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Savings natural resource funds: effectiveness of the Norwegian Government Pension Fund Global

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Abstract

Motivation: Many countries that are rich in natural resources struggle with the resource curse — the phenomenon of achieving worse economic development results by economies specializing in the extraction and export of natural resources. To address this problem, an explicit fiscal tool was proposed — natural resource funds. However, empirical studies on the effectiveness of resource funds conducted so far have delivered mixed and inconclusive results. Specifically, the effectiveness of savings funds, otherwise known as funds for future generations, which are a specific type of natural resource funds, is still being questioned.

Aim: This study aims to assess the effectiveness of savings natural resource funds in countries which are rich in natural resources on the example of the Norwegian Government Pension Fund Global (GPFG).

Results: The main contribution of this study is to demonstrate the effectiveness of GPFG as a savings fund for future generations. In order to achieve the research objective, a classification of funds was presented and the existing natural resource funds were categorized. Funds were divided into stabilization, investment and savings. The specificity of each type of fund was explained in detail. It was found that all savings funds are also investment funds, but the reverse relationship does not apply. The effectiveness of GPFG was studied considering the functions and tasks of individual fund types. The quantitative study confirmed the effectiveness of GPFG in increasing long-term investments in Norway. At the same time, the fulfillment of the stabilization function by the fund was also validat-

ed. The study confirms that the savings fund is an important economic policy measure to counteract the resource curse.

Keywords: *natural resource funds; savings funds; growth funds; resource curse; The Government Pension Fund Global*
JEL: F21; O11; O23; Q32; Q38

1. Introduction

The resource curse is a phenomenon that occurs in many countries rich in natural resources and constitutes a significant barrier to achieving sustainable long-term economic development of these nations. The concept of the curse was first described by Auty (1993), and since then, it has been the subject of numerous studies in macroeconomic, political, and social dimensions (e.g. Arezki & van der Ploeg, 2007; Auty, 2001; Bulte et al., 2005; Dymitrowska, 2015; Fleming et al., 2015; Neumayer, 2004; Sachs & Warner, 2001; Sala-i-Martin & Subramanian, 2013; van der Ploeg, 2011). Based on the research results available in the literature, it must be stated that the resource curse is the phenomenon of achieving worse economic development results by economies specializing in the export of natural resources, especially strategic ones such as fuels and minerals, compared to countries with little resource wealth (Dymitrowska, 2015). This phenomenon is not a law but a significant tendency in many resource-based economies[1].

In recent years, the attention of researchers, government officials from resource-rich countries, as well as international and non-governmental organizations, has been focused on searching for effective means to counteract the resource curse. One of the most promising measures is the implementation of an active national resource fund policy. This is mainly due to the success of some natural resource funds as well as their growing importance in the global financial market.

Recently, several interesting and important studies have been conducted on the effectiveness of natural resource funds in countering the resource curse. However, the results of this research are inconclusive. Some studies confirm the effectiveness of the funds (e.g., Asik, 2017; Bagattini, 2011; Ouoba, 2020; Shabsigh & Ilahi, 2007; Sugawara, 2014; Taguchi & Ganbayar, 2022; Tsani, 2015), while others suggest necessary conditions, such as high governance and robust fiscal rules, for effective functioning of the funds (e.g., Allegret et al., 2018; Sugawara, 2014; Taguchi & Ganbayar, 2022). Additionally, there are

[1] In this study, the concepts of a country rich in natural resources, a country specializing in the extraction and export of resources, and an economy based on the extraction and export of natural resources are treated unambiguously. These countries are classified based on meeting the following conditions: the average annual revenues of the mining industry (as a percentage of GDP) exceed 25%, or 25% of the average annual exports consist of natural resources (Dymitrowska, 2015).

studies that question the effectiveness of natural resource funds (e.g., Ossowski et al., 2008; Ouoba, 2016).

At the same time, it should be noted that the concept of how resource funds function has significantly changed over the past few decades. The primary objective of the initial funds was to protect national economies from the unstable situation in the international commodities market. Such funds are called stabilization funds. The majority of research on the topic of resource funds thus far has focused on the effectiveness of these funds (Table 2). In recent years, the basic stabilization function of resource funds has been expanded to include a developmental function (also known as a long-term development function). Such funds are called growth funds. Within growth funds, investment and savings funds (also known as long-term development funds or funds for future generations) should be distinguished. The latter of these types of funds has gained significant popularity in countries rich in natural resources, both advanced and emerging and developing economies (Table 1).

Most of the studies conducted so far have focused on the effectiveness of stabilization funds in counteracting the resource curse. There is only a limited number of studies on the effectiveness of growth funds, including investment funds and, specifically, savings funds. This is due to the fact that the issue of the effectiveness of savings funds is new. A significant number of new funds, especially in emerging and developing countries, were established after 2010 (Table 1). At the same time, the results of the research conducted so far are not conclusive. The literature emphasizes the importance of further studies in this area, especially regarding the role of investment and savings funds. It is also noted that the effectiveness should be supported by case studies in selected countries (e.g. Taguchi & Ganbayar, 2022).

Therefore, it was decided to conduct a detailed analysis of the effectiveness of savings natural resource funds in countries that are rich in natural resources, using the example of the Norwegian Government Pension Fund Global (GPFG).

This study examines the effectiveness of savings natural resource funds in the context of countering the phenomenon of the resource curse in the economic dimension. The study, therefore, considers the economic aspect of effectiveness evaluation. The Norwegian fund was chosen for analysis because it is the most commonly used as a model for creating new funds for future generations in other countries. GPFG has also been in operation for over 30 years, which provides a reliable research period. At each stage of the study, a series of research tasks were carried out. A detailed analysis of the literature on the effectiveness of natural resource funds was conducted. Classification of funds was made and the savings fund was characterized in detail. Indicators enabling the analysis of the effectiveness of savings funds in the economic dimension were also identified.

The paper consists of four parts preceded by an introduction and summarized by a conclusion. The literature review is dedicated to analyzing the results of previous studies on the effectiveness of natural resource funds, especially sav-

ings funds. The contribution of this research to the existing literature was also determined. In the next part of the paper, the research methods used to achieve the research objective are presented. The following sections present the results of the study and the discussion.

To achieve the research objective, mostly foreign literature (in English) has been examined. Sources provided by international organizations, including the World Bank, International Monetary Fund, the Organization for Economic Cooperation and Development, World Economic Outlook, Natural Resource Governance Institute, International Forum of Sovereign Wealth Funds, and Sovereign Wealth Fund Institute have also been taken into account.

2. Literature review

This section of the study reviews the literature on the qualitative and quantitative evaluation of the effectiveness of natural resource funds in countering the resource curse. The section also explains the contribution of this research to the literature.

Due to the significant changes in the types of established natural resource funds in recent years, the current classification of funds and the categorization of individual funds into appropriate types were carried out in the first stage of the study, which constitutes a new contribution to the literature. There is no universal (and current) classification of funds in the literature, which affects the heterogeneity of the results of conducted studies on the effectiveness of funds. The classification and categorization of funds enabled a subsequent analysis of the literature, taking into account the effectiveness results of individual types of funds.

In order to classify funds according to the current situation, a detailed review of the results of previous studies was conducted, as well as a thorough analysis of the functioning of resource funds in resource-rich countries. 52 natural resource funds in 41 countries were examined. Based on the results, two main types of natural resource funds were identified: stabilization funds and growth funds (also known as long-term development funds). Growth funds include investment funds and savings funds (also known as long-term savings or future generation funds). All savings funds are also investment funds. However, the reverse relationship does not apply. Some growth funds (investment funds) have been assigned only an investment function (Table 1). In some countries (e.g. Chile, Ghana, Mongolia, Nigeria), both a stabilization fund and a savings fund exist simultaneously. There are countries that have established multiple investment funds (e.g. Saudi Arabia) as well as multiple investment and savings funds (e.g. USA). In some countries, funds have been assigned all three functions: stabilization, investment, and savings (e.g. Norway, Botswana, Timor-Leste), with the main goal of the fund being to protect the interests of both present and future generations (Table 1).

Also worth noting is the fact that in recent years, the savings form of a fund for future generations has become increasingly popular. The majority of savings funds, especially in emerging and developing economies, were created after 2005, with more than 70% established after 2010. A new trend in the growing importance of this economic policy tool for countering the resource curse is thus evident.

The literature review was conducted, taking into account the division of funds into the three types described above. Such an approach is new.

The literature review was carried out based on the following criteria:

– type of funds examined: stabilization, investment, savings;
– type of study: quantitative, qualitative;
– number of funds/countries rich in resources studied;
– verification of fund effectiveness: effective, ineffective, no effect;
– main effectiveness indicators taken into account (dependent variables).

According to the assumption presented in the introduction, the effectiveness of natural resource funds is evaluated in the context of countering the resource curse phenomenon at the economic dimension.

The results obtained from the literature review are presented in Tables 2 and 3.

When analyzing the results of the previous studies on the effectiveness of natural resource funds in counteracting the resource curse, it should be noted that the majority of the studies listed in Table 2 are of a general nature. The studies are also mainly in the form of qualitative analysis. Researchers' attention is focused on various aspects of the functioning of natural resource funds. The importance of stabilization funds in countering the negative impact of global commodity market instability on the economic situation in resource-rich countries is mostly examined.

Moreover, most of the quantitative studies conducted so far have focused on stabilization funds (Table 3). In this case, the results obtained mainly confirm the effectiveness of such funds in reducing the volatility of government expenditure and primary balance. Crain & Davlin (2002), who analyzed funds from 71 resource-rich countries, considered the volatility of government spending, as well as economic and demographic outcomes, and confirmed the effectiveness of stabilization funds in reducing economic instability in resource-exporting countries. Shabsigh & Ilahi (2007) also took into account the volatility of inflation, broad money, and the real exchange rate, and the results obtained confirmed the effectiveness of natural resource funds in mitigating instability in these indicators.

Ossowski et al.'s (2008) study examined fiscal policy effectiveness, taking into account the primary balance without fuel sector outcomes, changes in government spending, and the relationship between changes in government spending and oil prices in 21 resource-rich countries. The results of this study are inconclusive. Bagattini (2011) conducted a study in 12 countries, taking into account sustainable fiscal performance: fiscal revenues, fiscal expenditures,

and savings, as well as governance indicators. This was also the first quantitative study to mention the importance of savings funds for the economic development of resource-exporting countries. The results confirmed the effectiveness of natural resource funds as a means of mitigating fiscal policy instability and rising public debt.

Another study that confirms the positive impact of stabilization funds in reducing instability of government spending is Sugawara's (2014). Asik (2017) also confirmed the effectiveness of stabilization funds, taking into account a wider range of stability indicators, namely the volatility of major macro variables of interest (real household consumption, real government expenditures, government consumption, gross fixed capital investments), as well as the procyclicality of fiscal policy.

Of note is also Ouoba's (2016) study, which analyzed the relationship between stabilization funds and economic growth and concluded that such funds have a negative and significant effect on economic growth. The effectiveness of stabilization funds in counteracting the instability of government expenditure and primary balance was once again confirmed in the study by Taguchi & Ganbayar (2022).

Analyzing the studies on the effectiveness of natural resource funds conducted in recent years, two current studies are worth mentioning: Ouoba (2020) and Taguchi & Ganbayar (2022). Within these studies, the division of funds into types was taken into account. Ouoba distinguishes two types of funds: stabilization/savings funds and investment funds. Stabilization and savings funds are treated as equivalent in this case. The effectiveness of funds was examined based on the results of the accumulation of physical and human capital, as well as economic growth. Robust evidence was presented for countries with stabilization/savings funds experiencing greater development of human capital and accumulation of tangible assets than those with investment funds or without resource funds.

Taguchi and Ganbayar (2022), on the other hand, conducted a comprehensive quantitative study on the effectiveness of different types of natural resource funds, including stabilization, investment, and savings funds. The study confirmed the effectiveness of stabilization funds in reducing the volatility of government expenditure and the primary balance, as well as the effectiveness of investment funds in increasing investment rates. However, the efficiency of savings funds in increasing gross national saving was not confirmed. The study also took into account a number of additional variables, namely economic growth, inflation, population, openness, resource dependence, and governance.

To summarize the literature analysis presented in Tables 2 and 3, it can be concluded that the least attention has been paid to studying the effectiveness of savings funds. And the results obtained are not conclusive. The effectiveness of this type of fund has not yet been verified.

Among the reasons for the lack of reliable results in the study of savings funds, their new nature should be mentioned. Although the oldest of the ana-

lyzed funds, the Texas Permanent University Fund, was established as early as 1876, most funds for future generations in emerging and developing economies were established after 2010. And the issue of the resource curse mainly concerns developing countries. Sugawara (2014) notes that in order to obtain reliable data for the analysis, the fund must operate for at least 5 years. However, the ambiguity of results, such as in Taguchi and Ganbayar (2022), confirms that in the case of the savings function of the fund, the research period should be extended.

Another issue is the diversity in classifying funds. In the study by Taguchi and Ganbayar (2022), which is the most recent study of savings funds, only five funds were included in this category. Based on the analysis conducted in this study, 21 funds should be classified as savings funds. In Ouoba's study (2020), savings funds are treated unequivocally as stabilization funds. Funds for future generations do indeed serve a stabilization function, but there is no reverse relationship, and typically stabilizing funds, of which 16 were identified in this study, do not serve as long-term savings for future generations (Dymitrowska, 2020). It is also worth noting the earlier statement that savings funds are also investment funds. Some of the operating funds have been attributed all three functions of natural resource funds: stabilization, investment, and savings. Therefore, when examining the effectiveness of natural resource funds, it is important to take an individual approach to each fund.

It should be noted that a significant number of studies emphasize additional conditions that must be met to enable the effective functioning of a fund, regardless of its type (e.g. Allegret et al., 2018; Bagattini, 2011; Crain & Devlin, 2002; Frankel et al., 2012; Kalyuzhnova, 2006; Sugawara, 2014; Taguchi & Ganbayar, 2022; Tsani, 2013). The importance of an appropriate combination of a fund's operations and high governance, political stability in the country, and transparency and accountability of fund actions is emphasized. Therefore, when examining the effectiveness of natural resource funds, it is important to consider additional factors such as political stability, governance indicators, regulatory quality, rule of law, and control of corruption.

The novelty of this study lies in focusing primarily on savings natural resource funds, unambiguously understood as funds for future generations, which have received the least attention in the literature and whose effectiveness has not been confirmed by previous results. Due to the diversity of existing funds, an individual approach was chosen, and the Norwegian Government Pension Fund Global (GPFG) was studied. This fund has been in operation since 1990, which constitutes a reliable research period. Additionally, although GPFG has been assigned all the functions of natural resource funds according to its principles, long-term saving for future generations is a key function of this fund. GPFG is often used as a benchmark for creating new savings funds in developing countries (e.g. in Timor-Leste). The Norwegian fund is also an extreme form of a savings natural resource fund. Specifically, all proceeds from the sale of commodities are

collected in the fund, which is then invested exclusively abroad. In the country, a strictly defined percentage of the fund's profit is utilized.

3. Methods

This section outlines the methodology used to assess the effectiveness of savings natural resource funds in resource-rich countries, using the Norwegian Government Pension Fund Global as an example. Table 4 presents the indicators used to evaluate the effectiveness of GPFG, as well as the data sources utilized in the study.

Based on the assumption presented above, the effectiveness of natural resource funds is assessed in the context of countering the resource curse phenomenon at the economic level. The study, therefore, considers the economic aspect of effectiveness evaluation.

As in Taguchi and Ganbayar (2022), this study divides natural resource funds into stabilization, investment, and savings funds. However, an author's own approach to understanding individual types of funds was used, as well as the current categorization of funds presented in Table 1. The dependent indicators used in the study were divided according to the functions assigned to each type of natural resource fund. Given that the Norwegian Government Pension Fund Global (GPFG) is designed to fulfill all three functions, all three were considered in the study. However, the focus was primarily on the investment and savings functions, as GPFG's primary objective is to ensure responsible and long-term management of revenue from oil and gas resources, so that this wealth benefits both current and future generations. As such, GPFG is a typical savings fund, while also serving as an investment fund.

As in Taguchi and Ganbayar (2022), in order to assess the fulfillment of the stabilization function of the fund, two indicators were used: general government total expenditure (% GDP), which represents the volatility of government expenditure, and general government primary net lending/borrowing (% GDP), which represents the volatility of government primary balance. To assess the investment function, total investment (% GDP) was used, while gross national savings (% GDP) was used to assess the savings function. Data for all indicators were obtained from the World Economic Outlook (WEO) Database of the International Monetary Fund (IMF).

The total market value of GPFG (% GDP) was used as an explanatory indicator. Data for this indicator were obtained from the Norges Bank Investment Management (NBIM) website.

Within this study, the Norwegian Government Pension Fund Global (GPFG) is considered effective in countering the resource curse from an economic perspective if there exists a relationship between the total market value of GPFG and the following variables: general government total expenditure, general government primary net lending/borrowing (stabilization function of the fund),

total investment (investment function), and gross national savings (savings function).

Additionally, it is assumed that the fund fulfills the savings function if an increase in the total market value of GPFG as the explanatory variable leads to an increase in gross national savings as the dependent variable. For the investment function, it is assumed that an increase in the total market value of GPFG as the explanatory variable results in an increase in total investment as the dependent variable.

Regarding the stabilization function, following the approach used by Asik (2017), it is assumed that when analyzing the stability of government spending, it is important to examine whether changes in spending trends are consistent and independent of fluctuations in the global commodity market, rather than simply evaluating whether spending remains at a lower or constant level. Therefore, it is assumed that the fund fulfills the stabilization function if an increase in the total market value of GPFG as the explanatory variable leads to an increase in general government total expenditure as the dependent variable, while this increase remains stable compared to the fluctuation of global oil prices. Regarding the dependent variable general government primary net lending/borrowing, an increase in the total market value of GPFG as the explanatory variable should result in a decrease in this indicator.

The research period used in the study is 1998–2022. The research period was chosen due to the availability of data provided by NBIM. As in Ouoba (2020), this study assumes that it takes ten years for a fund to accumulate long-term capital and have a tangible effect after its establishment. The research period used covers 25 years of GPFG's activity.

In the first stage of the research, the focus was placed on determining the relationships between the indicators presented in the Table 4. To accomplish this, the study employed correlation analysis using the Pearson correlation coefficient. This coefficient allows to determine whether there is a linear relationship between two variables. It also allows to determine the strength of the relationship and its character: positive (positive correlation) or negative (negative correlation). Before using correlation analysis, the normality of the data distribution was checked. For this purpose, the Kolmogorov–Smirnov test for normality was performed.

In the second stage of the study, a linear regression model was utilized for indicators that demonstrated correlation. Linear regression is a versatile data analysis tool that enables the investigation of relationships, prediction, interpretation, hypothesis testing, and drawing conclusions based on data.

The calculations were made in the SPSS software.

4. Results and discussion

Before using correlation analysis, the normality of the data distribution was checked. For this purpose, the Kolmogorov–Smirnov test for normality was per-

formed. The results of the test are presented in Table 5. Upon analyzing the obtained data, it can be concluded that the significance level in test (p=<0.166; 0.2>) indicate normality of the data distribution. Considering that the data has a normal distribution, it is possible to apply correlation analysis using the Pearson correlation coefficient.

The results of the correlation analysis using the Pearson correlation coefficient are presented in Table 7. The descriptive statistics are presented in Table 6.

Upon analyzing the results, it can be concluded that the total market value (% GDP) is strongly and positively correlated with total investment (% GDP), with a Pearson correlation coefficient of 0.621. This correlation is statistically significant ($p<0.001$). Furthermore, there is a positive relationship between these two indicators, which means that with the increase in total market value of GPFG, the total investment in the country also increases. The obtained results partially confirm that GPFG fulfills the investment function of a natural resource fund.

The second relationship resulting from Table 7 is the correlation between total market value (% GDP) and government total expenditure (% GDP). It is also positively correlated, with a Pearson correlation coefficient of 0.534. This correlation is statistically significant ($p=0.006$). It should be noted that once again it is a positive relationship, which means that the increase in total market value occurs simultaneously with the increase in government total expenditure. As in Asik (2017), this study assumes that when analyzing the stability of government spending, it is important to analyze whether the trend in spending changes is constant and independent of changes in the global commodity market, rather than evaluating whether spending is at a constant level. Additionally, based on the obtained results on the increase in total investment in the country, it can be inferred that an increase in public investment is possible. This is also supported by Table 7, where a significant correlation between total investment (% GDP) and government total expenditure (% GDP) is visible. Therefore, Chart 1 shows a comparison of the results of government total expenditure (% GDP) and spot prices for crude oil and petroleum products for the years 1998–2022. Analyzing the graphs presented in Chart 1, significant volatility in the prices of crude oil and petroleum products is visible, while government total expenditure remains relatively stable. The results obtained thus partially confirm the fulfilling of GPFG's stabilizing function.

In the case of two indicators: general government primary net lending/borrowing (% GDP) and gross national savings (% GDP), there was no correlation found with the total market value (% GDP) of GPFG in the conducted study. Based on the assumptions and indicators used, the study results do not confirm the fulfillment of the saving function by GPFG.

In the second stage of the study, a linear regression model was utilized for indicators that demonstrated correlation: 1. total market value (% GDP) (explanatory variable) and total investment (% GDP) (dependent variable), 2. total market value (% GDP) (explanatory variable) and general government total expenditure (% GDP) (dependent variable).

In the case of the first analysis, the results are as follows (Table 8):

1. The model's R (correlation coefficient) is 0.621, indicating a moderate positive relationship between the explanatory and the dependent variable.
2. The regression model shows a significant result according to the ANOVA test ($p<0.001$). This suggests that the explanatory variable contribute significantly to explaining the variance in the dependent variable.
3. The regression coefficients provide information about the relationship between the explanatory variable and the dependent variable. The constant term (intercept) has a coefficient of 22.288 and is statistically significant ($p<0.001$). The coefficient for the explanatory variable "Total market value, % GDP" is 0.02, indicating that a one-unit increase in the explanatory variable corresponds to a 0.02-unit increase in the dependent variable. This coefficient is also statistically significant ($p<0.001$).

The results suggest that the total market value (% GDP) has a significant positive impact on the total investment (% GDP). The obtained results confirm that GPFG fulfills the investment function of a natural resource fund.

In the case of the second analysis, the results are as follows (Table 9):

1. The model's R (correlation coefficient) is 0.534, indicating a moderate positive relationship between the explanatory and the dependent variable.
2. The regression model shows a significant result according to the ANOVA test ($p=0.006$). This suggests that the explanatory variable contribute significantly to explaining the variance in the dependent variable.
3. The constant term (intercept) has a coefficient of 42.179 and is statistically significant ($p<0.001$). The coefficient for the explanatory variable "Total market value, % GDP" is 0.023, indicating that a one-unit increase in the explanatory variable corresponds to a 0.023-unit increase in the dependent variable. This coefficient is also statistically significant ($p=0.006$).

The results suggest that the total market value (% GDP) has a significant positive impact on the general government total expenditure (% GDP). The obtained results confirm that GPFG fulfills the stabilizing function of a natural resource fund.

The results obtained in the study confirm that GPFG fulfills the stabilizing and investment functions of a natural resource fund. This is consistent with the results obtained in previous studies (Asik, 2017; Bagattini, 2011; Crain & Devlin, 2002; Sugawara, 2014; Taguchi & Ganbayar, 2022). Given that one of the important functions of savings funds for future generations is the investment function, it should be stated that they are effective in this regard. However, in future research, it is important to conduct a detailed qualitative analysis of the functioning of GPFG, taking into account indicators such as the rate of return on the fund's investments, the number of companies in the fund's portfolio, the number of host countries, the fund's position in rankings, and compliance with the Santiago Principles.

The study did not confirm the fulfillment of the savings function by GPFG. The relationship between the total market value (% GDP) of GPFG and gross

national savings (% GDP) was analyzed. The gross national savings (% GDP) indicator was also used by Taguchi and Ganbayar (2022). The results of their study also do not confirm the effectiveness of natural resource funds in fulfilling the savings function. The authors justify this by the lack of access to reliable statistical data. The research period used in this study covered 25 years of GPFG activity, for which a full range of reliable data for both considered indicators was obtained. Therefore, it should be considered to include other indicators in future research to assess the effectiveness of natural resource funds in fulfilling the savings function. Additionally, analyzing the results of Norway's gross national savings (% GDP) indicator in the years 1998–2022 (Chart 2), it should be noted that they remained at a constant level in the range of 30–40% of GDP. There was no increasing trend in this indicator during the studied period.

An interesting direction for further research is also the evaluation of the significance of resource savings funds for diversifying the economy of a resource-rich country. The fulfillment of the investment function by the fund may have an impact on changing the country's position in the global market from a country specializing in the export of natural resources to a country exporting financial capital.

5. Conclusion

The aim of the study was to assess the effectiveness of natural resource savings funds in countries rich in natural resources, using the example of the Norwegian Government Pension Fund Global. To achieve this goal, in the first stage of the study, a classification of resource funds and the current categorization of existing funds (Table 1) was carried out. Based on a detailed analysis of 52 resource funds from 41 countries specializing in the export of strategic fuels and minerals, the funds were classified as stabilization, investment, or savings funds. The savings form of funds was characterized in detail, treated unequivocally as a fund for future generations. 21 savings funds were identified. At the same time, it was found that all savings funds for future generations are also investment funds. The indirect function of savings funds is also a stabilizing function. However, there is no inverse relationship. Typical stabilization and investment funds do not function as savings funds.

The classification and categorization of natural resource funds enabled a detailed quantitative analysis of the effectiveness of The Norwegian Government Pension Fund Global, which was classified as a savings fund. The study considered all functions assigned to the fund: both savings and investment, as well as stabilization. The analysis examined the relationship between the total market value (% GDP) of GPFG and gross national savings (% GDP), total investment (% GDP), government total expenditure (% GDP), and general government primary net lending/borrowing (% GDP).

The obtained results confirm the effectiveness of GPFG in increasing long-term investments in Norway. At the same time, the fulfillment of the stabili-

zation function by the fund was confirmed. Given that one of the important functions of savings funds for future generations is the investment function, it should be stated that they are effective in this regard. In future research, however, it is important to conduct further detailed qualitative analyses of the functioning of GPFG, taking into account additional factors such as the rate of return on the fund's investments, the number of companies in the fund's portfolio, the number of host countries, the fund's position in rankings, and the fulfillment of the Santiago Principles by the fund.

The limitation of this study is that although the effectiveness of savings funds in increasing long-term investments was confirmed, the significance of the fund for the growth of gross national savings was not confirmed. Overall, there was no upward trend in this indicator in Norway. It is suggested that future studies attempt to use other indicators to assess the fund's performance in fulfilling its savings function. Nonetheless the study confirms that the savings fund is an important economic policy measure to counteract the resource curse.

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Appendix

Table 1.
Natural resource funds

Stabilization funds		Growth funds		
		Investment funds		Savings funds
Qatar		Qatar Investment Authority (2005)		
USA		*Permanent Wyoming Mineral Trust Fund (1975)*		
Algeria	Revenue Regulation Fund (2000)	Angola	Fundo Soberano de Angola (2012)	
Cameroon	Hydrocarbons price stabilization fund (1974)	Brunei	Brunei Investment Agency (1983)	
Colombia	Fuels Prices Stabilisation Fund (1995/2007)	Libya	Libyan Investment Authority (2006)	
Ghana	Ghana Stabilization Fund (2012)	Saudi Arabia	Public Investment Fund (2008)	
Kazakhstan	National Fund (2000)		Monetary Agency (1974)	
Mauritania	National Fund for Hydrocarbon Reserve (2006)	United Arab Emirates	Abu Dhabi Investment Authority (1976)	
Mexico	Mexico Budgetary Income Stabilization Fund (2000)	*USA*	*Alabama Trust Fund (1985)*	
Nigeria	Nigeria Sovereign Investment Authority. Stabilization Fund (2011)		*Louisiana Education Quality Trust Fund (1986)*	
Peru	Fiscal Stabilization Fund (1999)	*Australia*	*Western Australian Future Fund (2012)*	
Russia	Russian Reserve Fund (2008)	*Canada, Alberta*		*Alberta Heritage Savings Trust Fund (1976)*
Sao Tome and Principe	National Oil Account (2004)	Equatorial Guinea		Fund for Future Generations (2002)
Turkmenistan	Stabilization Fund (2008)	Gabon		Sovereign Wealth Fund of the Gabonese Republic (1998)
Venezuela	Macroeconomic Stabilization Fund (1998)	Ghana		Ghana Heritage Fund (2012)
Chile	Social and Economic Stabilization Fund (1985/2006)	Kuwait		Reserve Fund for Future Generation (1976)
Kiribati	Revenue Equalization Reserve Fund (1956)	Nigeria		Nigeria Sovereign Investment Authority. Future Generations Fund (2011)
Mongolia	Fiscal Stability Fund (2011)	*USA*		*Alaska Permanent Fund (1976)*
				New Mexico State Investment Council (1985)
				North Dakota Legacy Fund (2010)
				Texas Permanent University Fund (1876)
		Chile		Pension Reserve Fund (2006)

Stabilization funds	Growth funds	
	Investment funds	Savings funds
	Mongolia	Future Heritage Fund (2016)
Azerbaijan	State Oil Fund of the Republic of Azerbaijan (1999)	
Guyana	Natural Resource Fund (2019)	
Iran	National Development Fund (2011)	
Norway	***Government Pension Fund Global (1990)***	
Oman	Oman Investment Authority (2020)	
Papua New Guinea	Papua New Guinea Sovereign Wealth Fund (2011)	
Timor-Leste	Timor-Leste Petroleum Fund (2005)	
Trinidad and Tobago	The Heritage and Stabilization Fund (2000/2007)	
Botswana	The Pula Fund (1993)	

Notes:

Funds in italics are from advanced economies, according to the classification of the International Monetary Fund, while the remaining countries belong to the group of emerging and developing economies.

Fields in the table filled with color pertain to countries specializing in mineral exports, while other countries export fuel resources.

Due to the lack of reliable data, the study did not include funds from four countries: Nauru, Chad, Ecuador, and Yemen.

Source: Own preparation based on the data provided by the Natural Resource Governance Institute, International Forum of Sovereign Wealth Funds, Sovereign Wealth Fund Institute and official websites of individual funds.

Table 2.
Research on the effectiveness of natural resource funds

	Stabilization funds	Investment funds	Savings funds
effective	Bacon & Tordo (2006) *(15)*; Baena et al. (2012) *(2)*; **Bagattini (2011) *(12)***; Barma et al. (2012); Bortolotti et al. (2020) *(20)*; Chalk et al. (1997) *(1)*; Dymitrowska (2020); Engel & Valdes (2000); Gould (2010) *(4)*; Hjort (2006) *(1)*; James et al. (2022); Lücke (2011) *(3)*; Medina-Bueno et al. (2021) *(1)*; Tsalik (2003) *(2)*; **Tsani (2013; 2015) *(27)***		
	Allegret et al. (2018) *(8)*; **Asik (2017) *(29)***; Clemente et al (2002) *(1)*; **Crain & Devlin (2002) *(71)***; Fasano (2000) *(6)*; le Borgne & Medas (2007) *(9)*; **Merlevede et al. (2009) *(1)***; **Ouoba (2020) *(23)***; **Shabsigh & Ilahi (2007) *(15)***; **Sugawara (2014) *(68)***; **Taguchi & Ganbayar (2022) *(54)***; Usui (2007) *(2)*	Kalyuzhnova (2006) *(2)*; **Taguchi & Ganbayar (2022) *(54)***	**Ouoba (2020) *(23)***
ineffective, lack of effect	Devlin & Titman (2004); Eifert et al. (2002)		
	Barnett & Ossowski (2002); Davis et al. (2001) *(6)*; **Ossowski et al. (2008) *(21)***; **Ouoba (2016) *(28)***; Villafuerte et al. (2010) *(7)*		**Taguchi & Ganbayar (2022) *(54)***

Notes:

Empirical studies are highlighted in bold.

The number of analyzed funds/countries is presented in parentheses marked in italics after each study.

Source: Own preparation.

Table 3.
Indicators for evaluating the effectiveness of natural resource funds — literature review

Author	Indicators for evaluating the effectiveness of natural resource funds (dependent variables)
Crain & Devlin (2002) *(71)*	volatility of government spending; economic and demographic results
Shabsigh & Ilahi (2007) *(15)*	volatility of inflation, broad money, real exchange rate
Ossowski et al. (2008) *(21)*	volatility of government spending
Bagattini (2011) *(12)*	sustainable fiscal performance: fiscal revenues, fiscal expenditures and savings; governance
Sugawara (2014) *(68)*	volatility of government spending
Tsani (2013; 2015) *(27)*	quality of institutions, governance
Ouoba (2016) *(23)*	economic growth
Asik (2017) *(29)*	volatility of major macro variables of interest (real household consumption, real government expenditures, government consumption, gross fixed capital investments); procyclicality of fiscal policy
Ouoba (2020) *(23)*	accumulation of physical and human capital; economic growth
Taguchi & Ganbayar (2022) *(54)*	volatility of government expenditure and primary balance; total investment; gross national saving; economic growth; inflation; population; openness; resource dependence; governance

Notes:

In the last two highlighted studies, the analysis was conducted taking into account the types of natural resource funds. The remaining studies generally relate to natural resource funds, mostly stabilization funds.

The number of analyzed funds/countries is presented in parentheses marked in italics after each study.

Source: Own preparation.

Table 4.
Indicators for evaluating the effectiveness of GPFG — study

Function of the fund		Indicators for evaluating the effectiveness of GPFG	Sources of data
Dependent variables	savings	gross national savings, % GDP	WEO
	investment	total investment, % GDP	WEO
	stabilization	general government total expenditure, % GDP	WEO
		general government primary net lending/borrowing, % GDP	
Explanatory variable		total market value, % GDP	NBIM, WEO

Notes:

WEO — World Economic Outlook Databases, International Monetary Fund; NBIM — Norges Bank Investment Management; GDP — gross domestic product.

Source: Own preparation.

Table 5.
Data analysis: Kolmogorov–Smirnov normality test and Shapiro–Wilk normality test

Specification	Kolmogorov–Smirnoy**		
	Statistic	df	Sig.
total market value, % GDP	0.148	25	0.166
gross national savings, % GDP	0.13	25	0.200*
total investment, % GDP	0.117	25	0.200*
general government total expenditure, % GDP	0.08	25	0.200*
general government primary net lending/borrowing, % GDP	0.093	25	0.200*

Notes:

* This is a lower bound of the true significance. ** Lilliefors Significance Correction.

Source: Own preparation.

Table 6.
Descriptive statistics

Specification	Mean	Std. Deviation	N
total market value, % GDP	139.35716	96.19055	25
gross national savings, % GDP	36.53592	4.61304	25
total investment, % GDP	25.10800	3.13433	25
general government total expenditure, % GDP	45.33120	4.07092	25
general government primary net lending/borrowing, % GDP	8.29892	5.52751	25

Source: Own preparation.

Table 7.
Data analysis: correlation analysis using Pearson correlation coefficient

		1	2	3	4	5
1	Pearson correlation	1	.185	**.621****	**.534****	–.378
	Sig. (2-tailed)		.375	<.001	.006	.063
	N	25	25	25	25	25
2	Pearson correlation	.185	1	–.217	–.697**	.806**
	Sig. (2-tailed)	.375		.298	<.001	<.001
	N	25	25	25	25	25
3	Pearson correlation	.621**	–.217	1	.554**	–.559**
	Sig. (2-tailed)	<.001	.298		.004	.004
	N	25	25	25	25	25
4	Pearson correlation	.534**	–.697**	.554**	1	–.959**
	Sig. (2-tailed)	.006	<.001	.004		<.001
	N	25	25	25	25	25
5	Pearson correlation	–.378	.806**	–.559**	–.959**	1
	Sig. (2-tailed)	.063	<.001	.004	<.001	
	N	25	25	25	25	25

Notes:

1 — total market value, % GDP; 2 — gross national savings, % GDP; 3 — total investment, % GDP; 4 — general government total expenditure, % GDP; 5 — general government primary net lending/borrowing, % GDP.

** Correlation is significant at the 0.01 level (2-tailed).

Source: Own preparation.

Table 8.
Regression analysis: total market value (explanatory variable) and total investment (dependent variable)

Descriptive statistics			
	Mean	Std. deviation	N
total investment, % GDP	25.10800	3.134330	25
total market value, % GDP	139.35716	96.19055	25

Correlations			
		total investment, % GDP	total market value, % GDP
Pearson correlation	total investment, % GDP	1.000	.621
	total market value, % GDP	.621	1.000
Sig. (1-tailed)	total investment, % GDP		<.001
	total market value, % GDP	.000	
N	total investment, % GDP	25	25
	total market value, % GDP	25	25

Model summary				
Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.621[b]	.386	.359	2.509

ANOVA[a]					
Model	Sum of squares	df	Mean square	F	Sig.
1 regression	90.935	1	90.935	14.440	<.001[b]
residual	144.842	23	6.297		
total	235.777	24			

Coefficients[a]					
Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
1 (constant)	22.288	.896		24.878	<.001
total market value, % GDP	.020	.005	.621	.800	<.001

Notes:

a — Dependent variable: total investment, % GDP; b — Predictors: (constant), total market value, % GDP.

Source: Own preparation.

Table 9.
Regression analysis: total market value (explanatory variable) and general government total expenditure (dependent variable)

Descriptive statistics			
	Mean	Std. deviation	N
general government total expenditure, % GDP	45.33120	4.07092	25
total market value, % GDP	139.35716	96.19055	25

Correlations			
		general government total expenditure, % GDP	total market value, % GDP
Pearson correlation	general government total expenditure, % GDP	1.000	.534
	total market value, % GDP	.534	1.000
Sig. (1-tailed)	general government total expenditure, % GDP	.	.003
	total market value, % GDP	.003	.
N	general government total expenditure, % GDP	25	25
	total market value, % GDP	25	25

Model summary				
Model	R	R square	Adjusted R square	Std. error of the estimate
1	.534[a]	.286	.255	3.514886

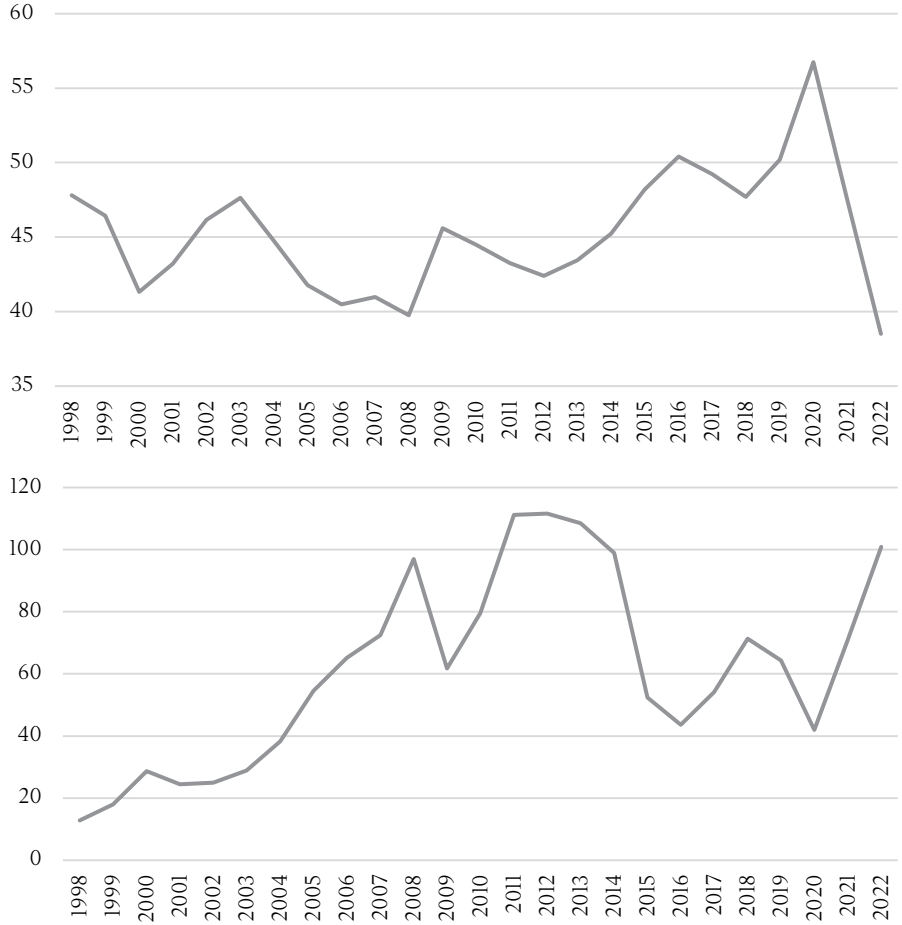
ANOVA[b]						
	Model	Sum of squares	df	Mean square	F	Sig.
1	regression	113.585	1	113.585	9.194	.006[c]
	residual	284.152	23	12.354		
	total	397.736	24			

Notes:

a — predictors: (constant), total market value, % GDP; b — Dependent variable: general government total expenditure, % GDP; c. Predictors: (constant), total market value, % GDP.

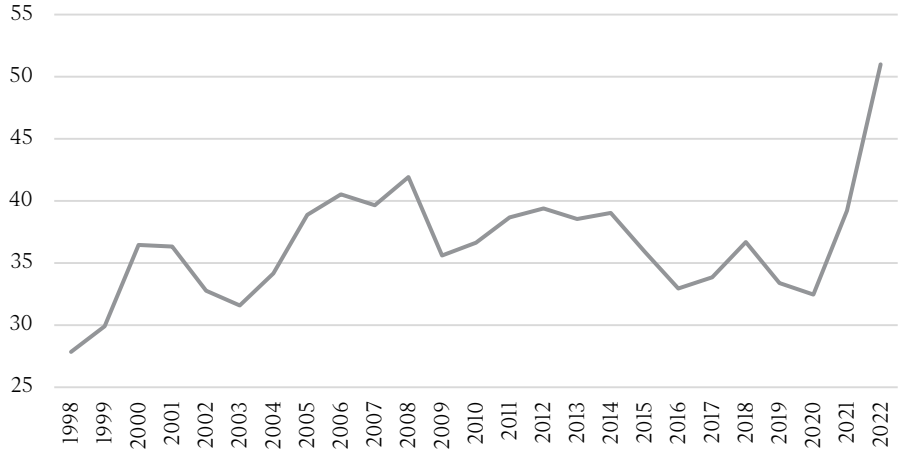
Source: Own preparation.

Chart 1.
Comparison of general government total expenditure (% of GDP, top) and spot prices for crude oil and petroleum products (dollars per barrel, down)



Source: Own preparation based on the data provided by the World Economic Outlook Databases, International Monetary Fund and Energy Information Administration (EIA).

Chart 2.
Gross national savings of Norway in the years 1998–2022 (% of GDP)



Source: Own preparation based on the data provided by the World Economic Outlook Databases.