITY

Abstract. The "Lorentz curve", reflecting the inequality of income distribution is considered. The equation of this curve is derived and it is shown how to calculate the level of subsidies to the population based on it.

Keywords: income, inequality, "Lorentz curve".

Problem statement. Inequality is ubiquitous and observable everywhere, and strict equality is more a mathematical abstraction than something real. And if the measure of equality can be considered error, accuracy and deviation from the average, then qualitative assessments of the type prevail with respect to inequality: insignificant, acceptable, large, huge, etc., and this is especially characteristic of economic and expert assessments. The problem of inequality is that it is still not quantified for some reason.

Analysis of publications. Publications on the topic of inequality in general and income in particular mainly contain criticism and condemnation of inequality of any kind. No one cares about the fact that no one has seen equality in social relations yet. Inequality is everywhere, even in the cemetery. And from the standpoint of mathematics, equality is a "point", and inequalities are a continuum–type set, therefore the probability of equality is zero. To quote some of the laureates. Drez [5]: "When the equilibrium of supply and demand is created in the market not with the help of prices, but with the help of quantitative restrictions, as in unemployment, then a certain level of normalized distribution gives additional freedom: inequality takes the place of equality". This is almost like Orwell's "rationing is inequality", and "restriction is freedom". But how to find the level of rationing after which this "freedom" comes? Samuelson does not lag behind him [5]: "… free trade can have a systematic impact on the ratio of the growth rate of real wages and GDP per employed person, as well as affect general inequality". Not

clear. After all, if all trade is free, then it systematically affects universal inequality according to this phrase. But which way? If in the direction of decrease, then over time everyone will become equal anyway, and the struggle for universal equality is useless in vain, and if in the direction of its growth, then we return to the doctrine of Marx, according to which the development of capitalism makes the rich richer and the poor poorer, a doctrine refuted by practice itself. On this occasion, Samuelson writes that: "if we take the position as… Marxism, that the system, degenerating… will be accompanied by the utter impoverishment of the poor (and the inevitable bloody revolution)" [3, 358]. Also from Paul: "perfect competition can lead to pronounced inequality". And for some reason it is not specified when the same competition may not lead to a pronounced inequality? In another place already: "With free competition (Laissez faire), income and wealth are not distributed in equal parts… differences in economic well-being still remain, and moreover, they are significant" It turns out that both perfect and free competition – both lead to inequality. Then it remains to admit that economic equality can only be ensured by… monopoly, because "there is no third". From these phrases, we see that inequality is continuously "breathing" (in one direction or the other), and everything influences it. Then there is a general question about the possibility of economic equilibrium of something in general, due to the dynamics of economic inequality. We read from Paul: "it is clear that income cannot always be above the

equilibrium level… A prolonged gap… should cause a movement back to the equilibrium point, where the gap already turns out to be zero" and nothing is said whether the income can be below equilibrium. What kind of "balance" is this in general, if it is so easy to "slip" past it? And how long does this long gap last? After all, if it is long-term, then why does the income "rest" for so long above this "equilibrium point", which it then easily skips? Moreover: "from any place… from the level of… equilibrium, income will tend to grow". What kind of equilibrium is this, from which everyone tends to "fly up", but at the same time there is a movement back to the equilibrium point? And Paul's "conclusion" is that the final one: "the result will be an increase in income, its movement back to the level of equilibrium". And how is that? How to imagine growth in general (no matter what), as a movement back (to conception?).

And a little bit about Pareto's law, which in its free interpretation says that 20% of people own 80% of "wealth" and vice versa. And here's how Paul interprets this law: "We are already familiar with Pareto's point of view, according to which there is nothing to be done about inequality. "The main forces determining inequality are too strong and stable; state intervention does not have a real impact on them". What are these main forces, who is their bearer – Paul does not specify. It turns out that Pareto and Paul inequality exists and it is objective. And the page below reads something else: "Pareto was right about the inevitability of approximately the same distribution of the product". Or Pareto, speaking of the inevitability of inequality, at the same time predicts the inevitable… sameness. Or this: "The point of view associated with Pareto… that inequality is a universal constant that no policy can change is not permanent". A fickle point of view… What's that supposed to mean? In other works of Paul, one can find this: "recently I read an article by one author… the author subjected the concept of Pareto optimality to devastating criticism". If the Pareto principle is destroyed, then why it being taught? Or: "research… over the past 50 years has refuted the uni-

versality and inevitability of the Pareto law". Pareto's law is refuted, destroyed, but alive. Imagine that in an article on physics you will find something like this: "research… has refuted the universality and inevitability of the law of conservation of energy". The law is the law and it is always inevitable. But this can happening in the economy. Another thought of his: "The welfare state… has slightly brought the system closer to the idea of greater equality… where both halves of the population receive the same part of the entire social product". Here the population is divided into two halves: below and above the conditional poverty line. But if both halves receive the same part, then how can they be distinguished at all? And how to understand this: "In order to mitigate inequality, we must first establish what are its main causes"? But above we noted that Paul was talking about the main forces that determine inequality, but it turned out that these forces exist, and their causes have not yet been established. But if inequality, as such, is objective, then before softening (or tightening) it, it would be necessary to think about the consequences of interference in the natural state of society, because Samuelson himself stated in the same place that: "experience shows… attempts to help one class of society at the expense of another, brought harm to both". Another curious thought: "only a few really realize… how big the gap between the highest and lowest incomes is". And why imagine something when it's enough to really look at a pensioner near a tank with "expired" supermarket products and at the photo of the oligarch's villa on the cover of a magazine. But the philosophical result of Paul's "thoughts" is: "Money is not everything. It is better to be uneducated, poor and happy than rich and unhappy". And the result of our analysis of publications is in Paul's phrase about science-economics: "Many more expressions and views can be cited… which, upon closer examination, turn out to be contradictory and meaningless".

The purpose of article. Taking for truth the objectivity of the phenomenon of income inequality in the economy and the impossibility of eliminating

it, to find an equilibrium natural level of inequality, to justify the measure of its measurement, thereby solving a number of related economic problems.

Presentation of the main material. First of all, we note that it is illiterate to take into consideration only income in isolation from costs, if only because your monetary income is the monetary costs of others and vice versa. Paul Samuelson: "We can paraphrase the expression "a person is judged by clothes" and say that "a person is judged by income". The phrase is one-sided. Let's say my daily income is 100, and the minimum cost of "living" is 50, and Paul has 1000 and 950, respectively. And which of us is richer? I can work every other day, and Paul has to "plow" for almost three weeks to rest for one day. And if we denote D – income; Z – the minimum required "living" expenses; B – the desired well-being, then the "wealth formula" can be written as

$$B = Ln(D/Z) \qquad (1)$$

If you have B > 0 (or D > Z), then you are rich; if B ≈ 0 (or D ≈ Z), then you are not making ends meet; and if B < 0 (or D < Z), then you live in debt. And the amount of income, as such, outside of costs, does not mean anything at all.

Now about income inequality. In [1], the results of modeling on a PC of the simplest services market are presented, when people "live" only with services and the price of the service is $1. Everyone can pay $1 and get from the other what he needs for "life". It is shown that if S dollars are distributed among everyone, then over time Z money is distributed among people with exponential density

$$p(Z) = (1/S) \times Exp(-Z/S). \qquad (2)$$

A similar result is obtained if half of the participants are not given anything, and the rest are given $2 \times S$ of money. And the laureate Jean Tirol noted that: "rivals can start in unequal starting conditions" [2, 116], and in [1] it is proved that the final result does not depend on the starting conditions. Based on the modeling, the conclusion is made that the exchange characteristic of market economic relations in it "pure" form, they generate a natural inequality in

the distribution of income. The inequality gap is further "aggravated" taking into account the inevitable inequality of opportunities and individual characteristics of the participants. Paul Samuelson noted that: "one of the factors helping to explain the difference in income is the differences in the people themselves". He also recorded the fact: "income is not evenly distributed, and there is no guarantee that attempts to divide income equally will leave its total amount unchanged". Alas, even if we divide the income equally and guarantee its total amount unchanged, the final result is still "exponential" inequality. For some reason, the question of the law of unequal distribution of income does not arise for Paul. As we can see, market incomes are distributed exponentially, and not "normally", as all economists believe, including the Paul laureate, who asks: "Are abilities distributed as normally as market incomes? ... The discussion on these fundamental issues could be continued. But ... from a scientific point of view, it is more fruitful not to draw final conclusions until the principles determining the pricing of goods and factors of production are investigated ... it is enough to confine ourselves to a warning against a hasty conclusion that there is something necessary and inevitable in this dispersion of income". It is strange to hear that economists still not: "... investigated the principles that determine the pricing of goods". And the conclusion that there should be a "necessary and inevitable" internal-endogenous component in the dispersion of income (except for the ability or different starting conditions and other exogenous factors) will be given below, and everything necessary for proof is in the Paul's book [3] where the author described something, but did not bring it to consider the "Lorentz curve", which characterizes income inequality, found empirically by the economist Lorenzo.

Figure 1 shows the "Lorentz curve" from Paul's book [3] for the USA on the top left and here is a description in a number of phrases of its "properties". On: "the so-called "Lorentz curve", where the percentage of the population is plotted on the abscissa

axis – from the poorest to the highest, and on the ordinate axis – the percentage of income they receive. The diagonal line of absolute equality…", where we see that half of the US population has only about ~20% of national income. Further: "The lower curve in the Lorentz diagram – a black line running at right angles – is a case of absolute inequality" – is also understandable. One person has all the income, and all the others have no income. Here is Paul's definition of the measure of inequality, which is: "the shaded area indicates a deviation from absolute equality and, therefore, gives us a measure of inequality in the distribution of income". And numerically, the same measure of Paul's inequality is defined as: "The shaded area on this Lorentz diagram (as a percentage of half of this area) of this income inequality". Let's take this as a basis.

If we take the density of income distribution (2), then the relative part of people with income (more precisely, with money) below the Q level will be

$$X = \int p(Z) \times dZ = 1 - \text{Exp}(-Q/S), \quad (3)$$

where the integration is carried out in the interval $[0 \dots Q]$, and the total "wealth" Y of the same people, attributed to their entire "wealth" (or normalized to a conditional unit) will obviously be determined by the formula for the average

$$Y = (1/S) \times \int Z \times p(Z) \times dZ = 1 - (Q/S + 1) \times \text{Exp}(-Q/S). \quad (4)$$

Excluding the variable Q/S from (3, 4), we get the "Lorentz equation"

$$Y = X + (1 - X) \times \text{Ln}(1 - X). \quad (5)$$

In (Fig. 1), a black line is drawn on the right-top of the "Lorentz curve" using the formula (4), and the "shaded area" S will be

$$S = \int (X - Y) \times dX = 0.25, \quad (6)$$

where integration is carried out in the interval $[0 \dots 1]$. Therefore, the measure of inequality Δ, as the ratio of the shaded area to half of the total area of the entire "square" of the graph, will be in percentage terms $\Delta = 50\%$. On the same graph, the "Lorentz curve" is given in gray, but according to Pareto's law. Their difference can be seen "with the naked eye".

The analysis of all graphs allows us to draw the following conclusions. For the free market, the natural inequality by the "measure of Paul's" is equal to $\Delta = 50\%$. Deviation to the lesser side means subsidies to the "poor" from the state, and to the greater – the robbery of the population (no matter by whom) with "subsidies" to the oligarchy. The "Lorentz curve" itself does not depend on the parameters of family income. It has no parameters at all. It is absolute, or rather, universal for exponential functions and, due to this universality, does not carry any economic information at all.

However, if we assume that there is some minimum income C in society with such that the density of income distribution instead of (2) will be

$$p(Z) = 0 \qquad \text{for } Z < C$$
$$p(Z) = (1/S) \times \text{Exp}[-(Z - C)/S] \text{for } Z \geq C, (2')$$

then equations (3) and (4) will take the form, respectively

$$X = \int p(Z) \times dZ = 1 - \text{Exp}[-(Q - C)/S], \quad (3')$$
$$Y = 1 - [(Q + S)/(C + S)] \times \text{Exp}[-(Q - C)/S], (4')$$

and the generalized equation of the "Lorentz curve" $Y = Y(X)$ will be

$$Y = X + (1 - X) \times \text{Ln}(1 - X)/(1 + C/S). \quad (5')$$

The measure of Paul inequality, as it is easy to show, will be

$$\Delta = 50/(1 + C/S)_{\%}. \quad (7)$$

Having determined the value of Δ from experimental data and the "Lorentz curve", it is possible to find the level of subsidies or social benefits from it

$$C/S = 50/\Delta - 1. \quad (8)$$

If it turns out that $\Delta > 50$, then C < 0 (or negative subsidies). This means that part of the population's income is withdrawn, for example, in favor of those who withdraw (racketeering, corruption of officials), or in favor of the oligarchy. In this case, the Y part of the "Lorentz curve" in its initial part will be negative.

By the way, according to the Paul graph drawn for the USA, $\Delta = 43.4\%$, or that ~ 15.2% of the income of the population of this country is due to benefits. Since the equation of the "Lorentz curve" is given (5'), it can be "experimentally" constructed only by

"one point", for example, by finding out what share of GDP belongs to 50% of the poorest population. To do this, the incomes of the population must be arranged in an increasing variation series and find the sum of the incomes of its half.

Figure 1 shows the "Lorentz curve" at the bottom-left, when one person receives 30% of income, and the entire population receives its "legitimate exponential" 70%. In this case, the equation of the "Lorentz curve" will be

$$Y = X + 0.7 \times (1 - X) \times Ln(1 - X). \qquad (5'')$$

Figure 1 shows the "Lorentz curve" at the bottom-right, when 30% of the population have nothing, and the rest are ordinary commodity producers. For this case, the equation of the "Lorentz curve" will be

$$Y = V + (1 - V) \times Ln(1 - V), \qquad (5''')$$

where it is indicated: $V = (10 \times X - 3)/7$ for $0.3 \leq X \leq 1.0$. Therefore, Paul's phrase does not carry information: "…there has been a slight shift in the Lorentz inequality curve in developed countries compared to less developed ones", because there are four options for even a small shift, as minmum (see all charts).

More. If 3 people with exponential incomes will work for the "common boiler", then instead of (1) the density of the income distribution of each

$$p_3(Z) = Z^2/B^3 \times Exp(-Z/B)/2!, \qquad (2')$$

or close to the gamma distribution, where $B = M/3$, and M is the average income per person, which gives us the shaded relative area of the Lorentz curve $\approx$ 0.434 (exactly like for the USA) The gamma distribution also has no "economic" parameters that can be interpreted.

It is not difficult to show that for an "exponential" income distribution curve, only $\approx$ 32% of the population should own $\approx$ 68% of income, but not 20% should claim 80% of income, as Pareto's law states. For the empirical Paul's curve (for income in the US, see Figure 1 at the top-left) this ratio is even more "even". There 36% of the population own 64% of the income (if you believe her majesty the US government statistics).

Conclusions. It is shown that income inequality is objective and has its own "equilibrium" distribution law. The measure of economic inequality can be taken as the parameter of the relative area of deviation between the line of absolute equality and the "Lorentz curve" (proposed by P. Samuelson). According to experimental data for the equation (5') of the "Lorentz curve", it is possible to calculate the level of subsidies C in the income S of the population, and by the "sign" ($\pm$) of the level of subsidies to find out how much the state "helps" ("+" under "democracy") or "fleeces" ("–" under oligarchic rule) its population.

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HOW TO SELL "SAMUELSON'S COW" AND BUY RAW MATERIALS FOR REFINERIES

Abstract. A method is given for calculating the prices of goods produced from one type of raw material when their "output" does not correspond to natural market demand (these are the prices of all types of meat processing plant products, prices for oil refining fractions, etc.), when it is impossible to sell "surplus" products to other markets. It is shown that if the supply does not match the demand, it is possible to get the maximum profit for the manufacturer. An assessment of the conditions for the possible formation of "surpluses" of products to be destroyed is given.

Keywords: Price, cost, meat products, oil.

Problem statement. Laureate Paul Samuelson said that: "In… school we were taught… not to mix quantities having heterogeneous dimensions" [1, 47]. But many economists "easily" work with aggregated objects, such as indices and "food baskets", noting at the same time: "The weakness of aggregated indices", and that: "economic analysis in its… aggregated… vide… has… an undoubted shade of improbability" [4, 43]. However, the reverse process, when goods from different types are obtained from the same type of raw materials, has not actually been studied to determine their optimal prices for components in the case when the production of components does not meet the demand for them.

Analysis of publications. Although there is no direct study of the problem, nevertheless, we note the statements of the laureates that are close to the topic. Paul Samuelson [1]: "various parts of a cow – its horns, skin, liver, kidneys, the best parts of the flesh and the tough brisket – are sold … at the price paid for each of them". Paul's phrase is about nothing, because any product is "sold at the price that is paid" and the laureate did not indicate how to find this price in order to have maximum profit. Another similar thing is: "the number of things people buy always depends on the price: the higher the price of the product, the less they buy it", or: "falling prices bring new buyers…

lowering the price may encourage each consumer of this product to make additional purchases". Without specific formulas, these phrases are analogous to the statement that tomorrow will be day. Or here is Lucas's "confession" [6]: "the influence of… factors is much higher and reaches 80%… I do not know how to divide the 80% I mentioned between these and other factors". The laureate does not know, but a method for solving this kind of "problems" will be proposed below. And here's what Richard Thaler writes [2], on the topic of choosing prices from factors by "factor": "we could define an efficient market as a state of affairs when the price is within the factor 2, i.e. the price is higher than half the cost and lower than two times the cost", but how to find out the value of this *cost* – did not say. Jean Tirol is more verbose [3]: "Let's say a monopolist produces a commodity that is used as a factor of production by two competing industries producing different end products… products… meet two independent demands… Due to… the fact that… industries compete, the price of each end product is equal to the intermediate price set in… the industry". How to find this intermediate price is also not clear. Even for a laureate: "it may be difficult to distinguish two separate components from the overall impact on profits". And if the components is not 2, but a lot, like "Samuelson's cow"? And Jean's departure from the

topic: "It is somewhat more difficult to classify dependent costs… it would be unnatural to divide the total costs into several components". It may be unnatural, but it can be extremely necessary, and below, using the example of "Samuelson's cow", it will be shown how this is done. Jean believes: "the total costs can be decomposed into n subfunctions", or: "Let's assume that the total costs can be divided into n components", but he does not say how to perform this decomposition and by what criterion. And his complaint: "The compilation of commodity sets… is more difficult to formulate… the restriction on the cross-distribution of utility for various goods… the theory of compiling sets of many goods concentrates on individual examples", i.e. the whole economic science is unable to distribute profits among the components of the "consumer basket". And in general, the "difficulty" is as follows: "Although the total costs are clearly defined, the individual costs are not". This is in principle possible if they spend from the common boiler "according to the list", but at the same time steal.

And these are phrases about nothing: "Pareto-optimal placement can be… by choosing the right prices and the appropriate redistribution of income between consumers" [9]. The prices are set by the manufacturer and his goal is to get the greatest profit. Where is the guarantee that the price that gives him the maximum profit will be this "right" price? There are no guarantees. Therefore, the Pareto-optimal placement (it is unclear what's and where) is a theoretical fiction. On the same topic: "optimal allocation of resources can always be achieved by market forces". And will such an "optimal" allocation of resources be Pareto-optimal at the same time? And what are these "market forces" and who is their bearer? There is no answer. In another place, this is: "an effective means of distributing… output is a single price". And which is better: efficient distribution or optimal distribution? Jean doesn't have an answer. A strange phrase: "the buyer's payments to the supplier can be coordinated in order to ensure some kind of distribution of this optimal total benefit", because the optimal one can-

not be any at the same time. Or here are Leontiev's thoughts [4] that: "optimal proportions of individual factors of production can often… not be consistent with each other". It is also as trivial that: "the production process… its individual factors are inextricably linked with each other", or: "Each link, component of the system can exist only because it receives something from others". And this is doubtful: "any attempt to deduce a general ratio from a comparison of factors… is doomed to failure", and we will refute this below. And here are two quite sound thoughts of the laureate: "In the process of reduction (this is the reverse process of aggregation – V. Sh.), the distribution of (parameters, such as prices and costs – V. Sh.). primary factors will also change", and this will be shown below by an example, and that even by someone: "the aggregated components of the final product… should be divided into components, each… reflecting the demand of the corresponding end user". This work is devoted to this optimal division of the aggregated cost and product prices into components (according to market demand).

The purpose of the article. To show on a concrete example of the "cow Samuelson" how to determine the prices and costs of the "cow's component's" and how to divide its aggregated (total) cost into components in order to ensure the greatest profit from sales with known demand functions for components.

Presentation of the main material. It should be noted that the energy food and other industries (transport, communications, services, etc.) produce "one-time consumption" products, for which the profit from consumption does not depend on prices. An apple can be plucked from a tree or bought in a restaurant – all the same, the profit from its use, expressed in money (in "natural" form – these are carbohydrates, vitamins, fiber), does not depend on the price. It's the same with oil. Its "caloric content" or profit from its "utilization" does not depend on the price either. But the demand (m_J) for the specified goods (J) depends on their prices (P_J). In [5] it is proved that only the demand function with exponential properties

$$m_J = M_J \times \text{Exp}(-P_J/A_J), \qquad (1)$$

in its pure form, meets the requirements for "one-time consumption" goods. Here: M_J – is the greatest demand for the product (J) on the market with free $(P_J = 0)$ distribution; A_J – is the profit from the full consumption of the product. It is also shown in [5] that this profit of the buyer from the consumption of goods (J) exactly corresponds to the profit of the monopolist-seller, but only when trading at the optimal price of the monopolist equal to $P_{OJ} = A_J + S_J$, where: S_J – is the cost of production. Indeed, with the demand function (1), the profit of the monopolist will be

$$Q_J = M_J \times (P_J - S_J) \times \text{Exp}(-P_J/A_J), \qquad (2)$$

and it has a maximum (from the ratio $\partial Q_J/\partial P_J = 0$) at the price $P_{OJ} = A_J + S_J$, at which a deviation in any direction means a drop in profit. Therefore, the chatter about monopoly price inflation in order to obtain a monopoly "superprofit" has no grounds. A monopolist maximizing his profit should only trade at the P_{OJ} price, otherwise his profit will fall. If the manufacturer does not need the maximum profit, but the largest monetary revenue, there is an obvious expression for revenue

$$W_J = M_J \times P_J \times \text{Exp}(-P_J/A_J), \qquad (2')$$

which has a maximum at a lower price $P_{WJ} = A_J$. When the supply of goods is large and the price falls below the P_{WJ} level, then part of the goods have to be destroyed and "keep" the minimum price of P_{WJ}.

Let's go back to "Samuelson's cow". As a result of production we have

M^0 – the mass of all commodity components from one average cow;

μ_J – is the fraction of the mass of the J-th commodity component from the average cow;

$X \times M^0 \times \mu_J$ – is the offer of the J-th commodity component on the market, where X – is the total processing of cows [pcs/day], which must be found;

S^0 – is the known cost per unit weight of an average cow [$/kg], which includes all costs for its subsequent processing, storage and transportation to the market to consumers;

S_J – is the cost of the J-th commodity component to be found. At the same time, the obvious relationship must be fulfilled

$$S^0 = \Sigma_J \mu_J \times S_J. \qquad (3)$$

Below we will call the natural demand exactly the value M_J, which does not depend on the price, but is determined by the peculiarities of the market and, as can be shown, the profit from the sale will have an absolute maximum with the proportionality of the "output" of the components to the natural demand $\mu_J \sim M_J$.

The idea of solving the "problem" is as follows. With a small X, the supply of each component will be small, in comparison with the possible demand, and there will be a shortage of all components in the market (J). And although market prices will be higher than monopoly prices $(P_J > P_{OJ})$, nevertheless, the profit of the producer (2) will be low. If the manufacturer somehow "artificially" overestimates the cost of S_J (for example, by increasing the payment to employees, etc.) to the level of $S_J = P_J - A_J$, then any price of P_J that has developed on the market will become, as it were, monopolistically optimal $(P_J \equiv P_{OJ})$. Therefore, for small X, we have not (3), but a sufficiently strong inequality $S^0 << \Sigma_J \mu_J \times S_J$. By increasing the volume of processing X, we seem to reduce these "inflated" costs S_J, thereby weakening the inequality $S^0 < \Sigma_J \mu_J \times S_J$, up to obtaining strict equality (3). If this happens (!!), then each component will "acquire" such a level of cost S_J that it will be able to be considered as a separate monopoly product in the future, not connected in any way with the price of the other components, but giving the manufacturer maximum profit. As a result, the total profit of the manufacturer from the sale of component goods will be the maximum, since all the components in it are monopolistic.

Assuming that in equilibrium on the market, the supply of the J-th product equal to $X \times M^0 \times \mu_J$ should equal the demand (1), for the price P_J we obtain the expression

$$P_J = -A_J \times \text{Ln}(X \times M^0 \times \mu_J/M_J). \qquad (4)$$

In order for the price of the J-th product to be monopolistically optimal in terms of profit, the ratio must be fulfilled for its cost price

$$S_J = P_J - A_J \equiv -A_J \times Ln(e \times X \times M^0 \times \mu_J/M_J), \quad (5)$$

where: $e = Exp(1) \approx 2.7183$. Substituting (5) into (3) after the transformations, we obtain for X (the optimal number of cows to be processed) the expression

$$Ln(e \times X) = -[\Sigma_J \mu_J \times A_J \times Ln(M^0 \times \mu_J/M_J) + S^0]/ /[\Sigma_J \mu_J \times A_J] \quad (6)$$

Having determined from (6) X, from (4) and (5), we uniquely determine both the optimal market price P_J and the cost price S_J of each component.

A numerical example of the formulation and solution of the problem is given in (Table 1), where $S^0 = 1.00$ and $M^0 = 250$ are taken as initial data.

Table 1.

№ (J)	μ_J	M_J	A_J	S_J	P_J
1	0.3333	7000	5.00	− 0.025	4.975
2	0.2667	6000	5.00	0.320	5.320
3	0.2000	5000	10.00	1.694	11.694
4	0.1333	4000	6.00	2.110	8.110
5	0.0667	3000	6.00	4.543	10.543

From (6) we get $X \approx 31.0$ and a wide spread of S_J costs and prices. As we can see, it turned out that for component $J = 1$, the cost of $S_1 < 0$. This means that the 1st component is produced in excess using this technology, and for it you need to put $S_1 = 0$, and sell it at a price that provides maximum income $P_1 = P_{W1} \equiv A_1 = 5.0$. Excess production should not get to the market.

For petroleum products, the calculations are similar, but there are nuances when several grades of oil are processed with different yields of refining components from each grade. In this case, it is possible to choose the ratio of the purchased grades of oil so as to ensure the total yield of each component closest to its natural market demand.

Let it be possible to purchase K grades of oil and after processing each grade we have N commodity components $(K \leq N)$ from each grade, but with their different share yield μ_{JL}, where J is the ordinal number of the grade of oil $(1 \leq J \leq K)$, and L is the ordinal number of the component $(1 \leq L \leq N)$. Let λ_J be the volume (or proportions) of purchases of each component. Then the maximum profit for the manufacturer will be when performing L proportionality relations $(\Sigma_J \mu_{JL} \times \lambda_J) \approx C \times M_L$, where C is some constant. The task is to select the values of

λ_J accordingly. The solution of the problem with accuracy up to a constant factor can be obtained by the least squares method, minimizing the quadratic form of deviations $F = \Sigma_L (\Sigma_J \mu_{JL} \times \lambda_J - M_L)^2$ by λ_J. From $\partial F/\partial \lambda_J = 0$ we have a system of K equations in its expanded form

$$\lambda_1 \times \Sigma_L \mu_{1L}^2 + \lambda_2 \times \Sigma_L \mu_{1L} \times \mu_{2L} + \ldots + \lambda_K \times \Sigma_L \mu_{1L} \times \mu_{KL} = = \Sigma_L \mu_{1L} \times M_L;$$

$$\lambda_1 \times \Sigma_L \mu_{2L} \times \mu_{1L} + \lambda_2 \times \Sigma_L \mu_{2L}^2 + \ldots + \lambda_K \times \Sigma_L \mu_{2L} \times \mu_{KL} = = \Sigma_L \mu_{2L} \times M_L; \quad (7)$$

$$\lambda_1 \times \Sigma_L \mu_{KL} \times \mu_{1L} + \lambda_2 \times \Sigma_L \mu_{KL} \times \mu_{2L} + \ldots + \lambda_K \times \Sigma_L \mu_{KL}^2 = = \Sigma_L \mu_{KL} \times M_L,$$

having solved which we find the optimal λ_J. Scaling λ_J so that $\Sigma_J \lambda_J = 1$, we get the desired shares of purchases of the required grades of oil for the mixture. If the price of the J-th grade of oil is equal to P_J, then for the cost of the "mixture" of grades S^0 we have the ratio $S^0 = \Sigma_J \lambda_J \times P_J$, and the fraction of the μ_L of the L-th component of the mixture will be $\mu_L = \Sigma_J \lambda_J \times \mu_{JL}$ and then we optimize the prices and costs of the components extracted from the mixture of grades by known formulas (4)–(6). Table 2 shows an example of calculating the prices of "first grade" oil components, where $S^0_1 = 5.00$ and $M^0 = 250$ are conditionally accepted as initial data.

Table 2.

№ (J)	μ_{1J}	M_J	A_J	S_{1J}	P_{1J}
1	0.28	6000	9.00	4.33	13.33
2	0.22	7000	8.00	7.01	15.01
3	0.20	5000	7.00	4.45	11.45
4	0.18	5000	6.00	4.45	10.45
5	0.12	4000	5.00	4.62	9.62

From (6) we get $X_1 \approx 19.48$ and from (2) the total profit $Q_1 \approx 35850$.

Table 3 shows an example of calculating the prices of "second grade" oil components, where $S_2^0 = 4.50$ and $M^0 = 250$ are conventionally accepted as initial data. The grade of oil is determined by the content of the most "useful" components in it, and the "utility" of component J reflects the parameter A_J of the demand function. So, in "first grade" oil, its total "utility" is equal to $\Sigma_J \mu_{1J} \times A_J = 7.36$, which exceeds the total utility of "second grade" oil $\Sigma_J \mu_{2J} \times A_J = 6.70$, and which in turn reflects the accepted costs $S_1^0 = 5.00 > S_2^0 = 4.50$.

Table 3.

№ (J)	μ_{2J}	M_J	A_J	S_{2J}	P_{2J}
1	0.15	6000	9.00	9.62	18.62
2	0.15	7000	8.00	9.78	17.78
3	0.20	5000	7.00	4.19	11.19
4	0.25	5000	6.00	2.25	8.25
5	0.25	4000	5.00	0.76	5.76

From (6) we get $X_2 \approx 20.22$ and from (2) the total profit $Q_2 \approx 33870$.

The system of equations (7) for calculating the composition of the mixture at K = 2 will take the form

$$\lambda_1 \times 0.2136 + \lambda_2 \times 0.1900 = 5600;$$
$$\lambda_1 \times 0.1900 + \lambda_2 \times 0.2100 = 5200, \qquad (7')$$

with a solution normalized to the unit $\lambda_1 \approx 0.80$ and $\lambda_2 \approx 0.20$. Therefore, by "mixing" two grades of oil in a ratio of 4:1, and recalculating the parameters for the mixture according to the formulas $\mu_{1+2} = \lambda_1 \times \mu_1 + \lambda_2 \times \mu_2$ and $S_{1+2}^0 = \lambda_1 \times S_1^0 + \lambda_2 \times S_2^0 \equiv 4.9$, we obtain the optimal solution already for a mixture of varieties, summarized in Table 4.

Table 4.

№ (J)	μ_{1+2J}	M_J	A_J	S_{1+2J}	P_{1+2J}
1	0.254	6000	9.00	5.00	14.00
2	0.206	7000	8.00	7.35	15.35
3	0.200	5000	7.00	4.28	11.28
4	0.194	5000	6.00	3.85	9.85
5	0.146	4000	5.00	3.52	8.52

From (6) we get $X_{1+2} \approx 19.95$ and from (2) the total profit $Q_{1+2} \approx 36060$. As we can see from the tables, although the volumes of oil purchases satisfy the intuitively expected ratios $X_1 < X_{1+2} < X_2$, nevertheless, for profits, the same inequalities are different $Q_2 < Q_1 < Q_{1+2}$, or in the numbers $33870 < 35850 < 36060$. So, by mixing "good" and "bad" oil in a 4:1 ratio, as a result (according to the profit from the sale of components) we will get oil even better than "good".

Note that as a result of the solution of system (7), the option that some $\lambda_L < 0$ is not excluded. This means that the L-th grade of oil should be excluded from the mixture of K grades and the results should be recalculated. If after recalculation again a certain $\lambda_L < 0$, then the process is repeated. If there are several negative solutions, then they should be removed one by one, starting with the largest modulo. If in the end we come to a positive result $\lambda_K > 0$ only for K = 1, then the data of K grades of oil do not give an optimal (profit-wise) mixture, and the producer can only use "first grade" oil.

Conclusions. An algorithm for calculating prices for goods of different quantity and quality produced from one type of raw material is given, when the output of goods is set by the technology of its production and does not correspond to natural market demand. It is assumed that there is no possibility of selling products in other markets. For oil purchases, an option for optimal mixing of its various grades is considered. The algorithm will provide the greatest profit of implementation.

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EFFICIENCY OF BARTER EXCHANGE

Abstract. The article presents the results of digital modeling on a PC of the barter exchange process in order to assess its effectiveness as a percentage of those who could not make the exchange they needed.

Keywords: Barter, exchange, rating, profit, efficiency.

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ЭФФЕКТИВНОСТЬ БАРТЕРНОГО ОБМЕНА

Аннотация. В статье изложены результаты цифрового моделирования на ПК процесса бартерного обмена с целью оценки его эффективности, как процентного соотношения тех, кто не смог произвести нужный ему обмен.

Ключевые слова: Бартер, обмен, рейтинг, прибыль, эффективность.

Постановка проблемы. В учебниках по экономике словá товарообмен и обмен встречаются часто, преимущественно как синонимы купли-продажи, но анализа чистого бартерного обмена с количественной его стороны нет. Нет однозначного ответа на вопросы: *почему* люди меняются; каковы *пропорции* обмена в условии отсутствия денег и цен; какова *вероятность*, что обмен сможет состояться; почему, если обмен состоялся, то он *необратимый* и т.д.. Если бартер – праматерь рыночных отношений, то почему он не исследован?

Анализ публикаций. Публикаций по *количественному* анализу бартера практически нет, хотя упоминают о нём достаточно часто даже и лауреаты. В [1] читаем воспоминания **Дреза**: «война только что окончилась. Полным ходом шло восстановление экономики… мне очень часто поручали особые задания… организовать бартерные соглашения в Финляндии для того, чтобы обеспечить… фирме оплату оборудования для текстильного производства чугунными чушками». Сам лично занимался *бартером*, а пропорции

обмена (почему столько чугуна за один ткацкий станок) его не заинтересовали. Или лауреат Ричард Талер: «…он предложил бартерную сделку. Он дает мне и моим детям билеты на подъемник и предоставляет снаряжение, а взамен я помогу ему вытащить бизнес из долгового болота» [2, 127]. А не продешевил ли Ричард? Ведь *тащить* бизнес из долгов – это долго, а покатать детишек – пара часов. И странное его заявление об *обмене* денег: «Поскольку убытки значат для нас вдвое больше, чем равнозначная прибыль, то даже обмен двух 5-долларовых купюр на одну 10-долларовую мы будем воспринимать как убыток» [2, 71]. А если Ричард прав, то почему он «прибыльно» не менял 10 $ на килограмм монет по одному центу, и не заполняет монетками карманы и трёхлитровые банки в холодильнике? Или это: «трудовые контракты можно рассматривать частично как обмен подарками» [2, 192]. Почему тогда при *обмене подарками* каждая сторона благодарит другую, а при заключении трудовых контрактов, если не доходит до «рукопашной», то обе стороны,

как минимум, – недовольны? «Мысль» Жана Тироля: «Мы полагаем, что всегда существует некая потенциальная выгода от обмена» [3, 688]. Интересно, в каких *единицах* измерять эту *выгоду*, на бартерном рынке, когда денег нет? А при каких условиях *потенциальная выгода* от обмена становится реальной? В чём *выгода* выражается? Одинакова ли эта *выгода* для обоих участников обмена? Если нет, то почему они меняются, а если да, то что им обеспечивает эту «одинаковость» *выгоды*? И ещё: «производитель, имеющий рациональное ожидание, выигрывает от предложения низкой гарантии в обмен на низкую цену» [3, 175]. Что можно «*выиграть*», предлагая более *низкую* цену за тот же объём товара? У меня и конкурента одинаковое производство. Я ничего не *ожидаю*, а у конкурента – *рациональное ожидание* непонятно чего. Мы оба **одинаково** снизили гарантии и цену, но конкурент *выиграл* (непонятно что и у кого), а я – нет. Где справедливость? А что будет, если его «*рациональное ожидание*» окажется **на практике**… иррациональным? Но Жан категоричен: «нам известно, что конкурентный рыночный обмен между потребителями эффективен» [3, 331]. По определению слов, *потребители* – они потребляют вещи, а если они их выставили на *обмен*, то, в сущности, эти вещи ими потребляться не могут. Я на рынке обменял «шило на мыло». Как узнать, был ли этот обмен *конкурентным* или нет? А в чём выражается эффективность обмена? Что эффективнее: обмен «шила на мыло», или «быка на **ПК**»? Если *нам известна* эффективность указанного обмена, то из каких это источников? Или странное: «Эффективное соглашение о разделе рынка может, например, потребовать от фирмы 2 предлагать меньше, чем ее спрос, в обмен на то, что фирма 1 назначит цену, превышающую монопольную» [3,391]. Итак, фирма 2 сократила предложение (терпит убытки). Её «клиенты» кинулись к фирме 1, а та взвинтила цену выше монопольной. В [6] показано, что лишь монопольная цена даёт продавцу

максимальную прибыль, а уход от неё **в любую сторону** приносит убытки. Получается, что для этих двух фирм – сплошные убытки. Один общий убыток от превышения цены выше монопольной, плюс ко всему фирма 2 сократила производство. Если этот *раздел* рынка эффективен, то есть вопросы. По каким критериям выбирать фирму 2 и фирму 1? На сколько надо снизить предложение фирмы 2, и на сколько выше монопольной цены надо поднять цену фирме 1, чтобы это «соглашение» стало супер *эффективным*? Или ещё перл: «время и усилия, которые требуются для расчета оптимальных решений… обмениваются на неэффективность принятия решений» [3, 77], это в том смысле, что, чем дольше вы принимаете решение, тем эффективнее оно будет, но потраченное время на поиск – это те же убытки. Но как можно *уже* **потраченное** время да на что-то обменять – загадка века. Я с удовольствием обменяю часть своего возраста, потраченного впустую, на что угодно. Перл: «обмен информацией влияет на конкуренцию на товарном рынке и делает ее более или менее согласованной» [3, 606]. А ведь конкуренция – это борьба за выживание всеми средствами, да и любой ценой. Победитель – только один. Тогда, что значит *согласованная* конкуренция? Кто с кем соглашается, и о чём это соглашение? По-моему обмен информацией в таких условиях – открытый и взаимный шпионаж. А как отличить *информацию* от *дезинформации*? Как и в каких единицах измерять уровень *согласованности* и *рассогласованности*? Но Жан – неисчерпаем: «при обмене информацией потребительские излишки уменьшаются, но прибыли и благосостояние растут» [3, 606]. Напоминаю, что излишек потребителя – это его прибыль от потребления купленной вещи [6]. Как можно, уменьшая прибыль потребителя, повысить его благосостояние – за ответом обращайтесь к политикам. Или, что произойдёт, если при обмене вместо информации с одной или с обеих сторон будет *дезинформация*? А вот прямая ошибка: «для покрытия пиковых

нагрузок … по некоторой (возможно, условной) цене … электроэнергетические компании вступают в соглашения об обмене энергией» [3, 31], ибо здесь факт не *обмена*, а *займа* (в долг). Или ещё одна: «Покупатель и поставщик договорились… Торговля не составляет проблемы, и стороны согласны, что товар должен быть обменен в любом случае» [3, 49], ибо здесь тоже не *обмен*, а *торговля* поставщика и покупателя.

Та же ошибка и у лауреата В. В. Леонтьева: «покупатели товара В стоят перед альтернативой либо покупать некое определенное количество товара по определенной цене… либо воздержаться от обмена вообще» [4, 134], где не верно применены термины «обмен»-«альтернатива». Обмен и торговля вещи разные, и отличаются между собой отсутствием\наличием промежуточного агента – денег, а *альтернатива* подразумевает выбор из одинакового набора вещей, но не псевдо выбор «брать, или не брать». А это – загадка грамотным читателям: «отдельные отрасли производства более или менее проникают одна в другую путем обмена» [4, 248], в том плане, как можно проникать *друг в друга*? А как проникать *более* или *менее*? А причём тут обмен, как таковой? А это не мысль лауреата, но бред абитуриента: «Согласно хорошо известной теореме Самуэльсона-Столпера при определенных условиях свободный, беспрепятственный международный обмен уравнивает не только цены на товары и услуги, но также и цены на так называемые первичные факторы производства, такие, как труд, капитал и природные ресурсы» [4, 248]. Но, вопреки своей же «теореме» в другой своей работе Пол Самуэльсон считает иначе, что вообще: «Не существует некоего единого фактора производства, именуемого трудом; существуют тысячи … видов труда» [7, 183]. Но если верна теорема, то цены на лимоны в Воркуте и в Риме должны совпадать. А это не так, хотя никто не препятствует обмену лимонов на Воркутинский уголь. Ещё одна мысль: «в сфере международных экономических отно-

шений, где не только цены обмениваемых товаров, но и размер предстоящих сделок становится предметом переговоров … » [4, 138]. Из Воркуты в Рим **продают** уголь. Из Рио в Воркуту **продают** кофе. Назовите *обмениваемые* товары.

В другой работе Леонтьева читаем, что: «американский работник готов отказаться от примерно 4.7% заработной платы в обмен на свободное время» [5, 222]. Зарплата у всех разная, и свободное время может быть от минуты до нескольких лет. Понятно, что «время-деньги», но где *пропорции обмена*? На сколько дней\часов меняется именно 4.7% заработной платы? А 4.99%? А эта фраза: «обмен товаров отечественного производства на конкурирующий импорт служит средством компенсации … недостаточного предложения капитала и соответствующего избытка трудовых ресурсов в США» [5, 276], говорит, что в США *избыток* трудовых ресурсов и *недостаточно* капитала. Описки нет, ибо далее читаем: «обмен товарами и услугами с зарубежными странами служит средством ослабления давления нашего (это США – В.Ш.) внутреннего избытка трудовых ресурсов и недостатка капитала» [5, 276]. Все считают, что международная торговля (а не обмен) приносит прибыль, но тут нам говорят, что это и средство непонятной *компенсации* капитала и труда, и ослабление *давления* труда на капитал. В США – N рабочих и M капитала. И это их *соотношение* останется неизменным: есть или нет экспорт-импорт с зарубежными странами. Получается, что компенсации нет, а «давление» тоже никак не изменится. Но вот нечто противоположное: «торговля между ними (это США – В.Ш.) и остальными странами мира заключалась бы в обмене американских капиталоемких товаров на иностранные трудоемкие товары» [5, 266], где в США товары капиталоёмкие (значит там **много** капитала), а в остальных странах мира производство трудоёмкое (там **много** трудящихся). Где **реально** избыток капитала и где – трудовых ресурсов установить нельзя. Но вот его верная

фраза об *обмене* вообще: «ссылка на обмен автомобилей на газетную бумагу, достаточно хорошо иллюстрировали логику теоретических доводов, но не имели какой-либо конкретной базы в виде… фактов и цифр» [5, 233]. Или труды экономистов об обмене не основаны на *конкретной* базе.

Вот ряд фраз о бартере без конкретизации источника. Например, у Пола Самуэльсона: «экономисты доказывали, что имел место бурный рост *теневой экономики*, которая включает в себя… безденежный обмен услугами». А как, кому и зачем нужно *доказывать* факт, который имеет место быть? Обратите внимание на *бурный рост* безденежного обмена который экономистами тихо игнорируется в теориях. Подробнее: «теневая экономика… включает в себя широкое разнообразие видов деятельности… азартные игры; проституция; торговля наркотиками; любые виды работ, сделанные лицами, незаконно попавшими в **США** из-за границы; безденежный обмен услугами». Бартер – цветёт и пахнет, а экономисты-лауреаты воротят нос от «запаха». Вот почти верная, но «не экономическая» фраза: «Без денег мы бы постоянно тратили много времени на бартер – прямой обмен блага на благо». Меняют не *благо на благо*, а своё ненужное барахло на «благо», нужное нам [6]. Да, «время – деньги», но где труды экономистов и лауреатов по этой теме: цены времени?

Возьмём операцию обмена валют. Это чистый бартер… Но что читаем у Пола: «Валютный курс представляет собой цену (соотношение), по которой валюта одной страны обменивается на валюту другой страны». Увы, увы. *Соотношение* возможно при **бартере** (1 конь = 2 коровы + 1 овца ± магарыч), и оно безразмерное, а *цена* – выражена в деньгах, на которые покупают и за которые продают. Поэтому *цена* и *соотношение* не корреспондируются. А кто тогда в валютном *обмене* покупает, а кто продаёт? «Покупка» ценных бумаг реально и есть тот **бартерный** обмен, когда один источник дохода (депозит) **меняют** на другой (% по бумагам).

И вот подтверждение Пола: «процентные ставки должны возрасти, чтобы стимулировать людей обменивать свои деньги на облигации и другие неденежные активы». Здесь им принят термин: *обменивать*, но ошибка в слове: *возрасти*, ибо с ростом процентных ставок деньги выгоднее держать на депозитах. А вот «бартер» в верхних эшелонах власти, и не где-то в Эфиопии, а в **США**: «Клинтон пытался провести свой… план через Конгресс, это ему удалось лишь после долгих переговоров с его членами, которые требовали определенных поблажек в обмен на свою поддержку». Если бы Клинтон «купил» конгрессменов за деньги, то это был бы скандальный факт политической коррупции, а так просто *обмен*. Ещё там же (и о том же): «**ФРС** может печатать наличные деньги, в обмен на которые она держит приносящие процент государственные ценные бумаги». Тут без комментариев. Или такое: «тратятся миллиарды долларов в виде потерянного **ВВП** (т.е. в виде разрыва **ВВП**) в обмен на снижение инфляции» … В эпоху отношений купли-продажи нам говорят, что снижение инфляции *меняют* на миллиарды. Как можно «тратить деньги… в обмен»? За деньги покупают, на то они и деньги. Ещё *бартер*: «*Корпорации получили возможность обменять свои высокозатратные долги либо на низкозатратные долги, либо на акции*». Короче, *бартер* существует реально и везде, а экономическая наука – молчит.

Характерны высказывания Пола Самуэльсона по этому вопросу. Ему известно, что в: «Германия. В 1946–1947 гг… существовал черный рынок с натуральным обменом» [7, 33], а почему он существовал – это вне сферы его интересов. И это подтверждает такая его фраза: «мы можем представить себе натуральный обмен, при котором один товар непосредственно обменивается на другой» [7, 45]. Зачем *представлять*, если натуральный обмен существует? И он верно отмечает, что: «обмен гораздо более совершенен по сравнению… когда каждый выступает как мастер на все руки» [7, 45], забывая отметить, что *мастера на все руки* суще-

ствуют и поныне. Отметил он и «недостаток» этого обмена, ибо приходится долго искать «пару»: «При… натуральном обмене… число возможных пар товаров намного превосходит количество… товаров (примерно ½n пар для n товаров)» [7, 45]. Если поверить этой фразе, то мы приходим к «экономическому открытию» Пола, что… (½n >> n). А если всё пересчитать, то *число возможных пар* будет не ½n, а ½ × n × (n − 1). Но, что можно Полу, того нельзя студенту. А в этой фразе ошибка: «Если я покупаю… подержанный автомобиль… мы просто обменялись имуществом… Мы ничего не создали» [7, 198]. Если кто-то продал свой автомобиль, то он им, как транспортным средством уже не пользовался, а покупатель – тот обрел для себя средство передвижения. Следовательно, *обмен* **создал** транспортную единицу. Несмотря на недостатки мастеров на все руки, бартерного обмена и несомненные преимущества денежного обращения, у Пола читаем, что в период гиперинфляции: «каждый стремится запастись «вещами» и отделаться от «плохих бумажных денег» … В результате – частичный возврат к простому продуктообмену, со всеми его неудобствами» [7, 255]. А вывод прост. **Все** эти формы обмена были, есть и будут. А то, что экономисты сконцентрировались на изучении лишь денежного обращения, объясняется просто. Это обращение легко контролировать государству на предмет налогообложения. А все иные способы товарообмена налогообложению не подлежат. При гиперинфляции, когда хвалёное денежное обращение терпит крах, общество «возвращается к истокам». Эту ошибку допустил Маркс в своей теории смены общественно-экономических формаций (первобытность, рабовладение, феодализм, капитал и… коммунизм). Коммунизма мы не дождались, а при хвалёном капитализме «цветут и пахнут»: и феодализм, в форме арендных отношений (отношения феодала и крестьянина – это аренда земли с выплатой ренты); и рабовладение (зайдите в Интернет); и «первобытность» в форме *мастеров на все руки*. И в подтверждение слова

Пола о «современном» человеке: «Если его… перенести на необитаемый остров, что он сможет купить на свои деньги?» [7, 31]. Или насчёт *плохих бумажных денег* при гиперинфляции. Почему они становятся *плохими*? Ответ находим у Пола: «деньги… бумажные… являются деньгами потому, что государство декретировало их как деньги». Значит, *плохие деньги* у того государства, которое теряет власть, а экономика тут не при чём.

Цель статьи. Если под эффективностью бартерного (денежного) рынка понимать отношение успешных сделок обмена (продаж) ко всем практически возможным, то нашей задачей будет численное определение эффективности, и того, какие параметры товаров и самого рынка и как влияют на её уровень.

Изложение основного материала. Отмечу, что бартерный обмен просто моделировать на **ПК**. Первое, что приходит на ум – каждый товар имеет свой рейтинг, и при обмене меняются товары «близких» рейтингов. Никто не будет менять карандаш на шубу, но обмен шубы на корову вполне возможен. Пусть на рынке N участников и у каждого *один* товар. Каждый случайно подходит к любому и предлагает обмен. Если разность рейтингов товаров их устраивает, то товары меняются и пара уходит с рынка. В итоге на рынке остаются лишь те, у которых рейтинги товаров существенно разнятся. Расположим товары по возрастанию их рейтинга, и пусть рейтинг товара равен его номеру в ряду. Карандаш будет иметь рейтинг 1, а шуба – **последний**. Предположим, что рейтинговая «оценка» всех товаров для всех контрагентов одинакова, но рейтинг своего товара у всех нулевой, хотя владелец знает его «истинный» рейтинг в глазах других. Если вам не нужна шуба, вы её на карандаш не поменяете, а, например, на корову – согласны. Ситуация моделировалась на **ПК**, для 60-и значений *разности* рейтингов товаров R для обмена при N = 1000000 участников. В конце рассчитывался % оставшихся, по отношению к N. Результаты моделирования приведены на (Рис. 1 (*слева*)). График

серого цвета – это когда у каждого всего один товар для обмена и он практически идеально аппроксимируются гиперболой $P \approx 27/(\frac{2}{3} + R)$. Как видим, при **эквивалентном** обмене по Марксу (когда $R \approx 0$), когда меняются товары приблизительно равных рейтингов, *обмен возможен*, хотя и занимает много времени, но **процент** неудачников обмена $P(0) \approx 40.5\%$, а при обмене не более, чем «соседних» рейтингов ($R \leq 1$) неудачников меньше $P(1) \approx 16.2\%$.

Примечание. На денежном рынке при линейном спросе на товар $n = N \times (1 - P/D)$, где: P – цена товара, N – максимальное число желающих купить, при себестоимости товара S, оптимальная цена производителя $P_O = \frac{1}{2} \times (D + S)$ и доля *неудовлетворённого* спроса $1 - n/N = P_O/D \equiv \frac{1}{2} \times (1 + S/D) > 50\%$. Или приведенный в модели вид бартерного обмена эффективнее (по количеству удачных сделок) денежного обращения (но без учёта фактора времени).
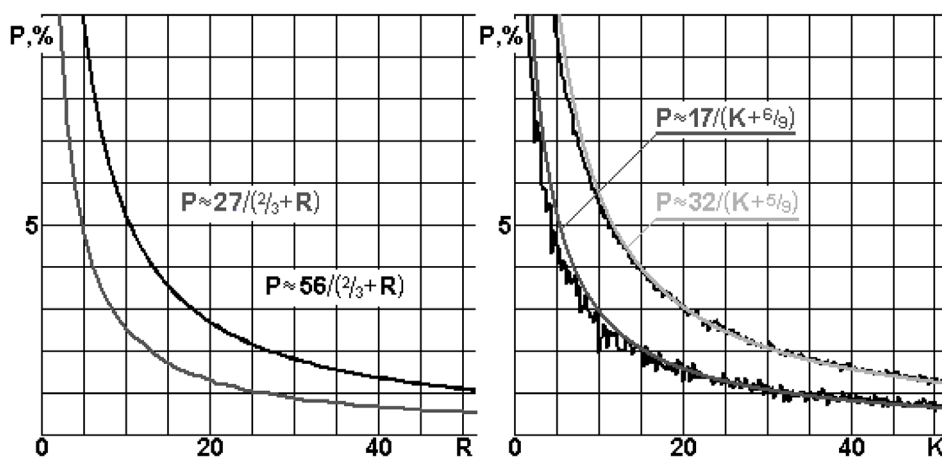
Рисунок 1. Неудачи обмена на бартерном рынке

На (Рис. 1 (*слева*)) график чёрного цвета – это когда у каждого на обмен много товаров, но одного рейтинга (в модели принято 1000), и эффективным считается уже обмен у того производителя, которому удалось обменять **все до одного** свои товары (это уже обмен не «ненужными» товарами, а когда их производят специально, но для бартерного рынка). Аппроксимация данных тоже гиперболой, но $P \approx 56/(\frac{2}{3} + R)$. Но здесь $P(0) \approx 84.0\%$, а $P(1) \approx 33.6\%$. Или чем больше на руках товара для обмена, тем труднее **их всех** обменять.

В [6] доказано, что на бартерном рынке товары меняются не по их эквивалентной «стоимости», которая никогда не известна, а по примерному **эквиваленту прибыли** от их потребления будущими владельцами. Ведь на бартер каждый выносит вещь, которая ему «не нужна», точнее, которую он не может прибыльно потреблять,

в надежде выменять своё «не нужное» на вещь «нужную», полезную – из которой он в её потреблении способен извлечь **прибыль**. Балерина и плотник обменяют топор (если он есть у балерины) на пуанты (если таковые есть у плотника), но никак не наоборот.

Рассмотрим вариант бартера, когда вместо **рейтинга** оценку товара проводят по его *прибыльности* в потреблении. При этом каждый однозначно оценивает прибыльность всех товаров, кроме своего, который по некоторым причинам прибыльно потреблять уже не может. Расположим товары в ряд по возрастанию прибыльности. Полагается также, что всем известен полный список товаров, и каждый способен потреблять любой товар, кроме своего. Если список товаров, желательных к потреблению, ограничен, то это просто скажется на времени поиска нужной вещи

(а время мы здесь не учитываем). Введём шаг по прибыли для моделирования $\Delta Q = 0.2 \times (Q_{MAX} - Q_{MIN})/(N-1)$. Тогда пара товаров будет обмениваться, если разность (по модулю) между их прибыльностью потребления ниже, чем $K \times \Delta Q$, где переменная К – аналог рейтинга R в предыдущей модели. Результаты моделирования на ПК даны на (Рис. 1 (*справа*)). Чёрная линия – результат прямого моделирования, а серые – это аппроксимации соответствующими уравнениями, найденными по методу наименьших квадратов (**МНК**). «Верхняя» пара линий – итог моделирования для равномерного распределения прибылей на некотором интервале, нижняя прорисована для экспоненциального их распределения. И видим, что неудачи «рейтингового обмена» (серый график *слева*) занимают положение почти точно посредине *между* «неудачами экспоненциального и нормального распределений» соответствующей прибыльности товаров (графики *справа*).

Как видим для равномерного распределения «прибыльности» вещей на бартерном рынке число неудачников обмена $P(0) \approx 57.6\%$, и $P(1) \approx 20.6\%$, а для экспоненциального соответственно $P(0) \approx 25.5\%$, и $P(1) \approx 10.2\%$. Кстати, ближе к реальному рынку именно экспоненциальное распределение прибыльности потребления товаров поскольку для него характерно малая плотность высоко прибыльных вещей и большая плотность т.н. «барахла».

Выводы. Показано, что бартерный обмен реализуется не по примерно равной «стоимости товаров», а по примерно равной *прибыли* их потребления уже «новыми» владельцами. Каждый выносит на обмен свой «бесполезный» товар, который он по каким-то причинам *прибыльно* потреблять не может, в надежде обменять его на конкретный (иногда и на любой) товар, способный в потреблении принести *прибыль*. Виды товаров для обмена (или пропорции обмена для «бесконечно делимых» товаров) устанавливаются контрагентами, по их оценке объёмов будущих *прибылей* от потребления. Бартерный обмен необратим, поскольку нечто бесприбыльное-бесполезное, бывшее «на руках» до обмена, превращается для каждого в то, что принесёт *прибыль*. Число тех, кто не сможет прибыльно обменять «шило на мыло» – в пределах 10…21%.

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INCOMPETENT MANAGERS, BACHELORS AND THE CONSEQUENCES OF "CASUAL RELATIONSHIPS" IN ECONOMY

Abstract. Objective probabilities of failures (risks) for some of the economic and other social types of people's relationships are calculated, such as: appointment of an incompetent manager, unsuccessful attempt to marry, failures to find counterparties for random economic transactions, failures in the "formation of a labor collective", etc.

Keywords: Incompetence, risk, bad outcome.

Problem statement. Everyone is familiar with such a concept as failure, but how much failures are objective in a statistical sense and what part of them is determined by subjective factors has not really been investigated. The problem is to calculate the value of the objective (unavoidable) failure factor for the subsequent assessment of competence in the activities of performers. As the laureate Richard Thaler correctly noted, people: "can reduce the risk of mistakes and all kinds of difficulties, but these risks will never disappear" [2, 347].

Analysis of publications. We often meet with people who are incompetent in their field of activity. It is possible to explain each specific case quite simply, but the question arises what will happen if we try to somehow "eliminate" this phenomenon; is it possible in principle; and if not, what will be the largest remaining percentage of "incompetent"? Laureate Richard Thaler [2] noted the famous: "Peter's principle: promotion ends when a person reaches the level of his incompetence", which indicates the objectivity of this phenomenon. He explained it from the standpoint of psychology that: "People are overconfident. They think they are competent enough… but in fact their competence… is much lower". The phrase is logically contradictory, because if *all people* overestimate their competence, then who (if not the Lord God) can really assess their competence? There is no question of a method of assessing competence,

because there is no single numerical scale for measuring it. Especially when, in his opinion, is often: "It is useful to hear the opinion of a layman about… the problem. There is always a chance for a fresh look", but the "competence" of a layman is zero (on any scale). A strange phrase: "A person will strive to avoid risk for the sake of profit, but strive for risk for the sake of loss". A person striving for a loss, and even risking something, is no other than an economist. Richard: "the dream of an updated economic theory has come true thanks to the emergence of a large number of young creative economists who are ready to take risks and break with traditional approaches in economics". If a certain theory is correct, then updating it means replacing it with a false theory. And why is that? But if it is false, then the maximum that an economist "risks" is to break off relations with Orthodox colleagues and… will get a Nobel Prize.

An example of the experience of the Modigliani laureate [1]: "The Rector of the university invited a wonderful new dean Howard Bowen. But the old and incompetent teachers (!! – V. Sh.) could not accept the fact that Bowen brought talented people with him. They managed to survive Bowen". Incompetence, as we can see, is very tenacious not only in everyday life, but even in the "scientific" environment. However, there is an opposite opinion. Blanchard's question: "Many of these people occupying new posts seem to be very competent…", where there is

clearly a hint of incompetence and "high-ranking" individuals. And here is the "answer" from the Kornai laureate: "There is natural selection – if you are incompetent, having only the right friends is not enough" [1], which is refuted by the centuries-old practice of public administration. Even laureate Volker argued that: "The functioning of… institutions should be carried out with the proper degree of competence, professionalism" [1], but not everything that should be carried out is feasible in reality. Marx believed that communism should be realized in the future, but it did not work out.

Jean Tirol also considers the problem of incompetence of company managers from the standpoint of psychology [3]. Here is his lengthy phrase that the science of economics there are: "models in which … the costs of regulation are associated with the study of the characteristics of employees. The firm… is gradually finding out which tasks are solved best by everyone. The choice is between rapid growth and errors in the distribution of work and … slow growth and achievement of goals… the theory reflects the sound understanding of officials that human capital is a serious limitation during periods of expansion… of an economy with insufficient managerial talents". Here are the *characteristics* of employees, their insufficient *talents*, some *common sense* and inevitable *mistakes*… Everything is characterized by one term – incompetence. By the way, he also notes that: "there are rare factors, such as managerial talent". And if this is the case, then most managers are untalented or incompetent. Jean even has: "…an arbitrator may be incompetent in making an accurate decision, but may have enough information to outline a set of acceptable decisions". No one will guarantee that this arbitrator will outline the entire set of acceptable solutions. A phrase that raises doubts about the scientific competence of the laureate-Jean: "We can distinguish two… cases of decision-making processes that… manage unforeseen accidents". If Jean can control randomness, then why doesn't he play on the stock exchange? And if these accidents are also

unforeseen, then who reports them to Jean, because for everyone the unforeseen means the unknown. Or a strange phrase: "this $1 increase in profit leads to an increase in the manager's salary in the range from $0 (full insurance) to $1 (residual claims). However, this does not necessarily have to be fulfilled", because the question arises: how much will the manager's salary increase if the specified condition is still not met, i.e. the profit increased by $1, and the manager's salary also increased, but not in the range $(0…1)$? But how? And it's strange how someone: "can damage the future career of a manager by reporting "bad news" about his abilities. Then the market imposes sanctions on the talent of the manager and restrains him …". Sanctions can be imposed on you by a legal entity or an individual, but not by a "faceless" market. And how can sanctions be imposed on… talent? And what does it mean to restrain talent? How that? And this is not clear in terms of causality: "the manager automatically discovers that he did not work because he received a low profit", and logically the phrase should sound like this: "the manager automatically discovers that he received a low profit because he did not work".

It is strange that: "…the passivity of managers invalidates the profit maximization hypothesis". But I believe that their excessive activity in the field of profit-stealing also invalidates this hypothesis. And who is right? But activity-passivity are ways of moving towards a certain goal. But for Jean: "It doesn't matter how much managers prefer achieving other goals, and it doesn't matter how hard it is to find a profit-maximizing strategy". And if this is the case, then the "hypothesis" *does not matter*.

By the way, logically competence and risk exclude each other. Those who are competent do not take risks, because they calculate everything, and the ignorant take risks and act "at random". Competence and risk are in a sense antonyms. In this regard, some of Jean's thoughts are not entirely clear. We read: "The manager is somewhat not risk averse" [66]. In the economic literature, the phrase "degree of risk"

is found at every step. And here it is not clear how the "some degree" of the manager himself is also superimposed on it. And how will the meaning of the phrase change if it is read like this: "The manager is somewhat risk-averse"? Since the degree of risk itself is unknown, both phrases sound identical. Along the way, I will completely incomprehensible provisions. Jean has: "high-risk consumers" and: "low-risk consumers". How to distinguish them is not said. But Jean insists that his: "consumers differ in the degree of risk". I am a fruit consumer, but I have no idea how to classify myself. Nevertheless, Jean puts forward the position: "let's assume that the consumer knows his parameter of the degree of risk … but the firm does not know". Without an unambiguous description of the method of determining the "degree of risk", this assumption is on the verge of stupidity. Especially when Jean happens that: "the degree of risk is not monotonous", without deciphering the concept of monotony in this case … How to understand these two phrases: "The manager is somewhat not risk averse" and: "the manager becomes infinitely not risk averse"? The first of them can be written like this: "The manager is somewhat prone to risk", and the second one can be painlessly removed from the word "infinitely". And how to understand that: "the manager is risk-neutral"? After all, if risk is an "objective" reality (failure or loss) accompanying any activity, then you can only be risk-neutral by doing nothing (but there is also a "risk" of dying of hunger). But with Jean: "the manager can always refuse to work". Still unclear: "the agent assumes all the risk, which does not matter, since he is risk-neutral". How is it possible, having taken on the load, to be neutral in relation to it? How, then, does "neutrality" differ from "infinite non-inclination"? By the way, how are "all risk" and "degree of risk" related? Which of them is bigger and how much? In what units should risks be measured, with what device? If the risk is identical to the probability of failure, then why do they buy lotteries, where the probability of losing is 95% and they will never jump with a parachute with

a probability of not revealing it of only 5%? Or this: "Managers, however, may have different attitudes to risk … it often turns out that managers are too careful when choosing … decisions". If the solution is chosen, it does not matter how: carefully, too carefully or recklessly. It is possible to talk about caution only if it is possible to refuse all options at all. And if the risk in its quantitative sense is understood as the probability of a generally "unexpected" outcome (such as a meteorite falling into soup), then here is Jean's opinion: "Unfortunately, the degree of "unpredictability" and complexity is difficult to determine empirically". Nobody knows anything about the width of the numerical scale of this degree. And since Jean has it: "managers are infinitely not inclined to receive risk-related income", they do not have failures, and, if you look from the outside, they are all "infinitely" competent, which I very much doubt.

The purpose of the article. Putting aside all the "individual" characteristics of managers, whil trying to simulate the situation on the PC and find out the probability of the manager being "on the wrong place" (to be infinitely incompetent) and what exogenous parameters determine this probability.

Presentation of the main material. Let's first consider the simplest task at first glance: how to optimally distribute N "portfolios" between N deputies's. Here, a "portfolio" is any managerial position for which N candidates are applying, and *optimally* means that each of the candidates will be competent "in his place". There are two extreme options. When each candidate is "competent" in only one field (in this case, the place of each is uniquely determined); and when everyone is "competent" in all areas of management (when the most competent holds the most "bread" position, and for the remaining N – 1 candidates, the process is repeated). This option is the most optimal, but in both cases there will be no "incompetent" bureaucrats in the management … The situation is different when (on average) each of the N candidates is competent in managing L (L << N) areas. In this case (when allocating seats

according to the second option), it may turn out that the places in which the next candidate is competent are already occupied by more competent "comrades" and he will have to choose a place where he is generally incompetent.

A similar situation occurs in the "marriage market" [4], when there are N pairs of grooms and brides and everyone has L (L << N) options for choosing a partner. In this case, for example, the richest groom takes the most beautiful bride. For the remaining (N − 1) pairs, the process is repeated. As a result, it may well turn out that all the familiar girls of the next groom married earlier to richer competitors and she will remain a bachelor. And vice versa. If an "ugly" girl has only rich suitors among the candidates for husbands, then they will be married to "beauties" and the girl will remain unmarried.

Another example of life support for a limited group of people, each of whom has several professions. The situation is the same: all the places in which the next candidate is competent are occupied, and he is forced to take the "wrong place". This is the case in any highly specialized "organizations": medicine, the army and, alas, even in science, where random people work alongside qualified specialists. Moreover, even in the state, with the overproduction of "specialists" of any profession, some of them are forced to do "not their business".

This kind of task also allows for its economic interpretation, if deputies are replaced by manufacturing firms of some products, and instead of "portfolios" we understand the buyers of these products. Each of the **N** manufacturing firms has several (L) purchasing firms, and, in turn, the purchasing firms have several (L) suppliers "in mind". Firms do not conclude long-term contracts, but "call" each other as necessary, randomly with offers, respectively, to sell or buy goods. In this case, even with an "equilibrium" market, when demand is almost equal to supply, there may be situations when the manufacturing company will be denied a random purchase by all its L "familiar" buyers, or the manufacturers will

refuse to supply goods to the purchasing company, although with a wider range of their counterparties (when L => N) such wouldn't have happened.

The modeling algorithm is simple. An empty matrix [N×N] was set, in which N units were randomly entered, so that there were no empty rows and columns in it. This means that each deputy can occupy one seat. Then, in the same matrix, another (K − N) "units" were randomly "thrown" into empty places, which set the average number of L = K/N seats from the "sphere of competence" of deputies. Further, starting from the "fattest" portfolio and below, the employment process was underway, the portfolio was occupied by the most competent. The matrix [(N − 1)×(N − 1)] remained and everything was repeated until the moment when there were deputies who were completely incompetent in any of the remaining spheres of activity. After that, the "lucky" and "unfortunate" were accounted for, and the cycle of dividing places was repeated many times to account for average results. The number of repetition cycles was 10000. The number of deputies N = 149 is chosen purely out of convenience for the logarithmic scale of the argument, because $Ln(149) \approx 5.00$. The average number of K/N vacancies of "competence" was taken as an argument.

If the matrix of "portfolios" and deputies is not square, then the model and calculation will not change, but the results will be different. If there are more deputies than "portfolios", then the percentage of incompetents will decrease, but unemployed "servants of the people" will appear, otherwise part of the incompetent will also… decrease, but at the same time empty vacancies will remain without managers at all.

For the economic interpretation of failures, the modeling is similar, and there was no criterion for choosing a partner-initiator of the transaction in this case, and the contacts of the firms were established randomly. Figure 1 (*left*) shows a graph of the percentage of unsuccessful transactions depending on the average number of K/N counterparties for

each firm, and Figure 1 (*right*) shows the standard error of unsuccessful transactions in the same absolute percentages. These charts are "fair" for an equal number of counterparties in the market (N = 149). Naturally, for another number of firms M, the vertical scale of the accuracy graph (on the right) will increase by $(N/M)^{0.5}$ times. As we can see, the most "difficult case" for "casual relationships" occurs when the average number of "partners" of each firm is L = K/N ≈ 2.72, while only ≈ 85.0% of transactions are completed successfully. It was not possible to prove this "theoretically".
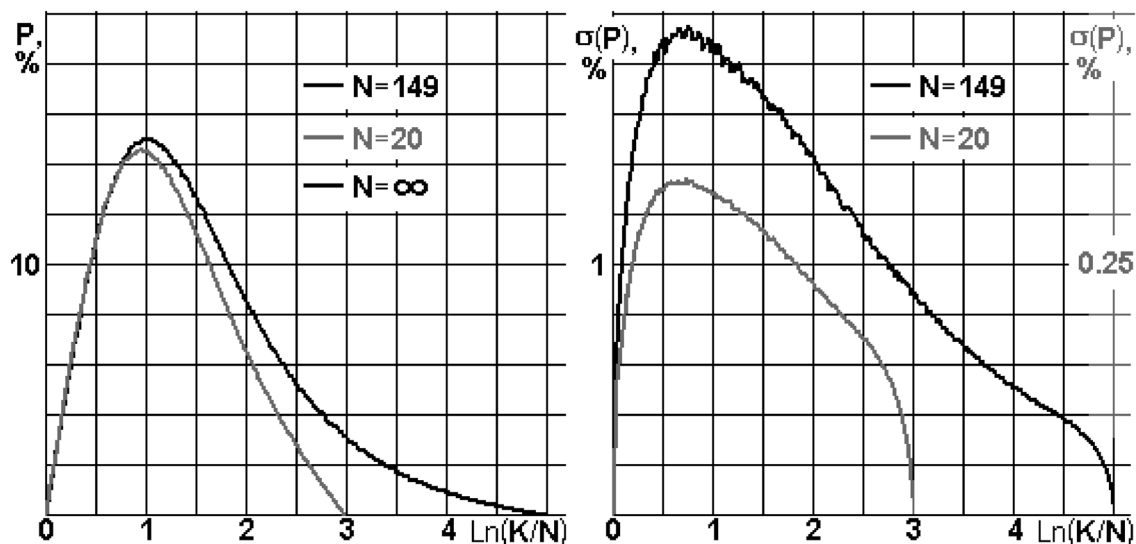
Figure 2. Failure of the transaction. Probability P and error σ(P)

Figure 1. (*in gray*) shows graphs for a "small" number of counterparty pairs N = 20, based on the same considerations of "convenience" Ln(20) ≈ 3. As you see, the "point" of the losers' maximum has shifted slightly, and the margin of error of transactions in the most unfavorable case has decreased by ~ 5 times. With an increase in the number of participants N => 8, the graph (on the left) in the "initial" part is identical to the "black" graph (in the same place at N = 149).

Conclusions. It is established that for some types of economic and other types of social interactions of people there is an objective probability of their "unsuccessful" completion, the upper limit of which is exactly equal to 15.0%. It is shown that the growth of options for "free" choice does not always reduce the percentage of subsequent failures. In some cases, there is a critical average number of options equal to ≈ 2.72 at which the percentage of failures is maximum.

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Section 7. Logistics

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THE NEED FOR PERFORMANCE INDICATORS IN TRANSPORT LOGISTICS ENTERPRISES

Abstract. This article examines the necessity, methods and main indicators of determining efficiency and evaluating it in enterprises providing transport logistics services. The main performance indicators that can be used in transport logistics enterprises are presented.

Key words: efficiency, key indicators of efficiency, efficiency assessment, transport logistics enterprises, cargo transportation, vehicles.

Introduction

Determining the level of efficiency of the work performed or the service provided in each organization serves to ensure the future perspective of the activity of this organization. It is also important to determine efficiency in enterprises that provide transport logistics services.

In Uzbekistan, the issue of determining and increasing the efficiency of the transport logistics sector is urgent. This can also be seen through statistics. The number of newly established enterprises in the transportation and storage sector of the economy increased by 164% in 2021 compared to 2013, and by 110% compared to 2020. This shows that the demand for services in this field is increasing in the economy of our country. Transport services in our country are mainly carried out by road transport. The volume of motor transport services increased by 115.5% in 2021. The volume of goods transported by road transport from 2010 to 2021 showed only an increasing trend and reached 1282 million tons in 2021. This is 90% of the total volume of transported goods. Taking into account that transport services have a large share, determining the performance indicators of enterprises providing transport logistics services, their improvement and increase will lead to the growth of our national economy.

In enterprises operating in the field of transport logistics, the determination of efficiency is generally expressed through the profit received and logistics costs in the management chain. Determining profitability in the field of logistics services requires a somewhat unique approach. Because such enterprises do not have uniform standards for calculating efficiency. It is for this reason that efficiency determination is carried out on the basis of a general methodology, taking into account the specificity of the enterprise's activity. This article talks about performance indicators in enterprises operating in the field of transport logistics.

Methods

The concept of efficiency usually expresses the ratio between the achieved result and the spent resources. Determination of efficiency in enterprises providing transport logistics services is also carried out on the basis of this efficiency principle. The pur-

pose of determining efficiency in transport logistics enterprises is to know how work is distributed between each participant in the delivery process. The success of the company's activities, which stage is lagging, identifying the shortcomings and eliminating them in time are based on these performance indicators. Currently, when talking about efficiency, the term KPI (key performance index), i.e. key indicators of efficiency, is used more widely.

This term was proposed by Peter Druker in the 1960s, who explained the need for this system through his expression "a strategy without measurement is just a desire" [5]. This system became widely used after 2000 years. KPI is mainly considered as a tool for evaluating the performance of employees, increasing profits, and achieving goals in enterprises and organizations. Today, KPI is widely used to determine the share of employees in the overall result, set bonuses, and motivate. When determining the main indicators of efficiency in transport logistics enterprises, it is necessary to study them not only in the activities of dispatchers, but also in each stage of the processes.

There is no universal classification of KPI in the field of transport logistics. According to Y. Melnikov, the main performance indicators can be divided into two groups: service and financial indicators. In this case, service indicators refer to services related to logistics operations.

Service KPIs include: perfect order, on-time shipment, on-time return of documents.

The financial KPI includes the ratio of the cost of delivery to the sales volume, the average cost of shipments, the ratio of the transported cargo to the capacity of the vehicle (utilization level).

According to K. S. Kryvakin firstly indicators which illustrate the effectiveness of all logistic system should be classified on base of activity of enterprise. He divided indicators in 6 groups:

1. Delivering system
2. Storage
3. Transportation
4. Producing system
5. Sales system
6. Information system

Each if this system has its own indicator for evaluating the effectivenss. Enterprises can calculate these indicators independently. The company may also include other indicators that it believes have an impact on performance among these indicators. In general, the company itself determines how many indicators should be taken as the main ones.

Kaplan and Norton believed that the number of such indicators should not exceed 20, and Hope and Fraser should not exceed 10. Based on the experience of business activities, he considered the «10/80/10» rule to be the best choice. According to this rule, an enterprise or organization must have 10 key performance indicators, up to 80 production indicators and 10 key performance indicators. According to Panov, no more than 10–15 indicators should be applied to departments. Because as the number of indicators increases, more weight falls on the divisions. The main time is spent on planning processes according to these indicators, their analysis. This does not have a significant effect on increasing the overall efficiency [3].

Based on Panov's proposal, we summarize the main influencing indicators for transport logistics enterprises. Panov and other scientists used this rule in the example of enterprises engaged in production to determine the efficiency of their employees and certain processes. Continuing with this idea, the following 10 performance indicators can be used in the field of transport logistics:

1. The level of availability of vehicles of various sizes — the availability of vehicles, trucks, airplanes and helicopters, which are widely used in the transportation of goods, and the possibility of using sea and railway transport without problems are assessed. 5 types of freight transport are considered as 100% according to which of them are available.

2. The degree of capacity utilization of the cargo transport vehicle.

3. The time when vehicles are not busy with cargo transportation during the period of general use. In this way, you can find out the technical capability of the vehicle and the extent to which it has been used. Based on this indicator, it will be possible to choose one of the following options: purchase, stop using, or use outsourcing.

4. Cargo storage capacity — the number and capacity of warehouses of this enterprise, the possibility of storing what types of cargo are evaluated.

5. The ratio of the storage time of cargo in warehouses to the duration of delivery of the total cargo.

6. The ratio of returned goods to the total transported goods due to the deterioration of the quality of goods during unloading, storage, reloading.

7. The ratio of the goods delivered by the enterprise during the month, quarter, year to the total goods transported in the area where the enterprise operates. This indicator can be used to increase competitiveness and plan future business expansion. This indicator can be used to plan which season to increase or decrease cargo transportation, and when to use outsourcing. This indicator can be divided into sub-indicators and used for planning by studying the section of cargo transported by each vehicle.

8. The dispatcher's time to complete one order. In this case, it is necessary to calculate the time of execution of the order in the segment of large, medium and small loads. Also, it is necessary to calculate a separate time consumption according to the distance of delivery of the cargo.

9. The dispatcher's level of monitoring of cargo by means of transport. From this, it is possible to find out which type of vehicle the dispatcher performs well in tracking cargo. Dispatchers are tasked with this indicator when distributing orders.

10. Degree of completion of orders. The ratio of orders completely fulfilled by the enterprise to total orders. In this case, orders canceled or returned due to the fault of the company or by the customer should be expressed in a separate sub-indicator.

These indicators mainly depend directly on the capabilities of the transport logistics enterprise. Basically, the indicators represent the efficiency of using the company's service capacity (vehicles and warehouses), the efficiency of dispatchers and the level of satisfaction with delivery in 3 directions.

Among these indicators can be included indicators that represent processes related to formalization. Among these indicators, an indicator of the level of flexibility of the transport logistics system available in the enterprise can be added. As the demand for goods and services changes not only in quantity, but also in quality, delivery and storage services, as well as payment methods for these services, must be ready for change. The widespread use of digital technologies in this field also requires the system to be flexible to changes.

These 10 indicators were proposed based on the analysis of transportation services provided by transport logistics enterprises. Some metrics may not be key performance indicators for some businesses.

2 methods are usually used to determine the efficiency of transport logistics activities.

1. The method of evaluating efficiency through criteria that can be calculated through objective-accurate quantitative measurements.

2. Subjective — a method of evaluating efficiency using criteria that cannot be expressed by quantity.

The indicators proposed to be used in the expression of efficiency given above are calculated only by exact numbers.

Summary

In order to measure efficiency, the enterprise should introduce indicators, change them, introduce new ones, and temporarily abandon some of them. These indicators should be constantly monitored. Because they are based on only one of the efficiency assessment methods. While there is a difference between the 2 methods of performance evaluation, there is also a relationship. A major problem in evaluating efficiency through these methods is that some indicators require both quantitative and qualitative

performance. This makes it difficult to express them through a common parameter. In order to avoid such problems, the following 4 main indicators should be analyzed when evaluating efficiency:

1. General expenses. Each cost is grouped and indicators show their share in the total cost.

2. Duration of the logistic cycle. Indicators representing the time it takes to complete one order.

3. Quality of service. This indicator is summarized by getting answers to questions on several criteria based on feedback from customers.

4. Logistic efficiency. An indicator that represents the distribution of the received profit by each stage of the logistic cycle.

Through the analysis of these indicators, issues of further improvement are considered by assessing the level of efficiency. Today, the most optimal way to increase efficiency in transport logistics enterprises is the maximum automation of processes. Implementation of this method, in turn, creates a number of difficulties.

The calculation of the proposed efficiency indicators will show at which stage in the activity of transport logistics enterprises the result is good and which link is leaking. The main advantage of these indicators is that their calculation is simple. It can bu calculated without any special progamm software. In addition, they can be adapted to the main purpose of the enterprise.

Overall the effectiveness of enterprise mostly calculated by the dividing the profit to the expenditure. However this cannot illustrate detail information. While using key performance indicators it can be seen all process performance.

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