

Determinants of Public Investment Effectiveness Evaluation in Unstable Macroeconomic Environment

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ABSTRACT: Investments in the public sector may be characterized by a lower sensitivity to macroeconomic changes since their implementation is linked to the need to achieve certain social goals, so these investments are undertaken and implemented even in deteriorating economic conditions. However, this does not mean that the course of investment processes in the public sector is stable in a changing macroeconomic environment. The constrained investment financing capacity in public sector units is increasingly problematic. The purpose of the presented paper is to identify the changing conditions affecting the scope and approaches to measuring the effectiveness of investment projects in the public sector, not only in monetary terms, but also in social aspects. The research findings presented in the paper point to the role of current socio-economic factors in shaping decision-making processes, as well as to the principles and criteria for evaluating the impact of public spending in a situation of unstable economic development. The study presents an analysis of available methodologies and performance evaluation indicators, along with the potential for adapting or expanding the range of possible analytical and organizational solutions. The study also includes examples of changes in investment activity in the public sector at different levels of competence.

KEYWORDS: public investment, effectiveness, macroeconomic factors

Introduction

The increased instability of the macroeconomic environment observed in recent years, including the need to respond to political, social and financial phenomena affecting the economy that are difficult to predict, may change the scope of the criteria for evaluating public investment projects in the direction of reducing the emphasis on maintaining a high level of efficiency. Among the important factors in this instability, one can point to changes in the level of public debt, inflation and interest rates, which have negative effects on the spending side of public investors. One of the already visible consequences is the increase in the prices of materials, resources and construction works and, as a result, the need to revise the original project assumptions. At the same time, unfavorable changes in the economy, resulting in the weakening of budget income streams of public sector entities, induce the search for effective methods and instruments for analyzing the efficiency of the use of public resources.

The paper aims to identify the changing conditions and principles of measuring the effectiveness of investment projects in the public sector. The research objective also entails analyzing the methodology and indicators used for assessing efficiency, as well as the conditions and applicability of selected analytical and organizational solutions.

Investments in the public sector may be characterized by lower sensitivity to macroeconomic changes, since their implementation is associated with the obligation to achieve certain social goals, and therefore even despite deteriorating economic conditions, such investments continue to be planned and implemented. However, this does not mean that

in a changing macroeconomic environment the course of investment processes and the scope of tasks undertaken in the public sector will maintain stability. Bearing in mind the changing conditions of the economic environment and the need to implement investment projects, from which public entities often cannot deviate, the paper refers to the need to increase knowledge in the area of performance evaluation, considered as an important element of the investment planning and evaluation process, which can be significantly affected by the aforementioned macroeconomic changes. Special attention was given to the formula of cooperation between the public and private sectors in the implementation of investment projects, which contributes to the utilization of the specific experience of these two sectors for increasing the efficiency of the use of public resources and improving the achievement of public goals.

Theoretical background

The role of the public sector in the market economy refers to the induction of factors that stimulate socio-economic development due to the nature of the public functions performed and the tasks assigned to it for the benefit of specific social groups (Kleer 2005, 9-12). Without going into a detailed consideration of the model of public sector functioning in the economies of different countries, it can be assumed that a common feature of public sector units is their involvement in many areas of investment activity, which largely affects changes in the conditions for the development of the economy in the short and long term (McCartney 2015, 62-74). Undertaking research on the financial dimension of public investment, on the one hand, prompts a focus on identifying appropriate sources of financing to secure the implementation of these investments. On the other hand, it should address the role of capital expenditures, considered as a development impulse on the scale of the national economy, or the regional dimensions of a country (Ocolisanu et al. 2022, 22-25). Furthermore, it should explore the efficiency of public spending from a macro perspective, relating this issue to methods of improving infrastructure management, to the correlation between the size of capital expenditures and obtaining economies of scale, and to the possibility of reducing the efficiency gap in public investment (Kapsoli et al. 2023, 13-14; Baum 2020, 37-42).

Crisis phenomena with varying causes and backgrounds can result in changes of a macroeconomic nature. The decline of the economy due to the occurrence of crisis phenomena can lead to changes in the income situation of public sector entities, but also to significant changes in the volume and structure of the sector's expenditures, and consequently to the abandonment of some planned investment scenarios (OECD 2019, 12-21). This means that under conditions of macroeconomic instability, there are impediments and limitations to the possibility of using the previously well-known assessment instruments of evaluation tools that would provide a basis for assessing the course of the entire life cycle of an investment project. Due to these very limitations of a macroeconomic nature, as well as relatively long investment cycles in the public sector, it may become difficult or even impossible to evaluate investment projects properly. It is also important to be aware of the difficulties, characteristic of public investment, concerning the direct measurement of investment effects in terms of social utility (Miłaszewicz 2014, 163-73; Satola 2017, 292-93), and sometimes the problems of their immeasurability in monetary terms (Opałka and Jarosiński 2021, 4143-45). Therefore, it is highly important to select the appropriate evaluation tools and properly interpret the results obtained (Afonso et al. 2005, 326-35).

As Kasiewicz (2009, 53-62) and others point out (Manescu 2022, 11-21; Volkery and Ribeiro 2009, 1204-06), the range of available research methods shows considerable variation in terms of the proposals and solutions developed up to now. Generally, these procedures require creating the possibility of evaluating a given project formulated in variants, that is, differentiated in terms of certain specific features of its performance. In the conditions of a changing macroeconomic environment, both in the short term and in view of

the prolonged impact of negative crisis factors, carrying out a scenario analysis is a key element in reducing the risk of a failure in achieving the planned objectives of an investment project, just by expanding the range of boundary conditions that are taken into account *a priori*, already at the preparatory stage of such projects. This means that it is only under unstable macroeconomic conditions that scenario analysis leading to the formation of several variants for the same investment project can be a facilitating tool for the assessment of the project's effectiveness, as well as be an element that increases the feasibility of the planned project. A decrease in budget revenues does not automatically lead to a reduction in the volume of investment expenditures. Regarding the identified significant development needs, it may become necessary to search for additional sources of financing, e.g., from the private sector, in order to implement public investments and achieve the planned quantitative and qualitative effects (Quak 2018, 2-8).

In practice, it is proposed to compare variants of particular investment projects and select the project with the lowest possible cost of servicing of the inhabitant. In such a case, it is possible to use cost comparison methods, such as cost-effectiveness analysis (CEA) or related methods, where the cost of obtaining a unit of result in several different variants of projects is compared (Jarosiński 2021, 769-86; Lipkan et al. 2018, 258-59). Therefore, it is recommended to prepare instruments and tools for carrying out a scenario analysis of the planned investment project, which could be differentiated in this analysis in terms of the basic factors that are of significance to the public investor and the consumers of public services, such as health care or other types of services (Shepard et al. 2015, 3-13).

Differentiations as to the assessment of the effectiveness of investment results can also be analyzed with regard to their correlation with sources of financing for public investment. However, it is worth emphasizing that examples of research conducted in public sector units, using the methods of data envelopment analysis (DEA) and multiple regression, indicate the possibility of obtaining a wide range of information referring not only to the measure of the effectiveness of the results of investment activity itself, but also to the issue of financial autonomy and diversity in the types of territorial units and the availability of investment capital from individual sources of budget revenues as the factors significantly determining the level of effectiveness of public investment (Wojcik et al. 2019, 589-92; Zioło 2012, 253-310; Sekuła and Julkowski 2017, 220-31).

In the above context, the observation can be drawn that efficiency as a research issue and as a factor included in the decision-making process in practical terms, emerges very clearly in projects undertaken using the public-private partnership (PPP) formula. Therefore, it relates to the specific organizational form and the specific allocation of financial inputs and project risks. In the case of projects planned and implemented under the PPP formula, the issue of effectiveness takes a slightly different form. It should be noted that public-private partnerships involve both public entities, which, as a rule, are the initiators of projects, as well as private entities, which are entering such projects with a market-based attitude regarding profitability.

The profitability of investment projects undertaken in the form of PPP is evaluated in terms of providing a positive net benefit to the society, exceeding the benefit that would be achieved by using another form of implementation of the task (EPEC 2011, 12). Thus, it becomes necessary to perform profitability analyses of an investment project already at its preparatory stage. The methods of assessing profitability may be varied, in most cases they are based on the principles derived from the method of cost-benefit analysis (CBA), that is, the comparison of investment outlays with material effects, which often cannot be expressed in monetary units. This type of situation also provides an opportunity to conduct simulations between different solutions of an organizational and technical nature, which involve varied levels of capital expenditures and, as a result, also varied levels of costs and benefits of the services provided (European Commission 2014, 41-66, Svensson and Hultkrantz 2017, 49-

51). The setting up of a public-private partnership agreement and the subsequent preparation of an investment project under such a formula, assumes the achievement of a certain level of efficiency, and therefore a financial surplus in relation to the costs incurred. In this type of project, the private sector will be interested in a specified rate of return on financed investments in partnership with a public entity, which imposes some limitations on the material scope of the investment, and also determines the organizational process of preparing such investments.

Examples of systemic solutions, also proven in practical terms, can be indicated in the public sector in the UK, often referenced as a pattern for planning and implementation of investment programs using the PPP formula (UK government 2022, 11-32). The general principle applied there is that a project under the PPP formula can be evaluated as profitable provided that the cost of its implementation is lower than the best realistic project carried out individually by a public sector entity, the result of which will cover an identical or maximally similar scope of public utility. This methodology also includes the optional construction of a hypothetical investment project, reflecting a public project alternative to the PPP formula and considered as a public sector comparator (PSC) benchmark (EPEC 2021, 165-66). The general evaluation criterion is that the PPP project variant should outperform the PSC benchmark in terms of efficiency, taking into account the amount of capital expenditure, as well as operation and maintenance costs. However, it should be noted that the implementation of a project under the PPP formula, as a rule, involves the emergence of additional factors that affect its total cost (Asian Development Bank 2022, 20-26).

Analyses conducted as part of the PPP formula include various scenarios for the course of future economic conditions, but in view of instability of macroeconomic factors, the implementation of public investment projects may be carried out in extremely difficult conditions. Even if one assumes that for private entities such conditions would be the reason to abandon the investment process, however, with investments in the public sector, the possibilities for withdrawal or significant rescheduling of such investments are limited. What should be borne in mind is that investments in the public sector, due to their social and economic nature, should be implemented in advance of all other activities aimed at improving economic and social conditions. Therefore, in an unstable macroeconomic environment, it turns out that the use of project analysis and evaluation instruments becomes difficult and can cause problems of a decision-making nature, due to the low reliability of scenarios for the course of investment processes, as well as due to the increased risk of a funding shortage.

Results of empirical research and discussion

For the purposes of the study, the desk research method of statistical resources, the comparative analysis method and the critical literature analysis method were used. A search of the resources of the databases of Eurostat and AMECO (*Annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs*) was carried out, as well as studies and compilations of data available in the resources of Polish central government institutions. During the empirical part of the research, extensive statistical material was collected, but due to the adopted concept of the research, the time horizon presented in the text was reduced to the years 2010-2022, with the use of available forecasts until 2024. The applied timeframe made it possible to highlight the changes taking place in the economic environment, especially the deterioration of the situation of finances in the public sector due to the economic consequences of the crisis phenomena.

In a changing macroeconomic environment, new conditions are emerging and opportunities to evaluate the effectiveness of investments carried out in the public sector are changing. Considering the above phenomena, the study took into account the current socio-economic factors that can influence decision-making processes, as well as the principles and

criteria for evaluating the effects obtained through public expenditures, differently than would be the case in a situation of stable economic development. Based on the results of the study, it was possible to identify changes in investment activity in the public sector, as well as in the face of ongoing crisis phenomena, the need for further observation of factors affecting the effectiveness of the use of public funds in public sector units at different levels of competence was identified.

Capital expenditures in the public sector are characterized by an ever-increasing demand for certain components of technical and social infrastructure. Public entities, apart from tasks carried out under the PPP formula, are the only entities that, as a rule, should be engaged in undertaking these types of investments. The results of the research in Table 1 show that in the countries of the world selected for analysis, public investment expenditures are characterized by a relatively high rate of growth in statistical year-on-year terms. It is evident that investment outlays, despite the already high level of infrastructure provision in highly developed European and non-European countries, are still being incurred and are related to meeting specific public needs. Referring to the research results in Table 1, high growth rates were recorded in the Czech Republic, Germany, Austria and Poland. It is also characteristic that a high level of growth rate in capital expenditures was recorded in the European Union as a total. According to calculations based on the volumes of outlays projected by AMECO, capital expenditures in the public sector are also expected to continue to grow in the following years, 2023 and 2024.

Table 1. Rate of change in expenditures on public investment projects (gross fixed capital formation) to the previous year, in selected countries, in %

Specification	2017	2018	2019	2020	2021	2022	2023	2024
Czechia	13.1	34.8	12.6	6.3	7.1	14.3	18.0	-0.6
Germany	6.1	9.4	5.1	9.3	2.3	8.3	8.9	10.2
Greece	28.7	-27.6	-21.2	12.4	28.5	10.3	19.3	22.5
France	1.8	5.2	10.7	-4.5	6.0	9.5	6.5	4.6
Austria	7.9	3.0	5.0	1.8	14.2	1.7	10.1	3.5
Poland	26.1	31.2	-1.2	2.4	1.2	11.3	16.5	10.4
European Union	5.0	8.4	6.6	4.6	6.4	7.1	13.0	7.0
United Kingdom	-1.4	2.5	8.9	5.4	11.0	11.7	3.6	4.0
United States	2.3	1.9	11.3	3.1	-1.4	19.3	2.7	3.4
Japan	-3.2	-0.4	12.0	5.3	-5.6	20.7	-4.4	-1.9

Source: Own compilation based on data: AMECO online (2023)

It should be noted that the indicators in Table 1 were calculated on the basis of nominal values of capital expenditures, which means that the actual effects achieved in individual years may be slightly different, considering the inflationary increase in the prices of construction works, resources, materials, which may diminish the real effect achieved. Considering the socio-economic circumstances and macroeconomic instability due to the variation of crisis phenomena, also in the period 2020-2023 in most of the countries studied, the growth rate of public sector investment expenditures can be characterized as high. In some of them, there was a decline in the growth rate of public investment, but it was of a temporary character.

An important factor affecting the ability to finance public investments is the budgetary situation of the state and local government units, which determines their internal capacity to finance investments. As already mentioned, it is not always possible to finance public investments exclusively from own resources. A common issue, including in the framework of public-private partnerships, is the investment financing with the use of external funding sources. This may result in an increase in public debt, as one of the most common phenomena within the public sector of individual countries around the world, and excessive levels of indebtedness lead to a limitation of the public sector's investment capacity.

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Table 2. Rate of change in the volume of gross public debt, to the previous year, in selected countries, in %

Specification	2017	2018	2019	2020	2021	2022	2023	2024
Czechia	5.5	-1.6	1.6	19.6	26.1	20.3	11.2	9.1
Germany	-1.4	-2.2	-0.7	13.1	6.6	2.7	4.7	1.9
Greece	0.8	5.4	-1.1	3.1	3.6	0.8	0.3	1.1
France	3.0	2.5	2.8	11.9	6.3	4.5	4.2	4.0
Austria	-2.1	-1.6	-1.7	12.7	5.8	4.9	3.5	2.0
Poland	5.3	-0.1	2.0	19.3	4.7	5.3	16.5	14.6
European Union	1.2	0.9	0.8	11.0	5.4	3.7	4.6	3.7
United Kingdom	-0.4	2.1	8.3	10.2	15.5	-0.9	3.8	2.5
United States	-9.8	12.3	7.6	9.5	15.6	12.7	1.4	3.7
Japan	-7.6	8.5	5.2	1.9	-2.4	-4.8	-0.6	1.4

Source: Own compilation based on data: AMECO online (2023)

According to the results of the analysis in Table 2, it can be noted that in highly developed countries with market economies in 2020-2023, the level of public debt has just significantly increased, which was associated with the financing of public tasks of a different character, often having its basis in crisis phenomena and instability of macroeconomic factors. Particularly in 2020-2022, there appeared factors stimulating changes in the level of public debt, hence the clear positive changes in the rate of debt growth during the considered period. Figure 1 shows the results of a comparative analysis of the rate of change of public capital expenditures and the rate of change of public debt for the European Union and the USA. In the case of the USA, the negative public debt dynamics recorded in 2017 was followed in subsequent years by high growth rates reaching above the 10% level by year. On the other hand, changes in capital expenditures fluctuated widely, falling in 2019-2021 and in 2022 recording the highest growth rate in the examined period, at more than 19%. The situation in the EU was characterized by significantly greater stability in terms of both indicators studied. The rate of change in the volume of public debt, after a very stable period until 2019, experienced a sharp increase in 2020 reaching more than 10% by year, but in the following years the increase slowed down substantially. The rate of change in the volume of capital expenditures during the reviewed period remained between 5% and 10%, although for 2023, the rate of growth in public investment is forecast to accelerate to 13% in relation to the preceding year.

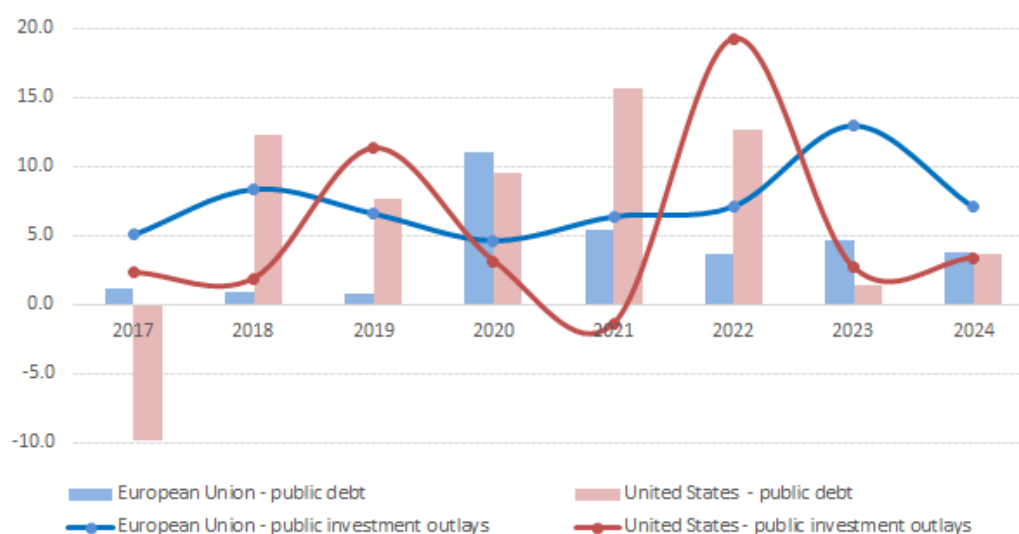


Figure 1. Comparison of the rate of change in the level of public capital expenditures and public debt in the EU and USA, in selected years, in %

The results of the analysis presented above show noticeable fluctuations in the needs and possibilities of financing public investments. The situation varied in the case of the European Union, individual member states, or other countries of the world, such as the USA, but the reasons for the observed variability of selected indicators characterizing public finances are related to global economic instability caused by the necessity to respond to unexpected phenomena, such as a pandemic or large-scale military conflicts.

In the crisis conditions observed since 2020, turbulence in commodity markets and difficulties in maintaining the uninterrupted supply chains between regions of the world have played a significant role, which has contributed to the acceleration of inflation and, consequently, to a significant increase in base interest rates set by central banks. As a result, it will be reflected in the interest rates on loans offered by commercial banks. This is confirmed by observations of interest rate changes in the Eurozone, other European countries and many countries around the world, particularly dynamic from the second half of 2022 (Bank for International Settlements. n.d.). Under such conditions, public sector entities faced the additional difficulty of incurring liabilities that generate higher burdens for servicing loans and credits, which at the same time limited the ability to further use external repayable funds for investment purposes.

Macroeconomic instability requires an individualized approach to the issue of investment financing in public sector entities, taking into account the existing diversity of the income situation and economic potential, as well as the structure of public spending at the scale of the state, as well as at the scale of local government. In more turbulent periods for public finances, characterized by economic slowdown and increasing levels of public debt, it is the legislative and organizational strengthening of the possibility of using the PPP formula that may be crucial for maintaining or even increasing the investment capacity of public sector entities. The currently observed changes in the level of interest rates, determining the cost of external capital, also cause the necessity of precise verification of the level of profitability of investment projects and the criteria for assessing the economic effects obtained. The implementation of public investment under the PPP formula appears to be quite common in many countries of the world. In particular, it is applied where limited possibilities of financing investments are noticeable within the budgetary economy of public entities, while at the same time urgent needs for the realization of certain components of social or technical infrastructure are recognized. Thus, social aspects argue for the need to undertake investments, while on the other hand, difficulties in finding funds for their financing are revealed. In such a situation, it is the PPP formula that gives a chance to complete the investment and obtain material effects much earlier than it would be the case if the investment was financed from the budget's own resources. Therefore, an important element of the study of conditions in terms of the effectiveness of public investments, are the results of empirical analyses presented in this paper, concerning the material and financial scope of projects implemented in the PPP formula within the selected countries.

Table 3. Public-private partnership (PPP) investment volume, in mln of constant 2017 international dollars

Specification	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Austria	290	10	10	40	60	50	70	80	80	80
Czechia	60	60	80	80	80	30	30	-	-	-
France	2 640	5 190	5 460	5 120	5 120	4 930	2 610	2 260	2 820	3 160
Germany	1 330	1 590	1 390	1 110	1 060	1 030	970	1 070	1 140	1 060
Greece	2 440	2 050	130	140	150	170	170	340	340	380
Italy	890	840	240	1 520	1 740	1 670	1 690	2 500	1 210	1 020
Poland	1 280	1 210	1 220	860	120	130	140	280	180	150
Spain	4 300	2 810	2 680	2 130	2 060	780	610	670	390	300
United Kingdom	12 430	9 040	6 750	6 790	6 460	5 370	6 150	5 460	3 820	2 830

Source: Own compilation based on data IMF (2023)

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The results of the research in Table 3 show that PPP investment outlays have remained relatively stable over the 2012-2019 period, although the volume of investment has increased in some countries, while others have experienced a decline in investment outlays. There were occasionally increases in PPP capital expenditures when it comes to the necessity of implementing important significant investments, for which it is impossible to find funds within the framework of the state or regional local budgets. Total capital expenditures under the PPP formula prove that there is a constant surplus of investment needs over the ability to finance them within the public resources, hence new projects have been undertaken. Projects carried out as part of PPP provide the guarantee that the participation of private entities determines the analysis and evaluation of efficiency in terms of selecting the most advantageous options.

The case of Poland, subjected to a more detailed study, indicates that in the period after 2009, when national legal regulations were introduced to improve planning procedures for implementing projects in the PPP formula, public entities became more active in such forms of investment. The results of the research presented in Table 4 show the diversity in the number and value of projects undertaken by the main segments of the public economy. The reported aggregate values of projects were calculated by converting the amounts presented in PLN into USD, according to the average exchange rate of the National Bank of Poland from the second decade of October 2023.

Table 4. Implementation of projects in the PPP formula in Poland between 2010 and 2023

Sector	Number of projects	Gross value of capital expenditures/services, in USD mln
Culture	7	31.8
Education	5	21.2
Energy	3	8.0
Energy Efficiency	29	110.0
Health Care	4	50.9
Housing	2	4.1
Public-utility Buildings	4	36.8
Revitalization	4	224.4
Sports and Tourism	24	127.1
Telecommunications	10	394.4
Transportation Infrastructure	26	474.5
Transportation Services	10	25.0
Waste Management	11	578.0
Water and Sewage Management	25	99.3
Other	15	15.8
Total	179	2 201.4

Source: Own compilation based on data: Public-Private Partnership (PPP 2023)

The largest number of PPP projects were undertaken in Energy Efficiency, Transportation Infrastructure and Water and Sewage Management. In comparison, the highest total value of carried-out projects can be observed in the Waste Management, Transportation Infrastructure and Telecommunications segments. This diversity reflects investment needs in the public sphere, as well as segments of the economy that may be particularly attractive in terms of obtaining financial results for private partners.

The above-characterized factors influencing the conditions and methods of assessing the effectiveness of projects implemented in the PPP formula on the background of the general conditions and solutions adopted in different countries lead to the conclusion that the involvement of private entities in investment cooperation with public sector entities contributes to a stricter verification of the effectiveness of undertaken investment projects. This is significantly due not only to the tendency of private entities

to maximize financial benefits from the capital, organizational resources and their own know-how involved. The equal significance is due to the noticeable level of formalization of the procedures defining the permissible forms, the scope of allocation of project functions and the obligation to examine the planned and achieved financial effects in projects organized under the PPP formula. This formalization means that in PPP projects it is necessary to provide evidence of a high level of effectiveness that would both fulfill criteria of economic attractiveness to private entities and criteria of a social nature, based on adequate accessibility and public utility.

Conclusions

The problems of financing and efficiency of public tasks require consideration of various forms of planning and evaluation of investment projects in the organizational, technical, legal and financial dimensions, often adopted from the practice of private enterprises management. The paper points out that the ability to effectively implement public investment projects is due, on the one hand, to the legal and organizational conditions of the functioning of public sector units, while on the other hand, to the degree of their financial independence and capability to acquire investment capital from non-budgetary sources.

In an unstable environment, it turns out that the implementation of public investment projects can take place under much more difficult conditions than for enterprises in the private sector. Private entities are able to undertake adjustment procedures sufficiently in advance to avoid possible losses associated with the implementation of investment projects in a deteriorating macroeconomic environment. Hence, they can easily postpone certain projects or even abandon them totally. In the case of public investment projects, the activities of public authorities are limited, since the implementation of such projects generally involves the need to meet specific needs that cannot be postponed. This is determined by the social nature of public investments, which, as a rule, are implemented in a slightly different formula, so in conditions of macroeconomic instability, the indicators used in the evaluation of such projects also deteriorate.

In this context, projects implemented in public-private partnerships can play an important role. The implementation of organizational solutions and evaluation methods, developed on the basis of good practices of project financing under the public-private partnership formula, provides real opportunities to maintain a high level of efficiency of public spending despite unfavorable economic conditions.

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