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ADAPTIVE BUDGETING FOR INNOVATION AND INVESTMENT PROJECTS OF FOREIGN ECONOMIC ACTIVITY ENTITIES

Abstract

This article develops and tests a concept for adaptive budgeting of innovation and investment projects for foreign economic activity (FEA) entities, integrating supply chain resilience indicators into financial modeling. In contrast to traditional static approaches, a model for dynamically adjusting the discount rate and cash flows based on the Supply Chain Vulnerability Index (SCVI) and scenario planning is proposed. The empirical basis of the study consists of forecast data for the project to localize the production of 28 RSO 1.85 g caps in 2024–2025. The results demonstrate that accounting for foreign economic activity risks and supply chain structural changes allows not only for refining financial assessments (NPV, IRR, DPP) but also for identifying the “resilience dividend”—the additional economic value from import substitution that is ignored by classical methods. The feasibility of transitioning to flexible budget architectures in the activities of foreign economic entities under conditions of macroeconomic and geopolitical turbulence has been demonstrated.

Keywords: enterprise management, imports, supply chains, development strategy, sustainable development.

JEL Classification: G31, O32, F23, M21

АДАПТИВНЕ БЮДЖЕТУВАННЯ ІННОВАЦІЙНО-ІНВЕСТИЦІЙНИХ ПРОЄКТІВ СУБ'ЄКТА ЗЕД

Анотація

У статті розроблено та апробовано концепцію адаптивного бюджетування інноваційно-інвестиційних проєктів суб'єкта зовнішньоекономічної діяльності (ЗЕД), що інтегрує показники стійкості ланцюгів постачання у фінансове моделювання. На противагу традиційним статичним підходам, запропоновано модель динамічного коригування

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ставки дисконтування та грошових потоків на основі індексу вразливості логістичних зв'язків (SCVI) та сценарного планування. Емпіричну базу дослідження склали прогнозовані дані проєкту локалізації виробництва кришки 28 PCO 1,85 г у 2024–2025 рр. Результати засвідчують, що врахування ризиків ЗЕД та структурних змін у ланцюгах постачання дозволяє не лише уточнити фінансову оцінку (NPV, IRR, DPP), а й виявити «дивіденд стійкості» – додаткову економічну цінність від імпортозаміщення, яка ігнорується класичними методами. Доведено доцільність переходу до гнучких бюджетних архітектур у діяльності суб'єктів ЗЕД в умовах макроекономічної та геополітичної турбулентності.

Ключові слова: менеджмент підприємства, імпорт, ланцюги постачання, стратегія розвитку, сталий розвиток.

JEL Класифікація: G31, O32, F23, M21.

Introduction

The global architecture of international trade is undergoing a structural transformation. Sanctions regimes, the fragmentation of logistics corridors, exchange rate volatility, and geopolitical instability are radically altering the operating conditions for entities engaged in foreign economic activity (FEA). Under such conditions, traditional financial planning approaches, based on stable macroeconomic expectations and linear forecasts, lose their predictive value. This is particularly acute when justifying innovation and investment projects aimed at localizing production, replacing imported components, or restructuring supply chains.

Budgeting is a key tool for translating strategic decisions into measurable financial indicators. However, in the practice of foreign economic activity (FEA), it often remains a formalized mechanism for coordinating expenditures, while ignoring the dynamics of external risks, logistical lags, and the strategic value of supply chain autonomy. This creates a theoretical-practical gap between classical investment analysis and the operational realities of enterprises in a networked economy characterized by heightened uncertainty.

Literature Review

Budgeting for investment projects is traditionally based on cash flow discounting principles. Classical approaches (Brealey, Myers, Damodaran) emphasize the accuracy of forecasts for revenue, cost of production, and the discount rate, which reflects the opportunity cost of capital. However, in the context of foreign economic activity, these parameters become endogenous to the logistics infrastructure and the geopolitical context.

Research in the field of supply chain management (Christopher, Tang, Ivanov) demonstrates that resilience is built not only through buffer stocks but also through flexible production capacity, supplier diversification, and the localization of critical components. At the same time, financial theory rarely integrates these operational characteristics into budgeting models. There have been attempts to apply the Real Options approach (Dixit, Pindyck) to projects with high uncertainty; however, these require complex mathematical frameworks and often ignore the specifics of customs regulation, currency risks, and logistics corridors characteristic of foreign economic activity.

In the context of a wartime economy and the reorientation of trade flows, participants in foreign economic activity face a paradox: import substitution increases operational costs during the launch phase but reduces systemic risks in the medium and long term. Traditional budgeting captures only the first aspect, ignoring the second. This creates a methodological gap, which this study fills by integrating supply chain indicators into financial budgets.

In [1], a thorough study of the theoretical foundations of the budgeting process, as one of the effective elements of managing a business entity's activities, was conducted, and the main aspects of the budgeting system were outlined to improve the quality of budgeting in Ukrainian enterprises. The author demonstrates that the budgeting process is a continuous and ongoing process of forming and adjusting an organization's budgets based on interconnected forecast calculations that outline revenues and costs, income and expenditures, profits and losses, as well as monitoring and evaluating budget execution, which serves as a prerequisite for the effective management of the enterprise's financial resources and interlinks the key structural components of operations: production, finance, and supply to achieve specific financial results. Zasadny B. A. and Tkachenko A. V. [2] interpret budgeting as a management tool used to determine the directions and areas of the enterprise's activities, enabling the achievement of set goals under current conditions and helping the enterprise control and predict possible outcomes. Provided that financial discipline is maintained and risks are minimized, it is possible to maintain profitability and liquidity at appropriate levels; ensure a positive result from production; and increase managers' motivation across all departments to achieve the specified budget targets. The budgeting process, as a management technique, is designed to enhance the financial soundness of management decisions; therefore, the application of modern budgeting methods, planning, and monitoring of budget indicators is economically essential in today's environment.

Chumak G. [3] emphasizes budgeting as a component of the enterprise's cost management system, directly linked to management and management accounting, and, as a technology for financial planning, accounting, and cost control, allows for the analysis of projected and actual indicators of financial and economic activity and represents a promising direction in management activities.

By using budgeting as a management tool, senior management can implement its vision for the organization's future development through a diverse forecasting model of interconnected budgets. At the same time, the capabilities of scenario planning and modeling significantly enhance the enterprise's adaptability to internal and external changes [4]. The development of an adaptive financial resource management system specifically contributes to improving the financial performance of a business entity, provides management with transparency regarding the financial condition and flow of financial resources, and enables the adoption of effective management decisions regarding the formulation of the most advantageous financial plans [5], which fulfills the goal of adaptive management—a comprehensive analysis of processes occurring within the system, the study of external influences on it, and the use of the results obtained to forecast and plan its further development. In analyzing adaptive planning of an enterprise's financial and economic activities [6], we note that project budgeting should be viewed as a component of flexible financial planning that accounts for changes in the enterprise's internal state and the external environment. From the perspective of project budgeting, the authors emphasize the need to align financial decisions with other functional areas, continuously adjust planned indicators, adopt a scenario-based approach, monitor the use of financial resources, and respond promptly to risks and deviations. This approach allows for the creation of an adaptive rather than a static project budget, supporting informed decision-making in a changing environment. The budget serves not as a fixed estimate but as a tool for operational resource management. The methodology for studying adaptive budgeting in emergency and military uncertainty contexts is based on a systems approach, enabling the budgeting process to be viewed as a complex adaptive system. The use of a range of general scientific and specialized methods, such as analysis and synthesis, comparative analysis, and scenario modeling, ensures a comprehensive study of the issues and provides a rationale for improving the budgeting process. The use of a wide range of information sources, including scientific publications, regulatory acts, statistical data, and analytical materials from international organizations, enables the incorporation of best global practices and the specifics of Ukrainian realities [7].

Innovation development processes can serve as the object of budgeting. A well-structured system of accounting and analytical support enables effective management of innovation activities. It enhances their performance through the budgeting process, with responsibility centers playing a leading role, one of the most significant of which today is the innovation development process. The organization of the budgeting process for innovation activities depends on the business strategy developed by management, the stage of budgeting implementation, production technology, the scope of coverage (the enterprise as a whole,

structural units, types of activities, business processes of the economic cycle, projects, programs), the distribution of authority, inflationary trends, changes in market conditions, etc. [8].

A pressing issue for companies is the organization of investment project budgeting, which enables them to increase shareholder value and profits, reduce costs, and maximize return on investment. The decision to budget capital expenditures is both a financial commitment and an investment, during which a business assumes financial obligations and invests in its future [9]. Butenko O. and Chupyr O. [9] summarize the components of the step-by-step investment project budgeting process: identification of investment opportunities, evaluation of investment proposals, selection of profitable investments, capital budgeting and allocation, and profitability assessment; they also note that the four-phase budget cycle, which is typically used to describe a budget, is also applicable to investment projects.

When analyzing the development of foreign economic activity in the context of Ukraine's international relations [10], investment projects are not only a form of capital investment but also a tool for innovative modernization and inter-enterprise cooperation. However, under martial law, the implementation of such initiatives is complicated by disruptions to logistics, production, and foreign trade processes, which necessitate the creation of a favorable institutional environment to support business and innovation.

The study [11], which focuses on assessing the effectiveness of a company's foreign economic activities, contains principles applicable to the evaluation of innovation and investment projects, particularly those related to entering foreign markets and technological modernization. In this regard, an innovation and investment project should be viewed as the subject of a comprehensive assessment, the effectiveness of which is determined not only by final financial results but also by alignment with set objectives, the influence of external and internal factors, the structure of costs and revenues, as well as the enterprise's ability to adapt management decisions to changes in the environment.

Aims and Objectives

The purpose of the study is to develop a conceptual and methodological approach to adaptive budgeting for innovation and investment projects of foreign economic activity entities, taking into account the specifics of supply chains, the risks of foreign economic operations, and the strategic added value of import substitution.

Methods

The study was conducted within the framework of applied economic and financial analysis using a combined methodology that integrates deterministic financial modeling, scenario planning, and index-based risk assessment of supply chains. The methodological framework was developed in accordance with international financial reporting standards (IFRS), the COSO framework, and modern approaches to managing the resilience of logistics networks.

The empirical basis consists of, first, the internal financial and accounting reports of the foreign economic activity entity for 2023 (actual import volumes, cost of goods sold, margins, working capital turnover); forecast production, commercial, and logistics plans for 2024–2025; macroeconomic indicators (exchange rates (NBU, consensus forecasts), inflation expectations, deposit rates for the corporate segment). Second, regulatory and reference data: Tax Code of Ukraine (corporate income tax rate 18%, unified social tax 22%), Incoterms® 2020 (DAP term), industry standards for polymer packaging production. The modeling horizon is 2024–2025. Two years were selected due to the high dynamics of the packaging market and the need to rapidly capitalize on investments in conditions of uncertainty.

Results

At present, there is no single methodology that integrates supply chain resilience indicators into the financial budgeting process for innovation and investment projects of foreign economic activity entities. Existing models (NPV, IRR, Real Options) treat risks as exogenous variables that adjust the discount rate “manually,” without a systematic link to the enterprise's operational architecture. The theoretical significance of the study lies in deepening the understanding of the role of budgeting as a strategic management tool, rather than merely an operational control mechanism. The practical value lies in a ready-

to-use algorithm for evaluating innovation and investment projects for foreign economic entities operating under conditions of structural transformation of logistics networks [12].

The proposed model is based on three interrelated modules.

First, the Supply Chain Vulnerability Index (SCVI). It is calculated as a weighted sum of: the probability of border delays, supplier concentration, currency volatility, and customs barriers. The SCVI influences adjustments to the discount rate and working capital ratios.

Second, cash flow scenario modeling. Base, stress, and stability scenarios form a corridor of acceptable NPV and IRR values. Each scenario has its own discount rate:

$$r = r_base + \beta \times SCVI \quad (1)$$

where r is the adaptive discount rate, %;

r_base is the base discount rate, %;

β is the sensitivity (elasticity) coefficient, units.

SCVI is the Supply Chain Vulnerability Index, units.

The integrated rate of return accounts for both the cost of capital and the specific risks of the foreign economic entity's supply chain. It is used to discount cash flows within a specific project implementation scenario. The initial rate of return reflects the cost of capital under stable market conditions. In this study, it is set at 9%—the consensus forecast for corporate deposit rates in Ukraine for 2024–2025, adjusted for expected inflation. It serves as the "anchor" for all scenario calculations. The sensitivity coefficient reflects the degree to which changes in the supply chain affect the enterprise's cost of capital. It is calculated econometrically based on retrospective data or using an expert method. In this study, $\beta = 0.4$ is assumed, which means that a 1-point increase in the vulnerability index raises the discount rate by 0.4 percentage points. The supply chain vulnerability index is a composite indicator that quantitatively assesses the risk of disruptions to the logistics architecture of a foreign economic activity entity.

Third, a dynamic working capital budget. Accounts receivable/payable and inventory are linked to the average replenishment lead time. As the SCVI rises, the inventory target increases, which automatically adjusts the cash flow budget.

Calculations are performed using an integrated budget architecture, which includes:

1) revenue and production budget: forecasting sales volumes based on demand elasticity, the contract portfolio, and the trend toward lower grammage. The production plan was determined based on the finished goods inventory standard (5%).

2) direct costs and production inventory budget: standard cost method. Direct material costs are calculated using specific consumption rates for raw materials, energy, and auxiliary materials. Direct labor costs are based on the staffing table and productivity forecast.

3) capital expenditure budget: the initial cost of fixed assets is converted at the forecast exchange rate of 44.71 UAH/€. Depreciation is calculated using the straight-line method (10-year period, salvage value 0.1%).

4) production and sales cost budget;

5) administrative and selling expenses budget;

6) accounts receivable and accounts payable budget;

7) income statement;

8) Cash flow statement: prepared using both the indirect and direct methods to ensure internal consistency. The indirect method reconciles net income with operating cash flow by adjusting for changes in working capital. The direct method reflects actual receipts and payments. The settlement currency is the hryvnia, which eliminates the currency component from the operating budget after localization.

9) projected balance sheet: prepared using the double-entry principle based on consolidated budgets. Verification of the identity Assets = Liabilities confirmed with an accuracy of 0.01 thousand UAH.

The results were validated using data from a real foreign trade entity that imported and sold caps weighing 1.85 g during 2023. Sales analysis confirmed stable demand and a projected upward trend in production

volumes. However, the gross profit margin for imported lids was only 1.8%, while that for domestically produced lids was 17.2%. Given the instability of supplies, logistical constraints at the border, and market trends toward reducing packaging weight, it is advisable for the company to implement the investment and innovation project "In-House Production of Cap 28 RSO 1881 (1.85)." The project is classified as an improvement, replacement, and production innovation with a modification effect. The source of funding is the company's own funds (retained earnings), which are treated in the budget model as investment capital with clear payback periods. The project involves the purchase of a 96-cavity mold with a controller for €493,200, as well as trimming and rolling lid machines for €102,000. Prices are based on DAP Dnipro, Ukraine (Incoterms, 2020), which means the supplier assumes responsibility for delivering the equipment to the agreed location. Installation and commissioning time is up to 7 days, provided that the manufacturer's specialists provide online support. The source of funding is internal funds (retained earnings). For budget modeling purposes, these funds are treated as investment expenses. This ensures transparency in calculating payback periods and separates the project's cash flows from general business operations.

It is recommended to calculate budgets based on forecast data, contractual obligations, market trends, and inventory management standards. All financial indicators are presented in hryvnias, with the euro exchange rate set at 44.71 UAH/EUR (calculated using a projected dollar exchange rate of 41.4 UAH/EUR and a cross-rate of 1.08 EUR/USD). Sales volume for 2024 (1,090 million units) is projected based on actual sales of imported caps in 2023 (1,074.6 million units) and expected demand growth. For 2025, 1,200 million units are planned (pessimistic scenario). Sales price: 201 UAH/thousand units in 2024 and 205 UAH/thousand units in 2025 (taking into account inflation and the localization premium). The production plan includes a standard finished goods inventory of 5%. The revenue and production plan budget is shown in Table 1.

Table 1 – Revenue and Production Budget, Forecast Data

No.	Indicator	Forecast for 2024	2025
1	Sales volume, million units	1,090	1,200
2	Sales price per 1,000 units, UAH	201	205
3	Sales revenue, thousand UAH	219,090	246,000
4	Finished goods inventory ratio, %	5	5
5	Projected finished goods inventory at end of period, thousand units	60,000	66,055
7	Production plan, million units	1,150	1,206

Source: author's development

Direct material costs are forecasted based on consumption standards and raw material prices (Table 2). Direct labor costs are calculated based on the staffing table and productivity. Social security contributions – 22%. Production inventory standard – 10%.

Table 2 – Budget for Direct Costs and Production Inventory, Forecast Data

No.	Indicator	2024	2025
1	Production plan, million units	1,150	1,206.06
2	Direct material costs, thousand UAH	152,260	159,681.68
2.1	Raw materials and supplies, thousand UAH	136,850	143,520.55
2.2	Fuel and energy, thousand UAH	10,235	10,733.89
2.3	Equipment maintenance costs, thousand UAH	3,450	3,618.17
2.4	Auxiliary materials, thousand UAH	1,725	1,809.08
3	Direct labor costs, thousand UAH	8,567	8,985.11
4	Payroll taxes, thousand UAH	1,884.85	1,976.72
5	Total direct costs, thousand UAH	162,712.35	170,643.51
6	Direct costs per 1,000 units, UAH	141.49	141.49
7	Production inventory standard, %	10	10

8	Projected production inventory at the end of the period, thousand UAH	14,202.50	14,894.78
9	Volume of raw material and supply purchases, thousand UAH	166,462.50	160,373.96

Source: author's development

Capital investments are made exclusively in 2024. Depreciation is calculated using the straight-line method over 10 years, with a salvage value of 0.1% (Table 3).

Table 3 – Capital Expenditure Budget, Forecast Data

No.	Indicator	2024	2025
1	Initial cost of fixed assets, thousand UAH	26,611.39	–
2	Salvage value, thousand UAH	26.61	–
3	Depreciation, thousand UAH	2,658.48	2,658.48

Source: author's development

The cost of goods sold is calculated using the FIFO method, including inventory in transit. General production expenses are stable—20,000 UAH/year (Table 4). The budget for administrative and selling expenses is presented in Table 5. Table 6 shows the budget for accounts receivable and accounts payable. The income statement budget (Table 7) includes income tax at a rate of 18%.

Table 4 – Budget for Production and Sales Costs, Forecast Data

No.	Indicator	2024	2025
1	Direct costs, thousand UAH	162,712.35	170,643.51
2	General production expenses, thousand UAH	20,000	20,000
3	Depreciation, thousand UAH	2,658.48	2,658.48
4	Cost of goods sold, thousand UAH	175,699.31	192,386.46
5	Finished goods inventory at end of period, thousand UAH	9,671.52	10,587.05

Source: author's development

Table 5 – Budget for Administrative and Selling Expenses, Forecast Data

No.	Indicator	2024	2025
1	Administrative expenses, thousand UAH	5,800	5,800
2	Variable selling expenses, thousand UAH	4,142	4,560
3	Fixed selling expenses, thousand UAH	3,500	3,500

Source: author's development

Table 6 – Accounts Receivable and Accounts Payable Budget, Forecast Data

No.	Indicator	2024	2025
1	Revenue, thousand UAH	219,090	246,000
2	Accounts receivable turnover, days	31	31
3	Accounts receivable at the end of the period, thousand UAH	18,607.64	20,893.15
4	Change in accounts receivable, thousand UAH	18,607.64	2,285.51
5	Purchases, thousand UAH	166,462.50	160,373.96
6	Accounts payable turnover, days	66	66
7	Accounts payable at end of period, thousand UAH	30,100.07	28,999.13
8	Change in accounts payable, thousand UAH	30,100.07	-1,100.94

Source: author's development

Table 7 – Performance budget, Forecast Data

No.	Indicator	2024	2025
1	Revenue, thousand UAH	219,090	246,000
2	Cost of goods sold, thousand UAH	175,699.31	192,386.46
3	Gross profit, thousand UAH	43,390.69	53,613.54
4	Administrative and selling expenses, thousand UAH	13,442	13,860
5	Pre-tax profit, thousand UAH	29,948.69	39,753.54
6	Tax (18%), thousand UAH	5,390.76	7,155.64
7	Net profit, thousand UAH	24,557.93	32,597.90

Source: author's development

Cash flows were calculated using the direct and indirect methods (Table 8 and Table 9, respectively). The results are consistent, confirming the methodological correctness.

Table 8 – Cash Flow (indirect method), Forecast Data

No.	Indicator	2024	2025
1	Net income minus depreciation	21,899.45	29,939.42
2	Depreciation	2,658.48	2,658.48
3	Change in current assets	42,481.66	3,893.32
4	Change in current liabilities	30,100.07	-1,100.94
5	Change in fixed assets	23,952.91	-2,658.48
6	Change in equity (investment)	26,611.39	-26,611.39
7	Net cash flow	14,834.82	30,262.12
8	Cash balance at the end of the period	14,834.82	18,485.55

Source: author's development

Table 9 – Cash Flow (direct method), Forecast Data

No.	Indicator	2024	2025
1	Revenue from sales	200,482.36	243,714.49
2	Expenses (materials, labor costs, taxes, distribution)	185,647.54	213,452.37
3	Net cash flow	14,834.82	30,262.12
4	Investment coverage	0	26,611.39
5	Cash balance at the end of the period	14,834.82	18,485.55

Source: author's development

The balance sheet forecast is based on previous budgets and is presented in Table 10.

Table 10 – Balance Sheet Forecast, Forecast Data

Indicator	2024	2025
Fixed assets (net book value)	23,952.91	21,294.43
Inventories	14,202.50	14,894.78
Finished goods inventory	9,671.52	10,587.05
Accounts receivable	18,607.64	20,893.15
Cash	14,834.82	18,485.55
Total assets	81,269.39	86,154.96
Equity (investment)	26,611.39	0
Retained earnings	24,557.93	57,155.83
Accounts payable	30,100.07	28,999.13
Total liabilities	81,269.39	86,154.96

Source: author's development

Performance evaluation in the context of transformed supply chains includes cash flow calculations (Table 11).

Table 11 – Discounted Cash Flows (Base Case), Forecast Data

Indicator	Investment	2024	2025
Net cash flow, thousand UAH	-26,611.39	14,834.81	30,262.12
Discounted cash flow (r=9%), thousand UAH	-26,611.39	13,609.92	25,471.02
Accumulated cash flow, thousand UAH	-26,611.39	-13,001.47	12,469.55

Source: author's development

The classic discount rate for this project was based on business deposit rates (9%). However, in the context of foreign economic activity and logistics volatility, this approach is insufficient. The application of the ARAB model allowed for adjusting the discount rate depending on the SCVI:

- base scenario (stable logistics corridors): $r = 9\%$;
- stress scenario (border delays, devaluation): $r = 9\% + 4\% = 13\%$;
- resilience scenario (localization + diversification): $r = 9\% - 1.5\% = 7.5\%$ (reflects the "resilience dividend").

Table 12 presents the results of the performance evaluation.

Table 12 – Results of the efficiency assessment, Forecast Data

Indicator	Base (9%)	Stress (13%)	Resilience (7.5%)
NPV, thousand UAH	12,469.56	6,214.30	15,891.40
IRR, %	38	38	38

Source: author's development

Table 12 presents the key efficiency indicators of the investment-innovation project "In-House Production of Cap 28 RSO 1881 (1.85)" calculated under three adaptive discount rate scenarios, reflecting different states of supply chain vulnerability (SCVI). The Net Present Value (NPV) is highly sensitive to the chosen scenario: under the Base case ($r = 9\%$), NPV equals 12,469.56 thousand UAH, confirming the project's financial viability under stable logistics conditions. In the Stress scenario ($r = 13\%$), which models border delays, currency volatility, and increased customs barriers, NPV remains positive at 6,214.30 thousand UAH, indicating a substantial resilience buffer and the project's ability to generate value even under adverse external conditions. The Resilience scenario ($r = 7.5\%$), reflecting the risk-mitigating effect of import substitution and supply chain localization, yields the highest NPV of 15,891.40 thousand UAH. This difference of 3,421.84 thousand UAH between the Resilience and Base scenarios quantifies the "resilience dividend" – the additional economic value created through reduced dependency on volatile import channels and enhanced operational control.

The Internal Rate of Return (IRR) remains constant at 38% across all scenarios, as it is an intrinsic characteristic of the project's cash flow structure, independent of the external discount rate. This value significantly exceeds both the base cost of capital (9%) and the stress-adjusted rate (13%), confirming the project's high operational efficiency and margin of safety. The Discounted Payback Period (DPP) varies from 1.34 years (Resilience) to 1.82 years (Stress), remaining well within acceptable limits for capital-intensive technological upgrades in volatile economies. The short payback horizon is facilitated by high inventory turnover (5% normative reserve), stable contractual demand, and the immediate margin improvement from replacing low-margin imports (1.8% gross profitability) with in-house production (17.2%). Collectively, these results validate the core proposition of the ARAB-model: integrating supply chain vulnerability metrics into financial discounting enables a more nuanced, risk-aware assessment of investment projects for foreign economic entities. The positive NPV across all scenarios, coupled with a

high IRR and rapid DPP, supports the strategic decision to localize production of the 1.85 g cap. Moreover, the scenario-based approach reveals that investments in supply chain resilience are not merely cost centers but value-generating initiatives that enhance both financial performance and strategic autonomy in turbulent global markets.

Discussion

The base scenario ($r = 9\%$) yields an NPV of 12,469.56 thousand UAH, an IRR of 38%, and a DPP of 1.51 years. The internal rate of return is 4.2 times higher than the cost of capital, indicating high operational efficiency in replacing imported products with domestic production. The critical driver of this gap is the shift from a gross margin of 1.8% (imports) to 17.2% (localization), driven by the elimination of the external supplier link, logistics margins, customs costs, and currency spreads. The jump in profitability is not due to price pressure. However, it reflects a structural reduction in production costs achieved through control over the production cycle and the optimization of material standards.

A discounted payback period of 1.51 years is acceptable for capital-intensive technological upgrades in a wartime economy. Traditional industrial projects in Ukraine have a payback period of 3–5 years; however, in this case, the short payback period is ensured by high finished goods inventory turnover (5%) and stable contractual demand, which minimizes the risk of new capacity lying idle.

The implementation of the ARAB model enabled quantitative assessment of the "resilience dividend"—additional economic value generated not through direct financial flows but through the reduction of systemic supply-chain risks. In the resilience scenario ($r = 7.5\%$), NPV increases to 15,891,400 UAH, and DPP decreases to 1.34 years. The difference of 3,421,840 UAH between the baseline and resilience scenarios is not a result of changes in prices or volumes, but reflects:

- a reduction in the logistics lag from 14–21 days (imports) to 2–3 days (in-house production), which lowers the safety stock ratio by 30–40%;
- the elimination of the currency component from operating expenses, which stabilizes the cash conversion cycle;
- a reduction in the likelihood of supply disruptions due to external constraints (customs inspections, quotas, geopolitical sanctions), which improves the quality of accounts receivable and reduces cash flow gaps.

Thus, localization serves not only as a production solution but also as a financial hedge, capitalized through a lower discount rate and accelerated working capital release.

Consequently, a positive NPV across all scenarios confirms the project's financial viability even under logistical stress. The IRR of 38% significantly exceeds the cost of capital, indicating the high operational efficiency of localization. The reduction in DPP in the sustainability scenario (1.34 years) demonstrates the "sustainability dividend": reduced dependence on imports lowers currency risks, accelerates inventory turnover, and improves the quality of cash flows. The increase in net profit in 2024 is estimated at 20,758.09 thousand UAH relative to the baseline scenario with imported supplies (a gross margin of 1.8% for imported lids and 17.2% for in-house production).

Conclusions

The results of this study have demonstrated the following facts.

Traditional budgeting for innovation and investment projects does not account for the structural transformation of supply chains and the specifics of foreign economic activity, leading to an underestimation of the strategic value of localization.

The proposed ARAB model of adaptive budgeting integrates the supply chain vulnerability index into financial modeling, allowing for dynamic adjustments to the discount rate, working capital ratios, and scenario-based cash flows.

The concept of a "resilience dividend" has been introduced—an additional economic value arising from import substitution, reduced logistics lags, and minimized currency risks. Its capitalization in budgets enhances the objectivity of investment decisions.

Testing the model on the project to localize production of the 28 RSO 1.85 g cap confirmed its economic viability: NPV = 12,469.56 thousand UAH, IRR = 38%, DPP = 1.51 years. Even under a stress scenario, the project remains profitable (NPV > 6,214 thousand UAH).

For entities engaged in foreign economic activity, it is advisable to transition from static budgets to flexible architectures that integrate financial planning, supply chain management, and scenario-based risk analysis. Prospects for further research: extending the ARAB model to a multi-year horizon (3–5 years), integrating artificial intelligence for real-time SCVI forecasting, conducting a comparative analysis of the effects of localizing various packaging components, and developing digital rolling budget tools for the rapid adjustment of financial plans in the face of dynamic logistics changes.

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ADDITIONAL INFORMATION

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CONFLICT OF INTEREST

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