European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol.16, No.8, 2024

Study of the Optimal budget Allocation and Pandemic Impact

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Abstract
Within the scope of this research, using the quantitative data of 88 quarters of Mongolian budget income and expenditure for 2020-2021, the structural effect was divided into two parts: pre-pandemic and post-pandemic, which were shown in the budget income and expenditure portfolio using the Markovitch portfolio choice model. Optimum values are obtained through programming or optimization, and how much the optimal value deviates from the original value is analyzed by the one-sigma rule. According to the results of the survey, the pandemic had a 48 percent impact on budget expenditures and 32 percent on budget revenue. Therefore, to improve budget efficiency, budget spending should be implemented effectively. In particular, policymakers should pay attention to the gradual increase in investment in the health and education sectors.
JEL categories: C23, C50, E62, I25, I15
Keywords: budget revenue, budget expenditure, balanced budget balance, budget deficit, Markovitch model, quadratic programming
DOI: 10.7176/EJBM/16-8-02
Publication date: October 30th 2024

1. INTRODUCTION

In 2020, the Government of Mongolia adopted the policy document "Vision - 2050" with the long-term goal of becoming a country with an above-average income in the next 30 years. In order to achieve the above goals, “Vision-2050” should be based on the policy of diversifying the economy by implementing appropriate macroeconomic policies and reducing dependence on the mining sector. Appropriate policies and economic diversification to reduce the cyclical effects of the "Recession" caused by sudden changes in commodity prices on the world market are important issues. In any economic and political situation, there is a need to correctly define the budget (fund) management policy, make the optimal distribution of state budget income and expenditure, improve budget efficiency, further reduce the debt burden, and gradually implement the policy to keep the budget deficit at a minimum level.

After the sharp decline in copper and coal exports in 2008-2009, in 2010, the Government of Chile approved the "Fiscal Stability (FSS)" law, based on Chile's experience. This law aims to reduce the impact of mining price fluctuations on the economy and budget by planning budget expenditures so that they are less dependent on

mining revenues. However, after the crisis of 2008-2009, Mongolia led the world in terms of economic growth. In 2011, real economic growth reached 17 percent, and the average growth in 2011-2013 was 13.8 percent. With the opening of mining deposits, Mongolia has become a country with high budget expenditures. Between 2010 and 2016, public spending averaged 37.3 percent of GDP, which is significantly higher than the average for commodity-dependent countries (29.5 percent) and other low- and middle-income countries (31.6 percent).

Every year, the World Bank evaluates the efficiency of public spending and sets a rating, and for Mongolia, the index is 2.06, which is 124th place, which indicates that the efficiency of public spending is poor (World Bank, 2021). Mongolia's score is low compared to other countries of the world and developing countries that invest less than Mongolia. The World Bank analysts concluded that the reasons for poor efficiency are weak investment management, poor project selection, delayed project implementation, significant cost overruns, and rapid wear and tear of built assets (Figure 1).

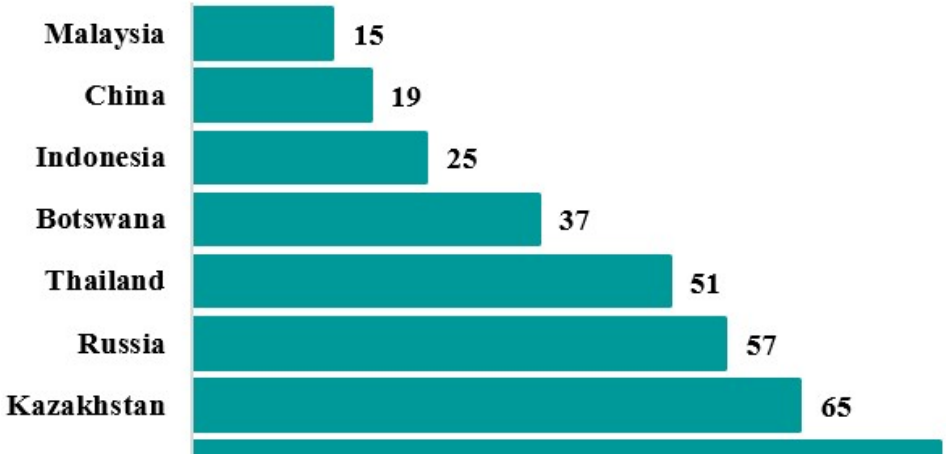

Figure 1. The efficiency of budget expenditures in 2020

Source: World Bank

Due to the impact of the pandemic, major problems such as high debt payments and economic grayness have arisen, as well as the loss of fiscal discipline and the planning of budget expenditures in preference to income, which may have a significant negative impact on the economy. More specifically, in the last 22 years (2000-2021), 15 years were of the budget deficit. These deficits could create risks for the economy to worsen in the coming years. Therefore, it is necessary to study the composition of the state budget income and to concentrate on and increase the tax and non-tax income that make up the current income. On the other hand, it is necessary to determine the optimal level to improve the efficiency of public spending and minimize the fluctuation of the spending package, and implement policy-level tasks in stages.

Purpose of the study

The purpose of this research is to calculate the structural effects of the pandemic on the budget revenue and expenditure package of Mongolia and to calculate the optimal distribution with the aim of minimizing the fluctuation using quadratic programming.

Research objective

Within the framework of the above objectives, the following objectives have been proposed:

1. to conduct research on the current state of Mongolian budget revenue and expenditure
2. to determine the structural effects of the pandemic on budget revenues and expenditures
3. Using the quadratic programming model, to determine the optimal percentages of budget revenue and expenditure portfolios and to compare them with historical averages
4. to compare the results and draw conclusions

Overview of research

When determining the impact of the pandemic on budget revenues and expenditures, most researchers evaluated it with econometric modeling.

(Markovitz model) This literature review examines the fiscal implications of the COVID-19 pandemic on sub-national governments, focusing specifically on the Russian regions. The research investigates the impact of the pandemic on budget revenues, expenditures, and federal transfers at the regional level. To analyze these effects, the study employs a unique dataset and compares monthly fiscal indicators in 2020, both before and during the pandemic, with the corresponding measures from 2019. The analysis takes into consideration regional responses to the pandemic, the health outcomes associated with the virus, and other pertinent regional characteristics. The findings highlight a substantial decline in small business tax collections due to the pandemic-related restrictions. Furthermore, changes are observed in terms of unconditional discretionary transfers and healthcare expenditures. Overall, this literature review sheds light on the specific fiscal consequences experienced by Russian regions during the COVID-19 pandemic.

For instance, Professor Ioanna-Laura Tibulca and others of the University of Economics in Bucharest, Romania, in their research work "The impact of the COVID-19 pandemic on tax revenues in the EU" (Țibulcă, 2022) showed the impact of the pandemic on the tax revenues of EU (European Union) countries. The COVID-19 pandemic has caused an economic crisis with far-reaching effects around the world. The study aims to offer the most up-to-date and accurate forecasts of tax revenues for the 27 EU member states for 2020-2022. Using data from 1995 to 2019, a time trend model regression model adjusted for unemployment rates was estimated for each member state. Based on this regression model, tax revenue projections are generated. The results show that tax revenues will decrease in 2020 and 2021, followed by a slight recovery in 2022 in most EU member states. In the future, EU budget policy recommendations aimed at improving and stabilizing tax revenue were proposed. According to the Fiscal Monitor report from IMF (International Monetary Fund), the fund's policy during the pandemic will provide financing for the health sector, protect the health of citizens, protect citizens and businesses that have suffered financial losses due to economic stagnation, and also support economic recovery after the pandemic, and emphasized the importance of having a back-up plan. The countries of the world approved and implemented a budget support package totaling $8 trillion or 9.5 percent of the world's GDP. As a result, it is believed that the debt level of governments will increase by 13 percent and reach 96 percent (*Fiscal Monitor, October 2020 Policies for the Recovery.*, 2020).

R. Enkhbat and Ch. Ankhbayar, professors and researchers of NUM, Business School (2019) optimized the fiscal revenue based on the quantitative data of the fiscal revenue during the 4-stage reform of the tax environment. The calculation of the quadratic programming policy was made for the 2nd period of reform, 1998-2006, the 3rd period of reform, 2007-2015, and the 4th period of reform, 2016-2018, and compared with the original values (Лхагважав, 2020).

2. THEORY AND RESEARCH METHODOLOGY

This research work is based on Markovitch set theory (Jorion, n.d.) and will be presented in detail in the next part of the presentation.

2.1 Budgetary revenue portfolio optimization policy

The set of budget revenues consists of income tax, property tax, domestic goods, and services tax, income from foreign operations, other taxes, non-tax income, and social insurance income. The individual weights of these Let it be expressed by the matrix $\mathbf{x} = (x_1, \dots, x_7)^T$. Then x_1: percentage of income tax in total income, x_2: percentage of property tax in total income, x_3: percentage of domestic goods and services tax in total income, x_4: percentage of foreign activity income in total income, x_5: percentage of total income percentage of other taxes, x_6: percentage of non-tax income in total income, $x_7$7: percentage of social insurance income in total income, respectively (Markowitz, 1952).

Let's denote the percentage of budget revenue growth **before the pandemic** by the matrix $\mu_x = (\mu_1^x, \dots, \mu_7^x)^T$. Then μ_1^x: increase the percentage of income tax, μ_2^x: increase the percentage of property tax, μ_3^x: increase percentage of domestic goods and services tax, μ_4^x: increase percentage of foreign activity income, μ_5^x: increase percentage of other taxes , μ_6^x: percentage of non-tax income growth, and μ_7^x: percentage of social insurance

income growth, respectively. The correlation between these parameters is denoted by the covariance matrix (A).

$$A = \begin{pmatrix} \sigma_{11}^{x} & \sigma_{12}^{x} & \cdots & \sigma_{17}^{x} \\ \sigma_{21}^{x} & \sigma_{22}^{x} & \cdots & \sigma_{27}^{x} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{71}^{x} & \sigma_{72}^{x} & \cdots & \sigma_{77}^{x} \end{pmatrix} \quad B = \begin{pmatrix} \sigma_{11}^{x\prime} & \sigma_{12}^{x\prime} & \cdots & \sigma_{17}^{x\prime} \\ \sigma_{21}^{x\prime} & \sigma_{22}^{x\prime} & \cdots & \sigma_{27}^{x\prime} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{71}^{x\prime} & \sigma_{72}^{x\prime} & \cdots & \sigma_{77}^{x\prime} \end{pmatrix}$$

Denote the percentage of income growth **during the pandemic** by the matrix $\mu_{x\prime} = (\mu_1^{x\prime}, \dots, \mu_7^{x\prime})^T$. Then $\mu_1^{x\prime\prime}$: percentage of income tax increase, $\mu_2^{x\prime\prime}$: percentage of property tax increase, $\mu_3^{x\prime}$: percentage of domestic goods and services tax increase, $\mu_4^{x\prime}$: percentage of foreign activity income increase, $\mu_5^{x\prime}$: growth percentage of other taxes, $\mu_6^{x\prime}$: growth percentage of non-tax income, $\mu_7^{x\prime}$: growth percentage of social insurance income, respectively. The correlation between these indicators is denoted by the covariance matrix (B).

$$A = \begin{pmatrix} \sigma_{11}^{x} & \sigma_{12}^{x} & \cdots & \sigma_{17}^{x} \\ \sigma_{21}^{x} & \sigma_{22}^{x} & \cdots & \sigma_{27}^{x} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{71}^{x} & \sigma_{72}^{x} & \cdots & \sigma_{77}^{x} \end{pmatrix} \quad B = \begin{pmatrix} \sigma_{11}^{x\prime} & \sigma_{12}^{x\prime} & \cdots & \sigma_{17}^{x\prime} \\ \sigma_{21}^{x\prime} & \sigma_{22}^{x\prime} & \cdots & \sigma_{27}^{x\prime} \\ \vdots & \vdots & \ddots & \vdots \\ o_{71}^{x\prime} & o_{72}^{x\prime} & \cdots & o_{77}^{x\prime} \end{pmatrix}$$

Then, at the expected rate of return, the policy to minimize the volatility of the budget revenue portfolio is expressed as follows.

$$\begin{aligned} &\min_{x \in \mathbb{R}^N} \sigma_p^2 = w_1 x^T A x + w_2 x^T B x, \\ &w_1 x^T A x + w_2 x^T B x \geq 0, \\ &I^T \mathbf{x} = 1, \\ &w_i \geq 0, \quad i = \overline{1,2}, \\ &w_1 + w_2 = 1, \\ &\underline{x} \leq x \leq \overline{x}, \end{aligned} \tag{1.1}$$

Here σ_p^2: volatility of the budget revenue portfolio, w_1: percentage weight before the pandemic, w_2: percentage weight after the pandemic, $\underline{x}$: lower bound of budget revenues or the minimum value of percentage weights, $\overline{x}$: upper bound of budget revenues or represent the maximum value of the individual weights, respectively.

2.2 Policy for optimization of budget expenditure package

The budget expenditure package consists of net loans minus wages and additional incentives, other costs of goods and services, other costs, interest subsidies, current transfers, capital costs, and repayments. The individual weights of these Let it be expressed by the matrix $\mathbf{y} - (y_1, \dots, y_7)^T$. Then y_1 the percentage of wages and bonuses in total expenditure, y_2 the percentage of other expenditure on goods and services in total expenditure, y_3 the percentage of other expenditure in total expenditure, y_4: the percentage of interest subsidies in total expenditure, y_5: total expenditure percentage of current transfers, y_6: percentage of capital expenditure as a share of total expenditure, y_7: percentage of net loan less repayment as a share of total expenditure (Markowitz, 1952).

Let's denote the growth percentage of budget expenditures in **the pre-pandemic period** by the matrix $\mu_y = (\mu_1^y, \dots, \mu_6^y)^T$. Then μ_1^y: increase percentage of wages and additional incentives, μ_2^y: increase percentage of other costs of goods and services and social security, μ_3^y: increase percentage of interest subsidies, μ_4^y: increase percentage of current transfers, μ_5^y: represents the percentage of net loan growth excluding repayment, and μ_6^y: the percentage of capital expenditure growth, respectively. The correlation between these parameters is denoted by the covariance matrix (C) .

Let's denote the growth rate of public expenditure **after the pandemic** by the matrix $\mu_{y\prime} = (\mu_1^{y\prime}, \dots, \mu_6^{y\prime})^T$. Then $\mu_1^{y\prime}$: increase percentage of wages and additional incentives, $\mu_2^{y\prime}$: increase percentage of other costs of goods and services and social security, $\mu_3^{y\prime}$: increase percentage of interest subsidies, $\mu_4^{y\prime}$: increase percentage of current transfers, $\mu_5^{y\prime}$: the percentage of net loan growth excluding repayments, and $\mu_6^{y\prime}$: the percentage of capital expenditure growth, respectively. The correlation between these indicators is denoted by the covariance matrix (D).

$$C = \begin{pmatrix} \sigma_{11}^{y} & \sigma_{12}^{y} & \cdots & \sigma_{16}^{y} \\ \sigma_{21}^{y} & \sigma_{22}^{y} & \cdots & \sigma_{26}^{y} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{61}^{y} & \sigma_{62}^{y} & \cdots & \sigma_{56}^{y} \end{pmatrix} \quad D = \begin{pmatrix} \sigma_{11}^{yr} & \sigma_{12}^{yr} & \cdots & \sigma_{16}^{yr} \\ \sigma_{21}^{yr} & \sigma_{22}^{yr} & \cdots & \sigma_{26}^{yr} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{61}^{y'} & \sigma_{62}^{yr} & \cdots & \sigma_{66}^{yr} \end{pmatrix}$$

Then, at the expected rate of return, the policy to minimize the volatility of the budget expenditure portfolio is expressed as follows.

$$\begin{aligned} &\min_{y \subset \mathbb{R}^N} \sigma_p^2 = w_1' y^T C y + w_2' y^T D y, \\ &w_1' y^T C y + w_2' y^T D y \geq 0 \\ &w_1' + w_2' = 1 \\ &w_i' \geq 0, \quad i = \overline{1,2}; \\ &I^T y = 1, \\ &\underline{y} \leq y \leq \overline{y}, \end{aligned} \tag{2.1}$$

Here σ_p^2: variance of the budget expenditure package, w_1': percentage weight before the epidemic, w_2': percentage weight after the epidemic, $\underline{y}$: lower limit of budget expenditures or the minimum value of percentage weights, $\overline{y}$: budget indicates the upper limit of expenses or the maximum value of individual weights, respectively.

3. RESEARCH RESULT

3.1 Analysis of Mongolia's budget situation

Although the rule was initially approved by the Fiscal Stability Law that the budget deficit calculated as balanced income should not exceed 2 percent of GDP, according to Article 6.1.2 of the law, the share of the balanced budget deficit in the gross domestic product calculated at annual prices of the current year was increased from 10.4 percent in 2017 and 2018 9.5% in 2019, 6.9% in 2019, 12.5% in 2020, 8.8% in 2021, 5.1% in 2022, 3.6% in 2023, and 2.8% in 2024. It is indicated that there is a loss or a profit of no more than two percent of the gross domestic product. However, this provision was violated in 10 of the past 22 years (2000-2021) (Figure 3).

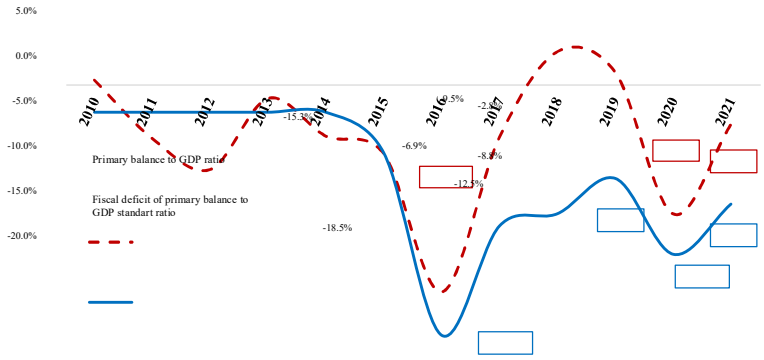

Figure 2. Mongolia's balanced budget balance and GDP ratio

Source: National Statistics Office, Researcher's Estimates

Since 2000, more than 96.9 percent of the state's budget revenue has been made up of current revenue, so Mongolia's budget has become more dependent on tax revenue. The instability of the state budget revenue structure in 2008-2020 was caused by income tax, non-tax income and domestic goods and services tax.

Considering the average of the last 30 years, 97.3% of Mongolia's budget income has been generated by current income, i.e. tax and non-tax income.

The instability of Mongolia's general budget expenditure structure is caused by capital expenditure, current transfers and other expenditure on goods and services. 75.6 percent of budget expenditures (on average for 1991-2021) are current expenditures, 17.2 percent are capital expenditures, and 7.7 percent are loan repayments. Also, although the percentage of net loans in budget expenditures has decreased, the increase in nominal terms will have the negative effect of increasing interest costs in current expenditures. The share of interest subsidies as a result of current expenditures has been continuously increasing since 2002, and it was 36.3 percent in 2019, before the outbreak of the pandemic, and 53.6 percent by the end of 2021.

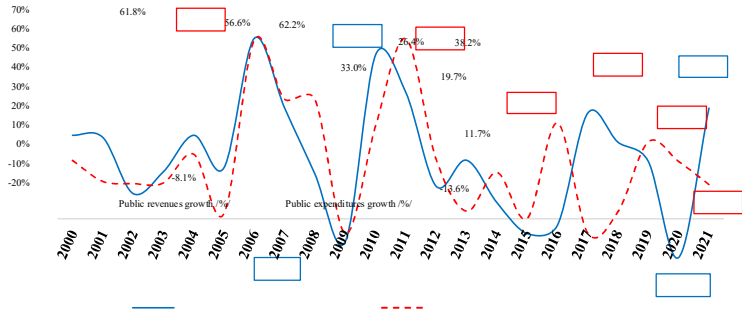

Figure 3. Budget revenue and expenditure growth (2000-2021)
Source: National Statistics Committee, Ministry of Finance in Mongolia

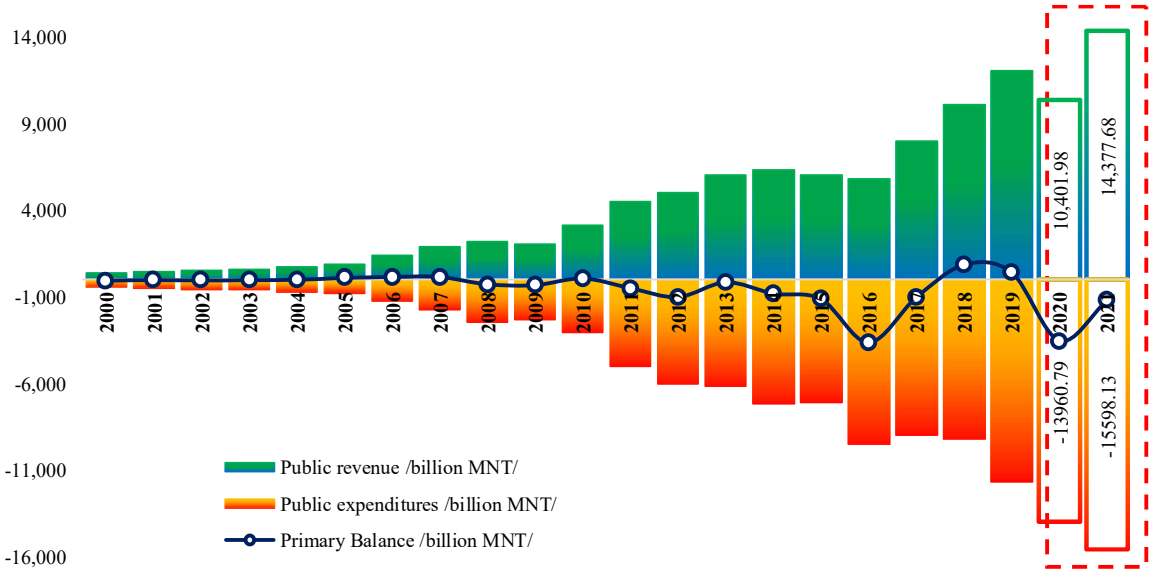

Figure 4. Dynamic indicators of Mongolia's budget

Source: National Statistics Commission, Ministry of Finance

In order to support the economy during the epidemic and curfew, the government made public decisions, exempting companies from social security contributions (Social Insurance Contributions) in order to expand the economy, on the other hand, providing pensions and benefits, Bank of Mongolia changed the policy interest rate, banks and NBFCs (Non-Banking Financial Institutions) continues to make major decisions such as delaying the loan repayment period and the complex policy of 10 trillion. If these decisions are sound and lead to sustained economic growth in the coming months, this could in turn have many consequences, such as recovery from the Great Recession, stabilization of inflation, and increased employment.

Before the outbreak of the pandemic, the balanced budget balance at the end of 2019 was positive, after the outbreak of the pandemic, budget revenues decreased and budget expenditures increased. By the end of 2020, budget revenue has decreased by 13.6 percent compared to the same period of the previous year, or reached 10.4 trillion. Due to the impact of the pandemic, budget expenditures increased by 19.7 percent and reached 13.9 trillion (Figures 4 and 5).

3.2 The impact of the pandemic on the budget revenue and expenditure structure

According to our estimates, the pandemic had a 20 percent structural impact on the budget revenue portfolio and a 32 percent structural impact on the budget expenditure portfolio, respectively. In other words, due to the impact of the pandemic, the budget revenue and expenditure package deviated by 20 and 32 percent from the historical average percentage (Appendices 8 and 9).

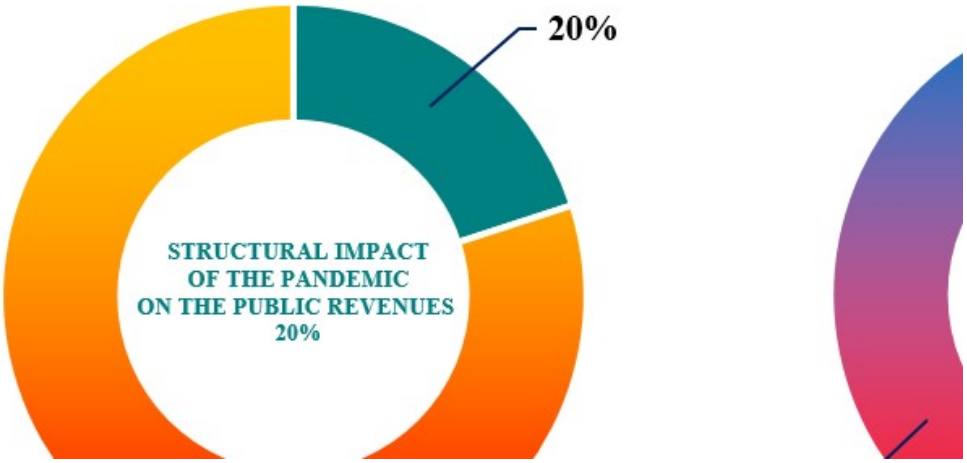

Figure 5. Impact of the pandemic on the budget structure

Source: Researcher's estimate

3.3 Optimization analysis of budget income and expenditure structure

In order to check how well each quadratic programming model for determining the optimal level of budget revenue and expenditure works, we compared the ability of the optimal percentage of each indicator to not take the value of the model's constraints. In this test, the policies to minimize the fluctuation of budget income and expenditure worked at 60 percent each[2]. Considering the optimal structure of budget income indicators (Figure 6), it is appropriate if the non-tax income is 8.12 percent, with a difference of -10.3 percentage points from the initial value. As for social insurance income, it is appropriate if it is 3.3 percent with a difference of -9.8 percentage points. For other taxes, it is appropriate to make 0.09 percent. However, the optimal value of income tax, which is the second major indicator of budget revenue, is 4.9 percentage points different from the original value, or 26.5 percent. It is appropriate if the optimal value of the domestic goods and services tax, which forms the largest percentage of budget revenue, differs from the original value by 19.8 percentage points, or about 50 percent. For property tax, the percentage is 0.06 percentage points, and for income from foreign operations, it is 11.52 percentage points.

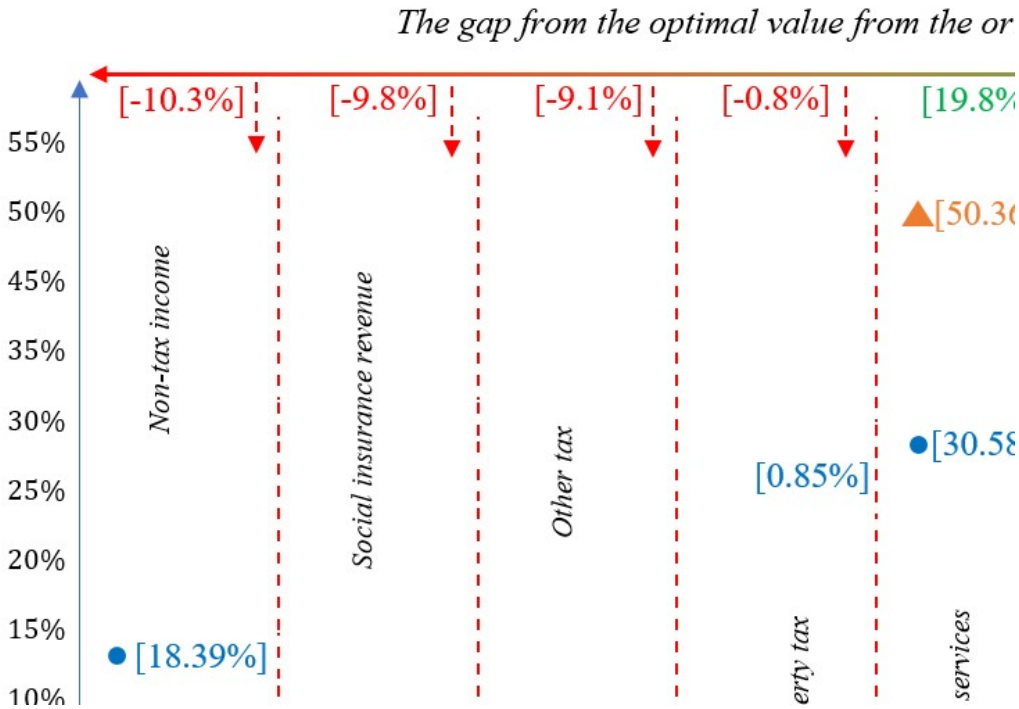

Figure 6. The optimal level of the percentage of budget income

Source: Researcher's estimates

When considering the optimal structure of budget expenditures (Figure 6), the optimal percentage weight of capital expenditures is 2.09 percent or -13.59 percentage points different from the initial value. On the other hand, it shows that it is appropriate if the cost of goods and services and the VAT amount to 18.72 percent with a difference of -11.46 percentage points. 15.31% and 0.03% of the net loan minus interest, subsidy and repayment is optimal. In terms of salary, bonus, and current transfer, it is optimal if the optimal value has a positive difference from the initial value, or the percentage is 31.11 and 44.20 percent, respectively. Furthermore, the optimal percentage of each budget income indicator is compared with the upper and lower bounds in one sigma interval and considered whether it is significant in Figure 7.

The deviation from the original value of the appropriate percentage

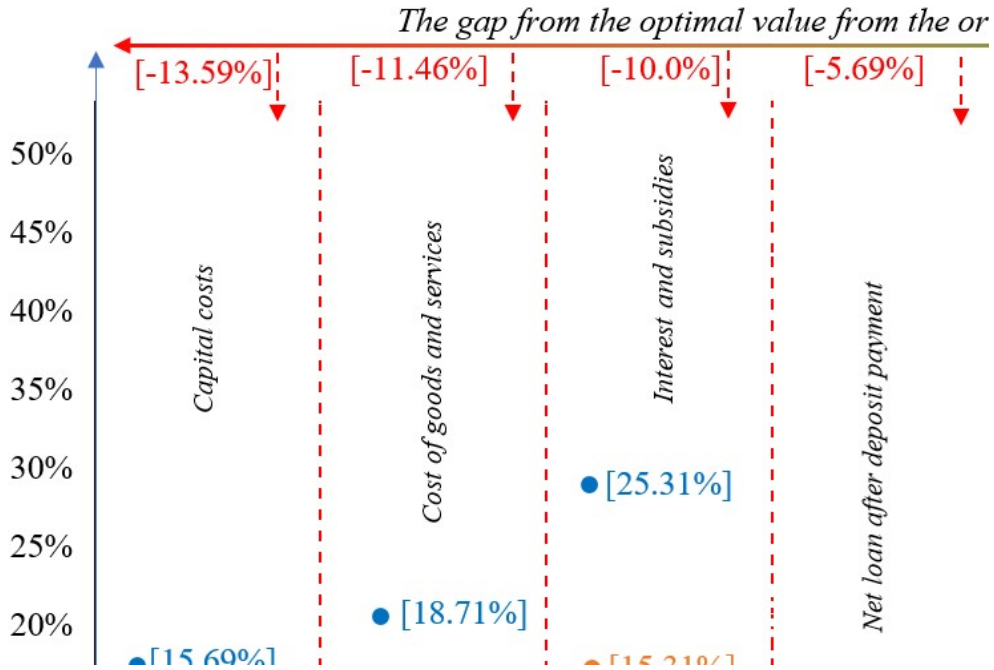

Figure 7. Optimal level of the percentage of budget expenditure

Source: Researcher's estimates

As can be seen from Figure 8, the optimal percentages of income tax, property domestic goods and services tax, and foreign operating income are higher compared to their initial values, while the percentage of other indicators is lower than their initial values. It is worth noting that the difference between social insurance income, non-tax income and other taxes is lower than the demarcation. On the other hand, more attention will be paid to the optimal ratio (above the limits) of the indicators of income tax, domestic goods and services tax, and income from foreign operations.

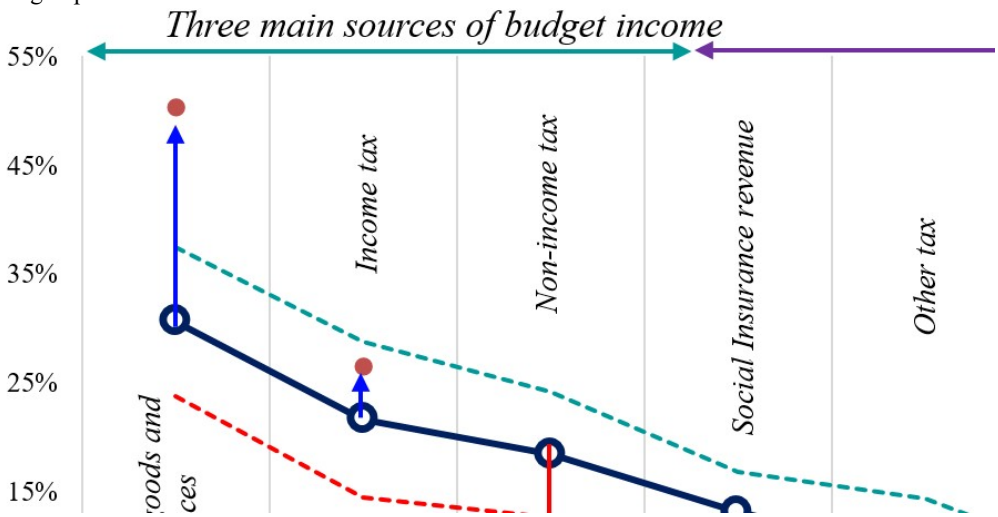

Figure 8. Comparison of historical average and optimal values

Source: Researcher estimates

According to Figure 9 below, if the optimal percentage of the budget expenditure indicators, i.e. interest subsidies, goods and services costs and ND, capital costs, and net loans excluding repayments, is less than the initial value, the optimal values of the remaining indicators, such as wages and additional incentives, and current transfers, are the initial values. Based on the demarcation we have established, it is worth noting that the difference in wages and additional bonuses, current transfers, and capital expenditure is far from the demarcation

or the difference is large. However, the net loan amounts excluding interest subsidies, goods and services costs, VAT and repayments are close to the delimitation value.

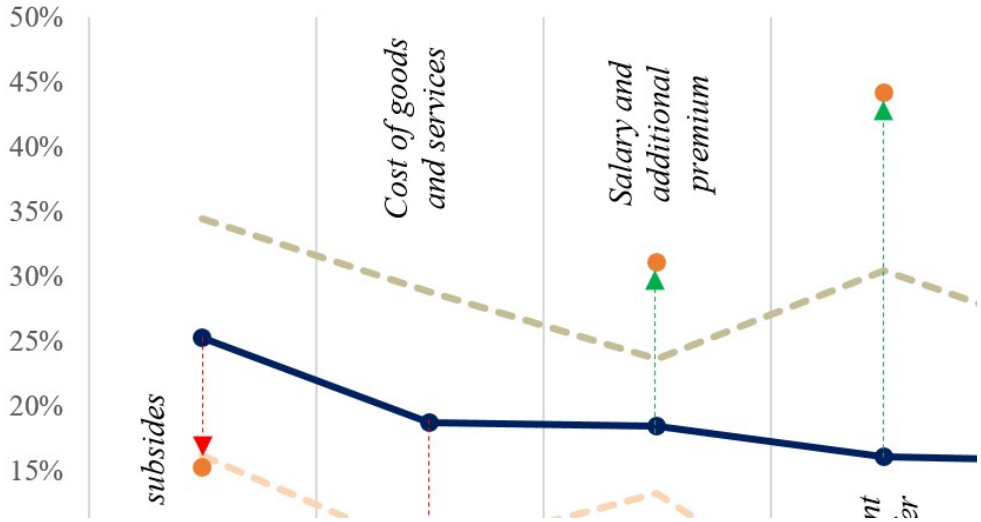

Figure 9. Comparison of historical average and optimal values

Source: Researcher Estimates

4. CONCLUSION

Through this research work, the structural effects of budget revenue and expenditure packages during the pandemic were calculated and the optimal weight was calculated for Mongolia. In doing so, the structure of budget income is considered in 7 parts, budget expenditure in 6 parts, and numerical data of 88 quarters from the first quarter of 2000 to the fourth quarter of 2021 were used. When determining the optimal structure of budget income and expenditure, a portfolio was created based on the following portfolio selection models. It includes: (i) models for minimizing the volatility of the budget revenue portfolio and (ii) minimizing the volatility of the budget expenditure portfolio. Comparing the ability of these models to not get the limiting value, both models performed at 60 percent. The calculation results of the above 2 models were obtained, the appropriate level of the budget share of revenue and expenditure was calculated, and the following conclusions were reached.

I. According to the results of our quadratic programming policy, the impact of the pandemic on budget revenue is 20 percent, and the impact on budget revenue structure is 32 percent.
II. In order to create an optimal budget structure of our country, income tax is 26.54 percent, property tax is 0.06 percent, domestic goods and services tax is 50.36 percent, foreign operating income is 11.52 percent, other taxes are 0.09 percent, non-tax income is 8.12 percent, social insurance is 3.3 percent of income is appropriate.
III. As for the budget expenditure package, it is appropriate if 31.11% of wages and additional bonuses, 7.25% of goods and services costs and social tax, 15.31% of interest and subsidies, 44.2% of current transfers, 0.03% of net loans minus repayable payments, and 2.09% of capital expenditures.
I. In addition, the optimal percentage level of the budget income and expenditure package created as a result of the calculation was compared to the historical average value by setting the upper and lower limits. In doing so, the importance of the sector is determined depending on whether the appropriate value of the budget income and expenditure package exceeds the border we calculated. According to the results of the analysis, non-tax income, social insurance income, other taxes, property tax are below the lower limit, domestic goods and services tax, foreign activity income are above the upper limit, and income tax is between the upper and lower limits. .
VI. Furthermore, it is necessary to regularize research analysis, make optimal distribution, and create an appropriate tax rate in order to reduce the fluctuation of Mongolian budget income and expenditure and improve the efficiency of the budget.

In conclusion, the COVID-19 pandemic has illuminated the need for adaptive fiscal policies and robust budgetary practices. As states continue to navigate the challenges of the pandemic and prepare for future crises, policymakers must learn from the experiences discussed in this literature review and implement policies that enhance fiscal resilience, data-driven decision-making, and equitable resource allocation. Effective governance and proactive fiscal measures will be essential in safeguarding the financial health of states in an uncertain world.

5. DISCUSSION AND POLICY IMPLICATIONS

The impact of the COVID-19 pandemic on state budgets has been profound, with significant revenue shortfalls and increased expenditures presenting unprecedented challenges. This discussion section synthesizes the key findings from the reviewed studies and examines their implications for fiscal policy and governance.

Revenue Shortfalls and Increased Expenditures

The first major impact discussed in the literature was the substantial decline in tax revenues due to the economic fallout of the pandemic. This decrease in revenue has created immediate fiscal stress for state governments. The reviewed studies highlight the need for states to develop more robust and adaptable revenue sources to withstand future crises. Diversifying revenue streams and exploring options like digital taxation and progressive taxation systems may help states reduce their vulnerability to economic shocks.

Concurrently, the increased expenditures associated with the pandemic, particularly in the healthcare and social support sectors, have strained state budgets. This crisis has underscored the importance of maintaining a fiscal cushion for emergencies. Policymakers must recognize the value of building up financial reserves in preparation for future crises, as well as enhancing budgetary flexibility to allow for swift reallocation of resources to critical areas.

Uncertainty in Budget Forecasting

The unpredictable nature of the pandemic introduced considerable uncertainty into budget forecasting, making it challenging for governments to plan and allocate resources effectively. This uncertainty has shown the need for improved data analytics and modeling capabilities to enhance the accuracy of budget projections. Policymakers should invest in advanced forecasting tools and data collection infrastructure to better anticipate and respond to future crises.

Fiscal Optimization Strategies

The reviewed studies highlighted various fiscal optimization strategies employed by states, including resource reallocation, debt management, and cost-cutting measures. These strategies were essential in mitigating budget deficits during the pandemic. However, it is crucial to recognize that they are not one-size-fits-all solutions. Each state's unique circumstances, economic structure, and fiscal health will influence the effectiveness of these strategies.

Policy Implications:

- Diversify Revenue Sources: Policymakers should explore alternative revenue sources beyond traditional taxes to build fiscal resilience. These could include revenue generated from digital services, environmental taxes, or progressive taxation systems.
- Build Fiscal Reserves: States should prioritize the creation and maintenance of fiscal reserves or rainy-day funds. These reserves can act as a buffer during crises, allowing for continued service provision without immediate budgetary strain.
- Enhance Budgetary Flexibility: Governments should implement mechanisms that enable swift reallocation of resources during emergencies. Flexible budgeting practices and contingency funds can aid in this regard.
- Invest in Data Analytics: Policymakers should invest in advanced data analytics and forecasting tools to improve the accuracy of budget projections. Real-time data monitoring systems can also aid in rapid response to crises.
- Tailored Fiscal Optimization: Recognize that fiscal optimization strategies should be tailored to the specific circumstances and fiscal health of each state. A one-size-fits-all approach may not be effective.
- Collaborative Federal-State Efforts: Promote collaboration between federal and state governments to

ensure coordinated fiscal responses during pandemics and other crises. Federal aid packages should be designed to address long-term fiscal sustainability concerns.

- Equitable Resource Allocation: Ensure that resource allocation during crises considers equity concerns and strives to reduce disparities in healthcare access and economic recovery.

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