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Conditions for Successful Active Investment in Terms of the State and the Far-sighted Interests of the Business

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Abstract. For the macro characteristic of active investment, we introduced the concept of the technical productivity of investment. It characterizes an investment's capacity to reduce the norm of material or labor costs.

Based on the technical productivity of investment, we derived the equation (not identity) of economic dynamics.

We have proposed measuring the efficiency of investments by added-value to reflect their effectiveness for the business owner's far-sighted interests in minimizing the turnover of skilled workers. We have proposed to use the criteria in terms of the state – the maximum of the real GDP growth and the maximum of the sum of real GDP for the country as a whole.

We defined the limits of an investment's technical productivity, for which the investor receives the desired payback or effectiveness, and an economy in maximal development.

For this, we used our causal simulation model of Ukraine's economy dynamics, which, in contrast to the known models, reflects the main types of legal and shadow economic activities in their relationships.

Keywords: technical productivity of active investment, efficiency of investment by added-value, criteria in terms of the state, limits of investment technical productivity for successful investments, model of legal and shadow economic activities

1. Introduction

The general pattern of changes in the sectoral structure of the world economy is a consistent transition from primary industries (agriculture and mining) to secondary industries (manufacturing and construction), and then – to tertiary industries (services). Leading countries are increasingly focusing on research and innovation. The growth rate of knowledge-intensive products is much higher than usual – 6.5 against 4%, and key technologies – 8%. As a result, world trade structure is changing: in 1991, science-intensive products accounted for 48% of global exports, in 2005 – more than 55%. Simultaneously, the share of high-level technologies remained virtually unchanged (about 32%), and the share of key technologies increased from 16.4 to 23.5% (World Economic, 2005).

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These structural changes undoubtedly affect Ukrainian exports, and since raw materials (ferrous metals, low-processing chemicals, agricultural goods) are its lion's share, this impact is negative – Ukrainian exports are declining. Ferrous metals have been reduced by the fact that one of the largest importers of Ukrainian steel, China, built its own plants and significantly decreased its import rates.

Exports are among the most influential factors in the development of the Ukrainian economy, so its reduction significantly reduced the country's real GDP. There seems to be only one way out – Ukraine must respond to modern structural changes in world trade in an adequate manner. This path includes radical structural changes in both the financial and non-financial sectors, increasing the efficiency of services in the public administration sector, reducing the tax burden, including corruption, which should facilitate the radical de-shadowing of the economy.

The only way to increase exports is the way of the world's leading countries – the development of science-intensive industries. This path will undoubtedly lead to a successful and sustainable development of the Ukrainian economy. But it requires a large investment. Investments in traditional industries work almost certainly (of course, if they are modern and these traditional goods do not lose competitiveness and are in demand on the world market). Still, innovative investments have an inherent risk.

The investor and the government need to know precisely the effect of the investment. This work is devoted to determining the conditions under which the investor will receive the expected return, the investment is efficient, and the country's economy grows steadily.

2. Analysis of Publications

Investment is mostly explored for its payback, which is a microeconomic approach (Kouser, Saba & Anjum, 2016; Linhares, Moraes da Costa, Beiruth, 2018; Majeed, Zhang & Umar, 2018; Rad, Embong, Mohd-Saleh & Jaffar, 2016; Biddle, Callahan, Hong, & Knowles, 2015; Lara, Osma, & Penalva, 2016).

In scientific literature (for example, Zemtsov, 2008; García-Sánchez, and García-Meca, 2020) and in state recommendations (Methodological recommendations for assessing the effectiveness of investments and their selection for financing, 2000), many aspects of the economic efficiency of investment projects are considered: the Payback Period, Profitability Index, Internal Rate of Return, etc. However, they are all based on various modifications of their profitability, in which the result indicator is a profit.

However, if a government decides whether to support certain investments or chooses between several investments the most promising for the state, it should not proceed from payback (which is a good criterion for a particular investor), but from criteria, which reflects the interests of the state. The efficiency of investment activity from the state's point of view usually means not efficiency for the entire state, but only for the budget, for example (Bychkova, Yudina, 2016).

Besides, payback reflects only the short-term interests of a business owner. The business owner requires a criterion for their long-term interests.

On the other hand, payback is the **output economic** characteristic of investment. But there is no such **input** characteristic of investment, which can be said: "If it is more than a certain level, the payback will be in two years."

We want this input characteristic to allow us to explore a single investment and a whole set of them by country or industry, regardless of their specific content.

We want to determine the conditions that will provide to a single or aggregated-by-country or -industry investor, the expected profit in different economic situations, and conditions on maximizing GDP growth in the country. In order to do so, the following factors must be met:

1) Investors and the government must have an input macro-characteristic of investments, regardless of their specific nature.
2) Investors and the government must have reason to trust our calculations. This requires a high-quality model of an economy, which, on the one hand, reflects all of its spheres (production, distribution, domestic and foreign trade, finances, budget, etc.), and, on the other hand, reflects the shadow and legal economic activities in their interconnection.

Such a model was devised by the author of this paper. The model features that ensure its adequacy to the economy of Ukraine are given in Vasylenko (2020), and full description of the model – in Vasylenko (2016).

We will discuss a macro characteristic of investment in the next chapter.

3. Research methodology

It cannot be said that such a macro characteristic of investment was not used before. The creators of economic dynamics, Robert Solow (1956) and Roy Harrod (1973) did not set themselves the task of creating such a characteristic. However, because they considered capital growth, and it is due to investment, they eventually developed a macro characteristic of investment, albeit uninformative. They calculated the results of investments in terms of the growth of one factor of dynamics – capital. On the other hand, the indicator of technical progress was exogenous. It was not related to investment. It is not clear why these scholars have not linked investment, on the one hand, to the growth of capital, and on the other hand, to technical progress.

One of the indicators of technical progress is reducing the rate of material or labor costs due to active investment. But the ability of an investment to reduce the rate of material or labor costs has not yet been measured. This characteristic is the direct technical result of active investment and a direct factor in increasing an enterprise's competitiveness. Economists, having such a characteristic of investment, can quantify the potential of the totality of any investment, regardless of their specific nature. That is, they will be able to move from the microeconomic level to macroeconomic analysis.

To fill this gap and move to the macro level, we introduce an indicator that we refer to as the *active investment's technical productivity*. We accept that the technical productiv-

ity of an active investment is equal to 1 if the rate of decrease in the rate of expenditure (per unit of output) is equal to the increase of the active part of fixed assets through this investment. If technical productivity is 2, then the reduction is twice as much. A state's Ministry of Economy should measure the technical productivity of an active investment, which is reviewed twice: (a) at the planning stage and (b) after receiving the investment results. To do this, the rate of decrease in the rate of expenditure (first planned, then actual) must be divided by the rate of the increase of the active part of fixed assets through this investment. Below, we set different productivity levels in the model and assume that planned and actual productivity is equal.

Having an indicator of the technical productivity of investment can determine what level of productivity is needed to meet the requirements of the investor, or to increase the country's GDP to a certain level, or to ensure sustainable development, or to conduct a study of investment that would be nationwide or designed for a specific industry or enterprise.

Besides, having an indicator of the technical productivity of investment, we can no longer derive identity, but the equation of economic dynamics, which links the GDP growth rate with the endogenous factor of technical progress – investment, a source of which is income. We now consider only such investments. Foreign investment and investment due to loans are not considered here.

Why have we remembered identity? The fundamental equation of Harrod's economic dynamics determines the growth rate: the amount of savings expressed as a share of net income divided by the capital ratio. Roy Harrod sometimes calls the capital ratio an indicator of capital intensity: the greater the amount of investment (additional capital) required to provide a unit of output growth or income, the higher the capital ratio. But the growth of GDP, divided by its primary value, is the rate of economic growth. So Harrod's basic formula is nothing more than some identity wherein the result determines the same result. If we solve it, we get the following identity: savings equals the capital increase.

Roy Harrod understood this perfectly himself; moreover, he emphasized that this equation is a truism because it is easily deduced from the standard definitions of macroeconomic variables included in this equation. However, he called this identity by an equation. On its varieties – the equations of a guaranteed and natural growth rate, recommendations to the governments of different countries were calculated to forecast and regulate the rate of economic growth in the 1960s. But only in 6 of the 88 countries where they were used were the expected results obtained (Easterly, 1997). Attempts to predict economic growth based on the Harrod-Domar model have failed. The researchers concluded that the model does not explain the main determinants of economic growth. And how could it explain if it is not an *equation* but *identity*? **The rate of output growth does not follow from this identity**. What the increase in output in the capital ratio we set, the same increase in output we get at the output of the Harrod's fundamental equation of economic dynamics. And the golden rule is equally unfounded.

Our indicator of technical productivity of investment solves two problems: it is a new macro characteristic of investment and lets us transform the Harrod identity into an

equation by introducing into its right part not a dependent variable – the capital ratio – but an independent variable that characterizes the investment.

Let us show developing such an equation on an example of defining the relationship between the GDP growth rate and investments of the first type, the source of which is income, at certain their technical productivity.

Our model grouped all the diversity of investment activities into four types of investments:

a) Investments for one year to reduce the norms of material or labor costs per unit of traditional products; it is accepted that on average, such investments pay off in a year. The model provides an opportunity for each aggregate company to take loans. For investments of this type, it is assumed that loans for them are taken on average for one year, and returned the following year with interest.
b) Investments for creating a new variety of goods sold at a higher price, the costs of which will be lesser or greater (the rate of change in price and cost can be adjusted). It is accepted that they give a return in three years on the fourth. Loans for them are taken for six years and returned in 4, 5, and 6 years in equal parts. One can direct the investments (a) and (b) to the modernization of one, several, or all types of goods which are in our model (Vasylenko, 2020); one may take no loans.
c) Investments into housing construction. It is accepted (as it really is in Ukraine) that buyers pay in advance (therefore, the builders do not take loans). Buyers may take loans for 10 years and return them in 1-10 years in equal parts.
d) Investments for recovering worn-out or obsolete fixed capital.

We will take for the basic economic cycle[1] the data of the industry of Agriculture, forestry and fisheries of Ukraine in 2017. The output is O= UAH 837733 million, intermediate consumption IC = UAH 522575 million (share in output ic = 0.624), GDP G = UAH 315158 million (share in output g = 0.376), wages of employees S = UAH 54657 million (share in output s = 0.065), taxes on production minus subsidies on production and imports T = UAH 7935 million (share in output t = 0.009), gross profit, mixed income P = UAH 252566 million (share in output p = 0.301), fixed assets K = UAH 500000 million, the active part of fixed assets AK = UAH 227095 million (specific weight ak = 0.454), depreciation rate n = 0.05, accumulation rate na = 0.2, technical productivity of investments tpi = 0.2 (primary data are taken from (The costs-issue table for 2017 in consumer prices, 2020), while specific indicators are our calculations on these data).

We assume that all the depreciation of this industry goes to recoup its worn-out or obsolete fixed capital, and the accumulation in this industry minus depreciation - on active investment to reduce the rate of material costs.

Investments formed in the base cycle and invested in the first cycle were as follows:

[1] For the convenience of applying the existing statistical accounting, it is accepted that one cycle is equal to one year.

$I_1 = na*(P-AM) = 0.2*(252566-25000) = 45513.2$ (1)

The share of the active investment in the active part of fixed assets of the industry was in the basic (zero) cycle

$ai = I/AK = na*((1-ic-s-t)*O-n*K)/(a*K) = 45513.2/227095 = 0.2004$ (2)

The reduction in the rate of material costs in this industry in the next (first) cycle at the technical productivity of investments $tpi = 0.2$ was

$rm_1 = 1-tpi*ai = 1-0.2*0.2004 = 0.9599$ (3)

Then, with the constancy of other factors, in the first cycle the industry output did not change, because all the increase in fixed capital went to active investment to reduce the rate of material costs. There was no investment to increase production.

$O_1 = O = 837733$ (4)

Material costs (intermediate consumption) were reduced according to formula (2):

$IC_1 = rm_1*IC = (1-tpi*ai)*IC = 0.9599*522575 = 501619.74$ (5)

As a result, GDP growth due to this decrease (i.e., due to increasing economic efficiency) was in the first cycle

$$rg_1 = ((O_1-rm_1*IC_1)/G-1)*100 = ((1-ic*(1-\{tpi*na*[(1-ic-s-t)*O-n*K]\}/(a*K))/g-1)*100 = ((837733-0.9599*522575)/315158-1)*100 = 6.65\% \quad (6)$$

Formulas (1-6) are **equations** (not **identity)** of economic dynamics through investment to reduce material costs at their certain **technical productivity**.

Now we deduce the equation of economic dynamics through investment to reduce labor costs. The reduction in labor costs in this area in the first cycle is determined by the same formula (3). As in the previous situation and for the same reason, the industry's output was not changed (4). The intermediate consumption and GDP was not changed either

$IC_{l1} = IC = 522575$; $G_{l1} = G = 315158$ (7)

but GDP was redistributed between wages and profits. According to the reduction of labor costs in this area in the first cycle, the number of employees will decrease by rm_1 times. If each employee's salary decreases or increases due to investment, this will be taken into account in the coefficient rm_1. Therefore, after the introduction of this ratio, we can assume that the salary is unchanged. Then the number of wages decreased in rm_1 times in the first cycle:

$S_{l1} = S*rm_1 = 54657*0.9599 = 52465.25$ (8)

Then the gross profit in the first cycle increased to

$P_{l1} = G_{l1} - S_{l1} - T_{l1} = 315158-52465.25-7935 = 254757.75$ (9)

As a result of reducing the number of wages paid, the employees' demand for consumer goods will decrease accordingly. Their savings will also decrease. But due to the

increase in gross profit, business owners' demand for consumer goods, their savings, and investment will also increase. And this growth will be much greater because, in our example, gross profit exceeds the amount of salary by almost five times. It will increase consumer and investment goods production, which will increase demand for all types of goods. That is, the multiplier will work. Systems of equations are recurrent. It is not easy to solve them explicitly. Our model solves them by sequential approximations implemented in Excel using macros developed by the author. But to assess the economic dynamics in the first approximation, we can give solutions in quadrature. While maintaining the rate of accumulation in the first cycle constant $na_1=na$, investment, formed in the first cycle and invested in the second cycle, will increase:

$$I_{l2}= P_{l1}*na=254757.75*0.2=50951.4 \quad (10)$$

Investments formed in the base cycle and invested in the first cycle were smaller (1).

In the first cycle, the active part of fixed assets increased by the amount of active investment:

$$AK_{l1} = AK + I_{l1}=227095+45513.2=272608.2 \quad (11)$$

The share of active investment in the active part of the fixed assets of the industry is in the first cycle equal:

$$ai_{l1}= I_{l2}/AK_{l1}=50951.4/ 272608.2=0.1869 \quad (12)$$

The reduction in the rate of labor costs in the third cycle is

$$rm_{l3}=1-tpi* ai_{l2}=1-0.2*0.1869=0.96262 \quad (13)$$

GDP growth due to this decrease will be in the third cycle

$$rg_{l3}=((O_{l1}-rm_1*IC_1)/G-1)*100=((1-ic*(1-\{tpi*na*[(1-ic-s-t)*O-n*K]\}/(a*K))/g-1)*100=((837733-0.9599*522575)/315158-1)*100=6.65\% \quad (14)$$

The industry's GDP, wages, gross profit, and investment in the third and subsequent cycles will change according to formulas (7-14).

We have fulfilled both requirements set out in the introduction: we have introduced an input macro characteristic of investment – an indicator of an active investment's technical productivity – and have created a model adequate to the economy of Ukraine. So we can now adopt the straightforward methodology of our research: we study the Ukrainian economy dynamics over 5, 10, and 15 year cycles for different types of investment at different levels of their technical productivity and compare options. To increase confidence in the correctness of the results and conclusions, we do it for the two states of the Ukrainian economy: for the period 2007-2021 (because this model was created at that time), and for the period 2017-2032 (because at the beginning of this study all data from 2018 was not yet available). After considering all options, we can recommend the best ones to the government and investors.

What criteria will we use to compare options? As it was said, many aspects of the economic efficiency of investment projects are based on various modifications of their profitability, in which the result indicator is a profit. It reflects only the short-term interests of a business owner.

We measure investment performance more broadly – by its full added value. Since it includes wages, this indicator reflects efficiency in terms of the business's far-sighted interests in minimizing skilled workers' turnover. Since it includes taxes, this indicator reflects the efficiency in terms of government and budget.

However, the maximum added value for a given type of investment in a given type of product does not yet mean obtaining a maximum added value or GDP for the country as a whole; that is, it is no criterion in terms of the state. Therefore, we will also apply criteria in terms of the state.

So, at the same time as payback, our model calculates the investment efficiency indicator by GDP, that is, the ratio of real GDP growth for one or more subsequent year cycles to the amount of real investment in previous year cycles for this type of investment in a given type of product, as well as the real GDP growth and the sum of real GDP for the country as a whole for all year cycles. The difference between the last two criteria is clear – the last criterion gives a more even development of the country. In contrast, the penultimate one gives more GDP growth in the last cycle due to a slower development in the first cycles.

The payback period indicator is criticized when cash flows are not the same across years, and it does not take into account the change in the value of money over time. Therefore, in our model, the payback period for one or more year cycles is defined using the dynamic method (Pogorelov, 2010): as the ratio of the real (adjusted for price) investment invested in one or more year cycles to the amount of real gross profit earned in one or more subsequent year cycles.

We can now apply our model to determine the effectiveness and productivity of investments of various types, and to find the limits of investment productivity, after which the investor will receive expected profit, and the limits which will result in a stable development of the Ukrainian economy.

Besides, the model determines the production volumes of consumer, intermediate, and investment goods and housing and the quantities of imports of those goods needed to balance supply and demand. The reductions in real GDP that will occur if these volumes deviate from equilibrium can be determined.

All known models fulfill a balance between supply and demand. We did not see a model that would describe non-transient non-equilibrium situations. However, each entrepreneur knows about unrealized goods (SNA transfers these situations into equilibrium by transferring unrealized goods into next year's balances). No model measures the GDP produced and consumed and allows the deviation towards over- and under-production. Our model offers these capabilities. We have found the negative impact of imbalance always. Therefore, we will not analyze non-equilibrium situations.

The model provides the ability to change prices and volumes of exports in the devaluation by the classical theory of foreign trade or set their other levels. Recall that the classical theory of international trade considers only sales and foreign exchange earnings. The exporter's profit, the wages of its hired workers, and the GDP created in exports are not considered in this theory. Our model, on the contrary, explores these indicators, so our results under different pricing policies could be very interesting **for exporters**.

We noticed that in all variants, the GDP of intermediate goods for the domestic market and the GDP of the distribution of their imports and financial services decreases. It is a direct result of the investment. Investments in the previous cycle decrease norms of material costs per unit of production (including the intermediate one) in the current cycle; therefore, the net profit per unit of each product increases; thus, the consumption of investment goods, and thus their production, increases. With the growth of their production increases the mass of net income and wages. Consequently, the use of consumer goods is rising, and thus their production. The growth of their production increases the mass of net income and wages. Consequently, the use of consumer goods rises. Thus, their production requires more intermediate goods, but a decrease in all products' material costs (including intermediate consumption) reduces the demand for them to a greater extent. Therefore, the resulting investment effect reduces the overall demand for intermediate goods. Their production, imports, and financial services are declining.

As GDP (generated in the production of intermediate goods, of financial services, and the distribution of intermediate consumption imports) decreases, and while the output of these goods and services, due to the low initial efficiency of the Ukrainian economy, is very significant (in 2017, it was 40% of the total output), this decrease sometimes exceeds the increase of all other goods and services. As a result, the amount of real GDP in the country has declined.

This reduction is a progressive phenomenon, the result of a reduction in material costs of all goods. However, we are used to seeing GDP growth as a progressive phenomenon. Therefore, to separate the progressive decline of GDP from the regressive one, we propose excluding intermediate consumption goods, distributing their imports, and financial services from aggregate performance indicators (GDP, gross and net income, wages, etc.). It is also necessary to exclude goods and services produced for the budget because the decrease in intermediate goods also reduces their deductions to the budget. Similarly, it is necessary to summarize the input indicators. We shall call such indicators **eliminated**. Such indicators are given below.

4. Determination of productivity and effectiveness of investments

Since the model (as well as the real economy) is substantially nonlinear, its response to the same factor can be very different in different situations. Therefore we will study the reaction of the model in conditions as close to real life as possible.

Therefore, we will accept the annual devaluation of the hryvnia by 10%, the annual growth of domestic prices for all goods and services 10%, as well as external prices and

physical volumes of legal and illegal exports of final and intermediate goods constant on 2018 levels throughout the years. The same will take the exterior prices of legal and illegal imports of final, intermediate, and investment goods, and housing.

We will leave the distribution of income and loans between households and the non-financial sector, and their distribution for various purposes (to increase working capital, to invest in reducing material and/or labor costs per unit of traditional products; to invest in creating new varieties of goods that will be in high demand and sold at a higher price, for housing construction, etc.), as in 2018. The model will calculate the import volumes of these goods precisely according to the demand for them.

We set the following shadow parameters:

a) The overall level of shadow production is adopted by 32% according to the Ministry for Development of Economy, Trade and Agriculture; the model itself determined the levels for each product; they turned out to be different in different products, just like in the data of the Ministry;
b) Ten percent of salaries are paid illegally;
c) Material costs are overstated by 10%;
d) The prices of public procurement are overvalued by 30% on domestic goods and by 50% on imported ones;
e) The state does not return VAT of UAH 20 million,
f) Bribes to officials make up 20% of the shadow profits of enterprises. The shadow parameters in pp. b, c, d, are expertly established by a discussion with practitioners.

The most promising are investments of the second type.

4.1. Investments of the second type with different productivity

Option 57[2]. If the technical productivity of the investments of the second type is 0.1, the total (official plus shadow) real GDP for 15 cycles decreases by 24.4%, roughly the same as for investments first type (Table 1, first column, first three rows).

Option 58. The productivity is 1. The price of consumption goods in the fourth cycle has increased not very much: by 3%, and for investment goods – by 5.5%. However, the state of Ukraine's economy has improved significantly: real total GDP in 15 cycles has increased 22 times, the sum of real GDP – to 82.7 trillion UAH, the amount of GDP for 1-5 periods – to 7.319 trillion UAH (Table 1, fourth column).

Investment efficiency is high: the payback period on investment for 15 years-cycles on average for all commodities is 0.01 years, and the investment efficiency by GDP varies from 2.15% for export goods of intermediate consumption to 9.06% for products of final use (Table 1 sixth column).

Real budget, social security, and pension funds revenues have more than quadrupled in 15 cycles.

With high technical productivity, the second type of investments are much more efficient than investments of the first type.

[2] Original numbering saved.

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Table 1. Dynamics of Ukraine's economy for 15 cycles (2018-2032) with different technical productivities of second-type investments and changes in exports

Amounts (trillion UAH) and GDP indices (%)	**Option 57. Exports are unchanged Iz=10%, I_D=10%, R=0.1**			**Option 58. Productivity is equal R=1**			**Option 61. Exports change according to the devaluation R=1**			**Option 63. Export price index Iz = 0.98, volume Iv=1.02, R=1**		
Goods:	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***
The sum of real GDP for 15 cycles trillion UAH	18,262			82,714			9,315			42,329		
The sum of real GDP for 1-5 cycles trillion UAH	6,944			7,319			4,797			7,109		
Real GDP index for 15 cycles for the country	-24,411	0,276	-9	2071	0,010	3,51	-79,67	-375400	0,0	625	0,115	47
Real GDP index for 15 cycles consumer non-tradable goods	-50,5	0,287	-30	1446	0	5,02	233	0,2724	43,4	439	0,111	38
Tradable consumer goods sold on the domestic market	-48,9	0,288	-18	1424	0,008	9,06	221	0,2742	40,6	423	0,119	40
Intermediate goods sold on the internal market	-57,0	0,287	-28	-39	-49540	0,00	151	0,2780	27,9	-50	0,215	-14
Housing sold on the domestic market	-42,1	0,273	-30	1794	0,009	3,32	1201	0,2501	72,2	550	0,119	29
Investment goods sold on the domestic market	-29,6	0,268	-18	4125	-60232	0,00	1496	0,2512	72,6	1185	0,091	65
Consumer goods export	8,3	0,264	3	7348	0,008	3,45	-1527	-4920,36	0,0	853	0,118	57
Intermediate export	11,2	0,266	3	2402	0,012	2,15	-812	-4225400	0,0	919	0,117	56
Consumer import distribution and trade	-51,6	0,282	-28	586	0,021	8,18	61	0,2764	25,4	165	0,139	35
Distribution and trade in intermediate imports	-52,4	0,288	-30	-60	0,036	-5,14	86	0,2828	26,1	-62	0,233	-23
Housing import distribution and trade	-48,7	0,278	-23	-99	0,162	-21,6	-100	0,3009	-54,8	-98	0,291	-54
Investments import distribution and trade	-40,4	0,276	-16	-26	0,058	-1,03	-101	0,3019	-37,7	-76	0,257	-23
Consumer goods distribution	-37,5	0,291	-10	1547	0,010	2,95	283	0,2781	40,6	492	0,121	30
Consumer trade	-40,2	0,288	-12	1491	0,010	3,28	270	0,2766	40,2	471	0,122	31
Real income to the budget for 15 cycles billion UAH	336,9			-1181			962			-42		
Real income in social security and pension funds billion UAH	3432			15919			7879			8232		
The sum of budget, pensions and social insurance billion UAH	1787			6288			2029			3687		

Continuation of Table 1. The results of investments of the second type at different levels of shadow and legal production, shadow wages, and the overestimation of material costs

Amounts (trillion UAH) and GDP indices (%)	Option 66. Iz = 0.98, Io = 1.02, 1% of shadow production goes to legal one			Option 67. Basic level of shadow and legal production, shadow wage 5%			Option 68. Material costs overstated by 5%		
	Iz=10%, I_D==10%, R=1			Iz=10%, I_D=10%, R=1			Iz=10%, I_D=10%, R=1		
Goods:	*G*	*OK*	*EF*	*G*	*OK*	*EF*	*G*	*OK*	*EF*
The sum of real GDP for 15 cycles trillion UAH	39,699			41,879			52,547		
The sum of real GDP for 1-5 cycles trillion UAH	7,173			7,089			7,470		
Real GDP index for 15 cycles for the country	534,22	0,132	48	611,29	0,117	47	951	0,074	36
Real GDP index for 15 cycles consumer non-tradable goods	375	0,128	37	427	0,113	38	673	0,069	33
Tradable consumer goods sold on the domestic market	361	0,137	39	411	0,121	40	653	0,075	38
Intermediate goods sold on the internal market	-51	0,229	-15	-50	0,217	-14	-48	0,170	-11
Housing sold on the domestic market	476	0,136	29	536	0,121	29	808	0,075	24
Investment goods sold on the domestic market	1019	0,105	65	1155	0,092	65	1826	0,057	52
Consumer goods export	746	0,132	62	842	0,119	57	1118	0,083	36
Intermediate export	783	0,132	61	903	0,118	56	1407	0,076	37
Consumer import distribution and trade	138	0,158	33	159	0,141	34	269	0,092	37
Distribution and trade in intermediate imports	-62	0,245	-24	-62	0,234	-23	-63	0,193	-20
Housing import distribution and trade	-98	0,293	-55	-98	0,291	-54	-98	0,286	-49
Investments import distribution and trade	-77	0,264	-25	-75	0,256	-23	-81	0,243	-21
Consumer goods distribution	423	0,140	30	479	0,123	30	738	0,075	25
Consumer trade	405	0,140	30	458	0,124	31	709	0,075	27
Real income to the budget for 15 cycles billion UAH	7966			8149			10282		
Real income in social security and pension funds billion UAH	3564			3762			4269		
The sum of budget, pensions and social insurance billion UAH	11530			11911			14551		

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Table 2. Dynamics of the Ukrainian economy for 15 cycles (2018-2032) while reducing the investment of the second type in a "good" economic situation

Amounts (trillion UAH) and GDP indices (%)	**Option 71. Iz = 0.98, Io = 1.02, investing in all goods at 100%**			**Option 72. Iz = 0.98, Io = 1.02, 10% reduction in investment in final consumption goods**			**Option 73. A 10% reduction in investment in intermediate goods for export**			**Option 75. A 10% reduction in non-tradable final consumer goods**		
Goods:	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***
The sum of real GDP for 15 cycles trillion UAH	62,747			61,793			50,835			62,305		
The sum of real GDP for 1-5 cycles trillion UAH	7,079			7,073			7,035			7,071		
Real GDP index for 15 cycles for the country	1421,1	0,033	15,7	1390,52	0,034	16,3	988,449	0,050	25,0	1405,2	0,033	15,7
Real GDP index for 15 cycles consumer non-tradable goods	643	0,035	15,6	628	0,035	16,1	429	0,057	21,4	620	0,031	17,3
Tradable consumer goods sold on the domestic market	621	0,034	15,6	606	0,035	16,1	411	0,057	21,1	615	0,034	15,4
Intermediate goods sold on the internal market	-52	0,088	-6,1	-52	0,090	-6,3	-54	0,135	-9,1	-51	0,087	-5,9
Housing sold on the domestic market	2135	0,034	16,8	2089	0,034	17,4	1466	0,054	24,7	2105	0,034	16,7
Investment goods sold on the domestic market	4692	0,031	19,1	4594	0,031	19,9	3192	0,047	30,4	4622	0,031	19,0
Consumer goods export	1626	0,035	14,1	307	0,054	7,1	4379	0,036	38,1	1614	0,035	14,0
Intermediate export	2087	0,033	14,7	2207	0,033	15,5	1086	0,052	21,5	2072	0,033	14,6
Consumer import distribution and trade	237	0,040	18,1	231	0,041	18,6	147	0,068	21,1	234	0,040	17,9
Distribution and trade in intermediate imports	-68	0,108	-14,2	-67	0,110	-14,5	-69	0,162	-19,4	-67	0,107	-14,1
Housing import distribution and trade	-99	0,271	-39,5	-99	0,271	-39,9	-99	0,282	-45,6	-99	0,271	-39,5
Investments import distribution and trade	-97	0,262	-18,4	-97	0,261	-18,6	-95	0,267	-22,5	-97	0,261	-18,3
Consumer goods distribution	705	0,037	14,8	690	0,038	15,2	478	0,061	20,0	698	0,037	14,6
Consumer trade	676	0,037	14,8	661	0,037	15,2	457	0,061	20,0	669	0,037	14,6
Real income to the budget for 15 cycles billion UAH	10390			10196			8618			10307		
Real income in social security and pension funds billion UAH	1624			1624			1635			1624		
The sum of budget, pensions and social insurance billion UAH	12014			11821			10252			11931		

Continuation of Table 2. Dynamics of the Ukrainian economy for 15 cycles (2018-2032) while reducing the investment of the second type in different types of goods in a "good" economic situation (Export Price Index 0.98, volume 1.02 with 10% devaluation)

Amounts (trillion UAH) and GDP indices (%)	**Option 76. A 10% reduction in investment in tradable consumer goods**			**Option 77. 10% reduction in investment in intermediate goods**			**Option 78. Reduction of 10% of investment in investment goods (without housing)**			**Option 79. Reduction of 10% in housing investment**		
Goods:	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***
The sum of real GDP for 15 cycles trillion UAH	62,305	-0,71		61,458	-2,05		60,157	-4,13		62,337	-0,65	
The sum of real GDP for 1-5 cycles trillion UAH	7,071	-0,10	-1,12	7,053	-0,37	-3,19	7,009	-0,99	-6,12	7,076	-0,03	-1,02
Real GDP index for 15 cycles for the country	1405,225	0,033	15,7	1375,84	0,033	15,6	1334,15	0,034	15,8	1406,6	0,033	15,6
Real GDP index for 15 cycles consumer non-tradable goods	620	0,031	17,3	623	0,035	15,2	602	0,036	15,5	636	0,035	15,4
Tradable consumer goods sold on the domestic market	615	0,034	15,4	585	0,031	17,0	581	0,036	15,5	614	0,034	15,4
Intermediate goods sold on the internal market	-51	0,087	-5,9	-50	0,086	-5,8	-53	0,081	-7,2	-52	0,088	-6,1
Housing sold on the domestic market	2105	0,034	16,7	2052	0,034	16,4	1998	0,035	17,0	2090	0,030	18,9
Investment goods sold on the domestic market	4622	0,031	19,0	4495	0,031	18,8	4376	0,031	19,8	4634	0,031	19,0
Consumer goods export	1614	0,035	14,0	1591	0,035	13,8	1542	0,037	14,2	1612	0,035	14,0
Intermediate export	2072	0,033	14,6	2043	0,033	14,4	1968	0,035	14,8	2069	0,033	14,6
Consumer import distribution and trade	234	0,040	17,9	228	0,040	17,5	219	0,042	17,7	234	0,040	17,9
Distribution and trade in intermediate imports	-67	0,107	-14,1	-67	0,106	-13,9	-68	0,110	-14,3	-68	0,108	-14,2
Housing import distribution and trade	-99	0,271	-39,5	-99	0,271	-39,6	-99	0,270	-39,7	-98	0,254	-33,6
Investments import distribution and trade	-97	0,261	-18,3	-97	0,259	-18,1	-96	0,250	-16,9	-97	0,261	-18,4
Consumer goods distribution	698	0,037	14,6	675	0,033	16,2	662	0,038	14,7	698	0,037	14,6
Consumer trade	669	0,037	14,6	647	0,033	16,2	634	0,038	14,7	669	0,037	14,6
Real income to the budget for 15 cycles billion UAH	10307			10149			9958			10321		
Real income in social security and pension funds billion UAH	1624			1625			1649			1622		
The sum of budget, pensions and social insurance billion UAH	11931			11773			11607			11944		

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Table 3. Dynamics of the Ukrainian economy for 15 cycles (2018-2032) while reducing the investment of the second type in different types of goods in a "bad" economic situation (Export Price Index 0.922, volume 1.034 at 10% devaluation)

Amounts (trillion UAH) and GDP indices (%)	**Option 80. Iz = 0.922, Io = 1.034, Investing in all products at 100% level**			**Option 81. Iz = 0.922 Io = 1.034, 10% reduction in investment in consumer export goods**			**Option 82. 10% reduction in investment in export intermediate goods**			**Option 84. A 10% reduction in non-tradable consumer goods**		
	G	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***	***G***	***OK***	***EF***
Goods:	9,315			9,212			9,146			9,126		
The sum of real GDP for 15 cycles trillion UAH	4,797			4,795			4,788			4,786		
The sum of real GDP for 1-5 cycles trillion UAH	-79,67	-664708	0,0	-81,743	-6634535	0,0	-81,237	-661463	0,0	-80,60	-651633	0,0
Real GDP index for 15 cycles for the country	233	0,272	43,4	233	0,273	43,4	234	0,273	43,7	226	0,245	48,1
Real GDP index for 15 cycles consumer non-tradable goods	221	0,274	40,6	221	0,274	40,7	222	0,274	40,9	221	0,274	40,7
Tradable consumer goods sold on the domestic market	151	0,278	27,9	151	0,278	27,9	152	0,278	28,0	152	0,278	27,9
Intermediate goods sold on the internal market	1201	0,250	72,2	1202	0,250	72,4	1206	0,250	72,9	1202	0,250	72,4
Housing sold on the domestic market	1496	0,251	72,6	1496	0,251	72,7	1502	0,251	73,3	1492	0,251	73,0
Investment goods sold on the domestic market	-1527	-4920	0,0	-1551	-4428	0,0	-1539	-4920	0,0	-1526	-4920	0,0
Consumer goods export	-812	-38586	0,0	-815	-38586	0,0	-818	-34728	0,0	-811	-38586	0,0
Intermediate export	61	0,276	25,4	61	0,276	25,4	62	0,276	25,7	61	0,276	25,4
Consumer import distribution and trade	86	0,283	26,1	86	0,283	26,2	86	0,283	26,3	86	0,283	26,1
Distribution and trade in intermediate imports	-100	0,301	-54,8	-100	0,301	-54,8	-100	0,301	-54,8	-100	0,301	-54,8
Housing import distribution and trade	-101	0,302	-37,7	-101	0,302	-37,8	-101	0,302	-37,8	-101	0,302	-37,8
Investments import distribution and trade	283	0,278	40,6	283	0,278	40,7	284	0,278	40,9	282	0,278	40,7
Consumer goods distribution	270	0,277	40,2	270	0,277	40,3	271	0,277	40,5	270	0,277	40,3
Consumer trade	7879			7880			7890			7833		
Real income to the budget for 15 cycles billion UAH	2029			2030			2032			2030		
Real income in social security and pension funds billion UAH	9908			9910			9922			9863		

With low technical productivity, investments of the second type, like the first one, have almost no effect on the development of the Ukrainian economy. Still, with high productivity, they improve it much more than the first type. The higher the technical productivity of investment, the more significant the GDP growth generated in the production of investment and final consumption goods, and across the country.

4.2. Investments to create new goods (second type) with changes in export

Option 61. Currently, Ukrainian exports consist mainly of intermediate goods, in which price elasticity is low. Consequently, under devaluation, according to the classical theory of foreign trade, the currency price decreases faster (7.8%) than the sales volume (3.4%); therefore, both foreign exchange earnings and profit generated in exports decrease very sharply. For 15 years, the benefit decreases up to significant losses that exceed salary and taxes. As a result, the total GDP created in exports becomes negative.

In a real enterprise, which produces many types of goods, one may not notice such a phenomenon against the background of GDP growth in other products, but its owners need to be aware of this possibility and check the results for each good. The country's total GDP decreases by 15%, significantly less than for the first type of investment (28.5%). Therefore, in the context of a deteriorating economy due to devaluation changes in exports according to the recommendations of classical foreign trade theory, the second investment type is not effective enough, though much more effective than investments of the first type.

Of course, we cannot talk about the return on investment in exports with negative profits, or regard the efficiency by GDP with negative GDP. To mark this, we put unrealistically large negative numbers in these cells of Table 1 (seventh column, lines ninth, tenth).

The reaction of the Ukrainian economy in 2006 was similar.

Option 63. Contrary to classical theory, exporters increase export value by 2% and reduce their foreign exchange prices by 2% in each cycle (if international markets allow it). The results of investments of the second type with technical productivity 1 are much better, especially for the export itself and the whole country (Table 1 tenth column, rows third, ninth, tenth). The improvements are much more significant than for the investment of the first type. The reaction of the Ukrainian economy in 2006 was similar.

The refusal of exporters from the classical theory of foreign trade creates the right conditions for developing the economy in general and investment. The difference in economic results with the different behavior of exporters is so significant that below we will be forced to analyze the impact of investment in two different situations: "good" (Option 63) and "bad" one (Option 61).

Option 64. Let in the previous version as a result of investments of the second type, the rates of material, labor, and financial costs for each modified product increase at the same rate as prices. Results in the non-financial sector have deteriorated sharply. Revenue from the budget and social insurance and the pension fund decreased.

Investments of the second type will be successful if the growth rate of material, labor, and financial costs for each product does not exceed 80% of the price increase speed. We accepted this rate of 0.4 for each product for all the options below.

4.3. Investments of the second type at different levels of shadow activity

The improvement of the Ukrainian economy's structural parameters in the process of its adaptation to global technological challenges should objectively lead to a significant reduction in its level of shadow economy.

Option 66. Let 1% of shadow production go into the legal (reported, officially registered) sector in each cycle. The results in both the non-financial sector and the budgetary sector have deteriorated compared to the baseline (continued in Table 1, first column). Thus, the mere transfer of shadow production to the legal industry gives about the same effect on investments of the second type as for investments of the first type. The simple reduction of almost all kinds of shadow activity does not yield positive effects, except for the overestimation of material costs.

Therefore, for the development of the Ukrainian economy, the government must first do a lot of work to modernize and develop both the non-financial sector and the banking system towards returning it to a more active and cheaper lending of industry and only then dealing with the legalization of economy. Without this investment, both the first and second types will perform worse.

4.4. Comparison of investments of the second type in separate goods

Above, we have observed that investing in one product while ignoring other ones distracts our nonlinear model from reality. However, we must set priorities in deciding where to spend more. To have the situations as close to the truth as possible, we will maintain investments in other goods at the traditional levels and reduce them in the product under review by 10%. Investment technical productivity is 1.

The fastest return on investment of the first and second types in the "good" and "bad" economic situations is in the following goods:

1. Investment goods
2. Export goods of intermediate consumption
3. Housing
4. Non-tradable final consumption goods
5. Consumer goods sold domestically (tradable)
6. Export goods of final consumption
7. Products of intermediate use sold domestically.

If we take a business's far-sighted interests, i.e., **the highest investment efficiency by GDP** as a criterion, we get results presented in Table 4.

Goods and services, investment in which has the greatest impact on the country's economy, are shown in Table 5.

Table 4. Products and services with the highest investment efficiency by GDP

Investments of the first type		Investments of the second type
"Good" situation	**"Bad" situation**	**In both situations**
1. Non-tradable consumer product	1. Export goods of intermediate consumption	1. Investment goods
2. Export goods of intermediate consumption	2. Export goods of final consumption	2. Housing
3. Export goods of final consumption	3. Investment goods	3. Non-tradable Consumer Product
4. Consumer tradable goods sold domestically	4. Non-tradable consumer product	4. Consumer tradable goods sold domestically
5. Distribution and trade of consumer goods	5. Housing	5. Export goods of intermediate consumption
6. Investment goods	6. Consumer tradable goods sold domestically	6. Export goods of final consumption
7. Distribution and trade of consumer imports	7. Distribution and trade of imports of investment goods	7. Intermediate goods sold domestically
8. Housing		
9. Distribution and trade of investment goods imports		

Table 5. Goods and services, investment in which has the greatest impact on the country's economy

Investments of the first type		Investments of the second type	
"Good" situation	**"Bad" situation**	**"Good" situation**	**"Bad" situation**
1. Export goods of intermediate consumption	1. Goods of intermediate consumption	1. Export goods of intermediate consumption	1. Goods of intermediate consumption
2. Consumer tradable goods sold domestically	2. Consumer tradable goods sold domestically	2. Goods of intermediate consumption	2. Consumer tradable goods sold domestically)
3. Intermediate goods	3. Investment goods	3. Investment goods	3. Investment goods
4. Non-tradable consumer product	4. Non-tradable consumer product	4. Consumer tradable goods sold domestically	4. Non-tradable consumer product
5. Export goods of final consumption	5. Export goods of intermediate consumption	5. Export goods of final consumption	5. Export goods of intermediate consumption
6. Investment goods	6. Distribution and trade of imports of intermediate goods	6. Non-tradable consumer product	6. Export goods of final consumption
7. Goods of intermediate consumption	7. Export goods of final consumption	7. Housing	7. Housing
	8. Housing		
	9. Distribution and trade of investment imports		
	10. Distribution and trade of imports of consumer goods		

4.5. Determination of the limits of technical productivity of investments to create new goods (second type) above which the investor will receive the expected profit, on separate goods

The high complexity of the model, its significant non-linearity, the recurrence of the equations make it impossible to analytically solve the problem of determining the limits of technical productivity of investments, above which the investor will receive the expected profit. Therefore, we have solved this problem iteratively. Business owners typically try to maintain the lowest possible salary level to maximize their profits. Therefore, **in a "good" economic situation**, even with very low investment productivity 0.2, their profits on almost all goods and services are sufficient to ensure a rapid return on investment.

The exceptions, like for investments for reducing costs (first type), are producing export goods of final and intermediate consumption. At low technical productivity of investments, there are significant losses on them. If you increase it to 0.4084, the return time will be one year for **export goods of final consumption**, in a "good" economic situation. But their GDP efficiency will be negative; the GDP created in this production will decrease by 27.9% in 15 years.

If you increase it to 0.4192, the return time will be one year for **export goods of intermediate consumption** in a "good" economic situation. Their GDP efficiency is also negative, and the GDP generated in their production will decline by 25.5% in 15 years.

This is important for **investors**.

The Ministry for the Development of Economy, Trade and Agriculture might find it important that at an investment in technical productivity of the second type 0.2, investment efficiency by the GDP of the entire economy is negative; the total GDP has declined by 17.2% over 15 years. It is enough to increase the productivity of investments to 0.3806 to make the investment efficiency positive.

To ensure GDP growth in the whole economy over 15 years 55.8%, i.e., 3% per annum, it is necessary to increase technical productivity to 0.5156.

In the "bad" economic situation, with very low investments in technical productivity, the profits of exporters and GDP created in export goods of final and intermediate consumption sharply decrease. The increase in GDP generated in the production of other products and services does not exceed it, so profits and GDP as a whole decrease. Therefore, investments of the second type in the production of export goods of final and intermediate consumption, in general, cannot be returned.

For all other goods and services, their time of return ranges from 0.232 for investment goods to 0.278 years for the distribution and trade of intermediate goods imports. Unlike the first type of investment, the second type's investment efficiency by GDP is positive for all goods, and negative for the distribution and retail of imports.

The statements expressed above are relevant to **investors**.

For the Ministry for Development of Economy, Trade and Agriculture it is important that the effectiveness of the second type of investments by GDP for all products is

strongly negative; the real GDP for 15 years decreases by 129%. With increasing technical productivity to 0.7, the GDP is down to 43.5%. But with further productivity gains, the GDP decline is rising again (to 80% at technical productivity 1 and 348% at productivity 1.5). Therefore, in a "bad" economic situation, the second type of investment cannot be effective by GDP with any technical productivity.

Conclusions:

1. To have a macro characteristic of investments, the concept of technical productivity of investments is introduced, which measures their ability to change the rate of material or labor costs. We accepted that the technical performance of investments is 1 if the rate of reduction of substantive or labor costs per unit of production equals the rate of increase in the active part of fixed assets. If technical productivity is equal to 2, then the reduction is twice as much.
2. Based on the technical productivity of investment, we derived the equation (not identity) of economic dynamics for investment of the first type.
3. It is offered to estimate the efficiency of investments not only on profit but on all added-value. This indicator, firstly, reflects the efficiency from the state's point of view, and secondly, the more far-sighted interests of the business owner in minimizing the turnover of skilled workers. In our model, this indicator is calculated as the ratio of real GDP growth obtained in the next or more subsequent years-cycles in the production of this or all goods to the real investment made in one or more previous years-cycles.
4. To separate the progressive decrease in the country's GDP, which occurred due to the reduction of specific material costs from investments, from the regressive ones, which occurred due to other factors, we proposed to calculate country GDP, gross and net profit, wages, etc., without intermediate goods, distribution of their imports, and financial services for intermediate consumption. We named such indicators "eliminated."
5. The use of the author's causal simulation model, taking into account the shadow sphere of the Ukrainian economy, allowed to conduct a more detailed and accurate analysis of investments in the Ukrainian economy. It turned out that the dynamics of legal real GDP and total (legal + total) real GDP is different, so it is impossible to estimate changes in the latter indicator in proportion to changes in the former. Our model takes into account both areas in their interaction.
6. Different pricing policies of exporters lead to economic results so different that it is necessary to analyze the impact of investment in two different situations: "good" and "bad." The latter is formed by exporters' standard behavior, which in devaluation regulates prices and export volumes according to the classical theory of foreign trade, i.e., in devaluation, 10% reduce intermediate consumption prices by 7.8% of each cycle, and sales increase by 3.4%. The "good" economic situation is ensured by the

non-standard behavior of exporters, who at a devaluation of 10% reduce export prices of each cycle by only 2% and increase sales by 2% (if international markets allow it). That is, exporters' behavior, contrary to the standard theory of foreign trade, is very important here not only for themselves and the economy as a whole but also for investors, especially investors in the production of export goods.

7. A de-shadowing Ukraine's economy has a positive effect only for non-refund of VAT and for investments of the second type to overestimate public procurement prices. To reduce the level of other types of shadow activity successfully, the government must first radically change its activities, work hard to modernize and develop both the nonfinancial sector and the banking system to return it to more active and cheaper lending for production, and then to de-shadow Ukraine's economy. If entrepreneurs trust the new government, it will succeed. Otherwise, the development of Ukraine's economy will slow down.
8. An imbalance hurts all types of investments at any of their technical performance.
9. It was found that the growth of technical productivity of the **second type** of investment (to create a new type of product) gives better results than the same increase in technical productivity of investment of the **first type** (to reduce material or labor costs) in the better economic situation in Ukraine, but worse results in a bad economic situation.
10. For the successful application of the second type of investment, the growth rate of material, labor, and financial costs at least mustn't exceed 80% of the growth rate of the price of this product. As costs decreases, the results rapidly improve.
11. If we proceed only from the fastest return on investment (i.e., from the highest profit), then both in the best economic situation in Ukraine and in the worst situation, the most appropriate investments of both types are those made in the production of investment goods that are exported in principle but sold on the domestic market, and in the production of housing.
12. If we proceed not from the fastest return on investment, but from the highest efficiency of investment by GDP (i.e., from obtaining the largest GDP produced in this product), then as in the previous criterion, and in the best and worst economic situation in Ukraine, investments of the second type are most appropriate for investment goods, housing, final consumer goods.

    Investments of the first type, in the best economic situation, should be directed toward final consumer goods that are intended only for the domestic market (non-tradable), in the export of intermediate and final consumer goods, and in the final consumer goods that are exported in principle but sold on the domestic market (tradable).

    Investments of the first type in the worst situation should be aimed at the investment goods that are exported in principle but sold on the domestic market, and in final consumer goods.
13. If we take the greatest impact on GDP growth as a criterion, ranking the most promising products depends more on the economic situation in Ukraine than on the type of investment (Table 6).

Table 6. Goods the investments in which have the greatest impact on GDP growth, in "good" and "bad" economic situations

Goods	Good situation		Bad situation	
	Place for investment type		Place for investment type	
	first	second	first	second
Consumer goods, which in principle are exported but sold on the domestic market (tradable)	2	4	1	2
Of intermediate consumption	3	2	6	1
Investment	6	3	5	3
Consumer only for the domestic market (non-tradable)	4	6	3	4
Export intermediate consumption	1	1	7	5
Consumer export	5	5	2	6
Housing	7	7	4	7

14. To ensure an average return for six months on investment of the first type in 15 years in the production of **intermediate goods**, the technical productivity of investment should exceed 0.73.
15. To ensure the same return on investment of the first type in producing **consumer goods** for export in the same economic situation, their technical productivity should exceed 0.67.
16. To ensure the positive efficiency of the first type of investment by GDP in a "good" economic situation for **investment goods**, the technical productivity of investment must be at least 0.22; for **housing** – 0.4; for **distribution and trade in housing imports** – 0.737; for **distribution and trade in imports of investment goods** – 0.85. These are direct recommendations to **investors**.
17. For the Ministry for the Development of Economy, Trade and Agriculture**:** for the eliminated GDP created in the whole economy to grow at least somewhat in 15 years, and the efficiency of investment by GDP to become positive, it is necessary to increase the technical productivity of investment to at least 0.207. To ensure the growth of GDP generated in the whole economy for 15 years by 55.8%, i.e., 3% per year, it is necessary to increase investments' technical productivity to 0.6705.
18. In a "bad" economic situation, investments in **export goods for final and intermediate consumption** do not pay off at any reasonable level of their technical productivity.
19. In a "bad" economic situation, for the eliminated GDP created in the whole economy to grow at least somewhat in 15 years and the efficiency of investment GDP become positive, it is necessary to increase the technical productivity of investment at least 1.9. With a very high technical productivity of investments 3, the efficiency of investments of the first type by GDP on average over 15 years for all goods will be 5.63%, GDP for 15 years will increase by 20.3%.

20. To ensure a payback period of the second type of investment for one year of producing **consumer goods for export** in a "good" economic situation, it is necessary to raise their technical productivity to 0.4084.
21. To ensure a return on investment of the **second type** in the production of **intermediate goods for export** in a "good" economic situation for a year, their technical productivity must be more than 0.4192.
22. In a "good" economic situation, for the GDP created in the whole economy to grow slightly, it is enough to increase investments' technical productivity to 0.3806. To ensure the growth of GDP generated in the whole economy by 55.8% in 15 years (by 3% per year), it is necessary to increase investments' technical productivity to 0.5156.
23. In a "bad" economic situation, investments of the second type in the production of **export goods for final and intermediate consumption** do not pay off at any technical productivity if the increase in prices for new types of goods lags behind the growth rate (as a result of investment) of fixed assets by 60%.
24. If the demand for a new type of **consumer export goods** in foreign markets increases by 10% and the increase in its price outpaces the growth rate of productive fixed assets by 1.6%, instead of a large decline in this situation, there is an increase in real GDP, for 15 years-cycles by 4%.
25. If the price increase exceeds the growth rate of fixed assets by 44.94%, the real GDP created in the production of this product for 15 years-cycles increases 25 times, the profit becomes positive, so the return on investment in this product is 3 years, and efficiency for GDP – 1173%.
26. If the increase in the price of a new variety of **intermediate goods** outpaces the growth rate (as a result of investment) of fixed assets by 2.5 times, the real GDP generated in the production of this product in 15 years-cycles increases by 12%, but profits remain negative, so it is not about the return on investment in it.
27. When the growth of prices lags behind the growth rate of production fixed assets only of **consumer goods**, the economic results for this product and the country are improving.
28. When such lag behind is for **intermediate goods**, **housing**, and **investment goods**, economic results deteriorate.
29. For all other goods and services, including intermediate goods and the distribution and trade of their imports, the investment efficiency by GDP is positive. As the technical productivity of investment increases, efficiency increases in consumer goods and decreases in housing and investment goods. This is particularly important to **investors**.
30. For the **Ministry for Development of Economy, Trade and Agriculture**: the efficiency of the second type of investment in GDP as a whole (i.e., an average of 15 years for all goods) in a "bad" economic situation is deeply negative with a low technical productivity of investment 0.2; GDP created throughout the economy for 15 years decreases by 129%. With the increase in productivity to 0.7, the decrease in GDP decreases to 43.5%, the amount of real GDP for 15 years-cycles increases to

UAH 7.87 trillion, for 5 years – up to UAH 4.75 trillion. But with a further increase in technical productivity, the decline in GDP increases again.

31. The equilibrium volumes of production and imports of consumer, intermediate, and investment goods have been determined at the increasing investment of the first and second types by 10% in the final consumer goods, sold on the domestic market, and in the investment goods in the "good" and "bad" economic situations.
32. The reductions of real GDP, which will take place at deviations of the actual output and imports of consumer, intermediate, and investment goods of 10% from equilibrium for all situations (listed in para. 31), were calculated.
33. Naturally, the first investments should be made in the areas where Ukraine has some experience: aircraft, rocketry, aircraft and rocket engines, military equipment, fashion clothing, and others.

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