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THE RESOURCE CURSE AND ITS IMPLICATIONS FOR FISCAL POLICY

Purpose. *The «resource curse» suggests that natural resources have been a curse instead of a blessing for a number of countries. Resource abundance leads to political and social tensions, lower economic growth, rent-seeking, and poor decision-making according to this theory. Mainly, natural abundance constitutes a difficulty for policy decision-makers. A high share of natural resources in the export of a country makes a country vulnerable to changes in resource prices on the world market. This study analyzes the management of the resource revenues from theoretical and practical view in a form of case studies of selected countries rendering both failure and success stories. The aim of the study is to identify challenges connected with dependency on natural resources (measured by the share in the country's export) and frame up fiscal policy recommendations for countries with natural resource abundance.*

Methodology / approach. *Since the resource curse is the phenomena which must be explored from a wider perspective, the chosen methodology is a qualitative country analysis and cross-country comparison.*

Results. *Data analysis in the period 2008–2018 shows that even countries that have transformed the resource curse into a blessing were hit by a fall in commodity prices in 2015 too. The paper confirms the pro-cyclical nature of fiscal policies in Nigeria and Mexico and the counter-cyclical nature of these policies in Chile and Botswana. Examples of good practice (Chile, Botswana) are shown.*

Originality / scientific novelty. *In the theoretical part of the paper, the recommendations for fiscal sustainability to present are summarized. In the practical part, another sample of countries with up-to-date data is analyzed in hand with a description of the main steps taken by local governments.*

Practical value / implications. *Both theory and practical examples are supposed to help to policy-makers in countries, which must deal with volatility in commodity prices. The main implication is to establish a fiscal rule which is resistant to any amendment and its compliance is controlled by the external institution.*

Key words: *resource curse, resource management, fiscal policy.*

Introduction and review of literature. Ownership of natural resources, as one of the forms of capital, can generally be considered as a certain advantage. Particularly in history, natural resources used to be the basis of wealth and power. However, colonial resource-rich countries which subsequently gained freedom did not reach economic growth for reasons connected particularly to their natural resources. It turned out that these countries were not able to successfully transfer their natural resources to other value-added assets. Other resource-rich countries, on the contrary, made surprising progress. Economists have done research to address the impact of natural resources on economic growth since the 1970s. The most notable contribution is the Sachs and Warner's [1] study, in which data on 97 countries in

1970–1987 showed statistically significant results indicating a negative link between natural resources and economic growth. The negative relationship between natural wealth and economic growth (and other macroeconomic indicators) began to be called the «resource curse». One of the possible definitions of the resource curse: *«A resource curse (also known as a paradox of plenty) refers to the failure of many resource-rich countries to make full use of their wealth of natural resources, and governments in these countries to respond effectively to public welfare needs»* [2, p. 1].

The line of research on the resource curse can be divided into two main areas: research of the effects of the natural resources on the economic development (curse transmission mechanisms and its manifestations) and recommendations on economic policy in countries with natural resources, some of which combine both. This article focuses on the latter. The aim of the article in its theoretical part is to identify, based on the previous literature, the key challenges faced by governments of resource-rich countries. The aim of the empirical part of the paper is to analyze the approaches of the governments of the selected countries. The qualitative form of research has been selected in view of the character of the problem under consideration, where a single scheme of instruments cannot be applied to all economies with natural resources. On the contrary, it is necessary to adapt the selection of instruments to the local conditions of the country. As Venables [3, p. 162] stated: *«The multistage nature of the challenge means that no single answer can be given to the questions of why it has proven to be difficult to harness natural resources for broader economic development»*.

The short review of the resource curse's transmission mechanisms. The study of the curse of natural resources has been dealt with by the number of studies and their conclusions are diverse. For instance, Warner [4] using GDP growth per capita in non-material sectors during the boom years led to the conclusion that 11 countries reported slower growth than before the reference period, but 7 countries otherwise. The debate about the existence of the curse remains unresolved.

The effects of the curse of natural resources can be divided into direct and indirect effects. Direct effects are positive, including GDP growth, employment growth, and revenue growth in the state budget. Indirect effects, however, prevail. In general, the negative impacts of natural resources on macroeconomic and other indicators are carried out through several transmission mechanisms. These mechanisms can be split up into economic and institutional ones. Economic mechanisms include (i) price level developments (discussed more below); (ii) Dutch disease: appreciation of the exchange rate due to higher demand for the domestic currency paralyzes other sectors in this economy and the manufacturing sector is relatively lagging in comparison with the mining sector. The Dutch disease model originates from Corden and Neary [5] (empirically confirmed by, for example, Harding and Venables [6]); and (iii) volatility: recent studies focusing on the economic factors of the phenomenon of the resource curse explain it from a different point of view, through the volatility they directly call the incarnation [7; 8; 9; 10].

Firstly, countries rich in natural resources show higher volatility in the dynamics of economic growth than in countries with low natural resources. Increased growth volatility then damages long-term economic development. Secondly, the resource curse can be manifested through exchange rate volatility. Increased exchange rate fluctuations lead to a lower foreign investment rate, further contraction of the manufacturing sector and, subsequently, lower productivity growth, especially in countries with poorly developed financial sector [7]. On the border between economic and institutional mechanisms lies (iv) insufficient diversification of the economy. The institutional mechanisms include: (v) the tendency to disproportionate growth in fiscal spending; (vi) insufficient investment activity; (vii) corruption and rent-seeking; and (viii) anarchist institutions. In addition to the above-mentioned mechanisms, exhaustibility of the non-renewable sources and negative environmental impact of extractive industries create a challenge to the government too.

It is important to note that the resource curse lies not in the country's equipment of large reserves of natural resources but in their large share of the country's exports and consequently in GDP generation (called as «dependency on natural resources» in this article). Most of the countries that own the so-called point sources, it means sources that are geographically concentrated in one place (oil, natural gas, minerals), are affected by the resource curse in a higher scope.

The knowledge of transmission channels and the potential impact of a high share of resources in exports and GDP is key to a setting of the appropriate monetary and fiscal policies. Although dependence on natural resources is also a major challenge for the national central bank and its monetary policy, this article will only address the challenges for fiscal policy. The key challenge for fiscal policy is the development of commodity prices.

Commodity prices. Commodity prices constitute two fundamental challenges for fiscal policy: (i) a possible fall in commodity prices over the long term (the so-called Prebish-Singer hypothesis), (ii) significant volatility over time and changes in a degree of volatility over time. The main causes of negative development in commodity prices over the long run include lower income elasticity of demand for primary commodities compared to other products, lack of differentiation across producers of one commodity, rigidities of wages in countries with unlimited labor supply (where prices cannot be pushed up by wages) and the oligopolistic structure of the markets in the developed world versus the perfect competition in the undeveloped part of the world [11]. Another problem is the volatility of commodity prices. It is difficult for policy-makers to handle large fluctuations in revenues which, moreover, cannot be reliably predicted. In addition, commodity price volatility is boosted by manufacturers who sell more when the price is higher and vice versa [12]. Price changes discourage private investment and may hinder the implementation of the necessary public investment [13]. If the government starts to pay a certain expenditure, it is hard to remove it, which in the long run leads to the accumulation of debt. Last, but not least, price changes raise the transaction costs in a form of a deadweight loss from the fraction, which is not used in times of low commodity

prices (non-used labor, capital or land).

The main objective of fiscal policy in countries dependent on natural resources is fiscal sustainability.

Fiscal sustainability. To achieve long-term fiscal sustainability, governments of resource countries should focus on the proper functioning of the following:

(i) Rent capture by the government: The mining companies are mostly owned by foreign companies in countries with natural resources, as the discovery and development of resource mining require advanced technology. The host government then sets up a fiscal and regulatory regime whereby an investor gets a normal return on investment, and everything beyond that rate is captured by the government. Exploration and development are mostly made available to companies based on the awarding of licenses [14]. With a view to the subsequent revenue generation from natural resources for the state budget, governments use the following instruments: royalties, income taxes, resource taxes, production-sharing agreements and indirect taxes, such as tariffs, export duties and value-added taxes [15]. However, as I see it, growth in income from natural resources may not be positive for the economy due to possible government failures. Governments will always face information asymmetries compared to mining companies. Public sector growth, in general, can lead to a rise in rent-seeking and corruption due to higher potential income from rent-seeking in the form of revenues from natural resources. High fees and taxes can lead to crowding out a private investment. So, it is essential to set up a system of taxes and charges to be as simple and stable as possible over time. The government should avoid various tax incentives and subsidies that would distort the market and disrupt the efficient allocation of resources.

(ii) Fiscal rules for limitation of discretionary use of revenues from resources: Governments in resource-rich countries face the urge to use revenues from natural resources for consumption, in other words, to act pro-cyclically so they increase government expenditure at the stage of economic growth [16]. According to Coutinho [17], the best-known fiscal rule is the so-called Sustainable Budget Index, which is counted as recurrent expenditure and recurrent revenue (recurrent expenditure / recurrent revenue), with recurrent expenditure not including expenditure on health and education. If this index exceeds 1, then the revenue is consumed. For fiscal stability, then, the value should not exceed 1, otherwise, the revenue is consumed.

(iii) Structural budget: Other sources propose to target a certain set of structural deficit limits. Such a rule encourages the government to conduct budgetary planning and its realization within the limits of the structural budget [11].

(iv) Natural resource funds: Another, widely used, tool is the so-called national resource fund. These funds were established, for example, in Chile, Norway or Venezuela. Especially in smaller countries, with the growth of commodity prices, the economy does not have enough capacities and possibilities to implement investment projects. In such a case, governments may decide to invest in financial capital in the form of national resource funds, which may either take the form of a stabilization

fund or a savings fund. Fundamental pillars of the right set-up of funds are: a) setting up a fund management system that all stakeholders will agree to, b) effective control of fund management, c) fund protection against additions. In deciding whether the government invests or consumes resource revenue, the moral dimension of the current generation's approach to future generations should be considered. According to the permanent income hypothesis, the consumption should increase by the expected annual value of the income from natural capital after the discovery of a new resource and the revenue above that value should be invested to cover the additional growth of consumption in the future. In developing countries, this rule needs to be adjusted because these countries are capital-scarce and need to accumulate a certain level of capital to achieve a higher growth trajectory. Savings for the future generation should, therefore, be lower, though future generation is going to be less equipped with natural capital because future generations will receive higher incomes [3].

(v) Effective management of public investment: Governments that have revenues from natural resources (that can be labeled «donations» or «gift from above») tend to invest in low-return and overly ambitious projects. According to Deaton [12], the roots of the low growth of African countries lie in a poor investment appreciation. Several meaningful projects would require long-term funding that the government cannot provide because of price uncertainty [18]. Countries with natural resources are therefore recommended to invest in long-term growth and diversification of the economy. However, the economic level of a country of interest must be considered. In case of an advanced country which is «capital-abundant», then it is recommended to invest in «sovereign wealth funds» (one type of natural resource funds as discussed above). If the country is «capital-scarce», then investment in domestic assets should be a priority [3]. An example of this may be infrastructure investment. For developed and emerging countries, investments in sectors that are not directly (or even negatively) correlated with the commodity market are also recommended.

Investing in the physical capital should be accompanied by investment in human capital [4]. Assuming certain degree of substitutability of capital, we avoid the declining return on investment in physical capital by investment in human capital (which does not face the declining return on investment). Unfortunately, according to Gylfason [19], it is just a country rich in natural resources that neglects investment in human capital because it is not forced to ensure revenue's flow to the state budget due to relying on an income from natural resources. A negative correlation between dependence on natural resources and education expenditure is also confirmed by the Cockx's study [20] which adds that the reason for lower spending on education is also the focus on capital intensive industries rather than on sectors requiring human capital, in other words, demand for physical capital is higher than demand for human capital.

This all is connected to the special rule for investing in capital, to the so-called Hartwick rule stating that total capital in the economy must be maintained. If a

natural resource is drawn, the government should invest in another form of capital to the same extent. Although this rule was primarily prescribed for countries with non-renewable natural resources, it is also beneficial for countries with other types of natural resources, whose prices are falling over time [14].

(vi) Citizen dividend schemes: the government may decide not to invest all incomes on its own, but to pass it on to citizens [3]. Especially in developed countries where there are a low birth rate and a long-life expectancy that causes an aging population, it may be wise to include part of the resources into pension funds.

(vii) Quality institutions: the main obstacle for the application of all these recommendations is that most of these steps involve strong institutions in a country, but they are largely absent in the developing world. If the government is the owner of the mining companies, it regulates itself by itself and an external controller is therefore needed. States that are unable to prevent their officials from committing corruption should apply policies that will limit state discretionary interventions. It is confirmed for example by Mehlum [21] that the quality of institutions determines whether the resource curse will be turned into a blessing. Accordingly, the Natural Resource Governance Institute (NRGI) [22] proposes in its charter the creation of competent institutions with a unified goal, transparency (it means that those who decide on the use of income from natural resources should be accountable to the informed public), the protection of property rights, involving of local communities in decision-making and evaluation and fight against corruption.

The proposed steps also depend on the ability of international institutions and non-profit organizations to create the necessary pressure on the state [13]. According to NRGI [22], governments and international organizations, for example, should promote more harmonization of standards for promoting sustainable development.

«The wide diversity in experiences of countries with substantial natural resources means that comparative analysis and exchange of experience of managing resource-rich economies could be very fruitful ...» [23, p. 408].

The purpose of the article. The aim of the study is to identify challenges connected with dependency on natural resources (measured by the share in the country's export) and frame up fiscal policy recommendations for countries with natural resource abundance. This article is to contribute to the research of optimal resource management practice on the example of selected countries with up-to-date data. Since the resource curse is the phenomena which must be explored from a wider perspective, the chosen methodology is a qualitative country analysis and cross-country comparison. Because the research could be distorted by an inclination to analyze the worst cases, this study is analyzing both success and failure stories. Except that the purpose of the article is to gather all recommendations based on previous research in one comprehensive and structured form which has been done in the previous chapter.

Both theory and practical examples are supposed to help to policy-makers in countries, which suffers the resource curse and to policy makers of countries with new discoveries of natural capital too.

Results and discussion. In the consequent analysis, we will focus on four countries: Nigeria, Mexico, Chile, and Botswana. The reasons for selecting these countries are as follows. At first, all countries meet the criteria of exporting natural resources. Nigeria exports primarily fuels which counts for 96 % of total exports. Mexico exports fuels which constitute 5,5 % of total exports and it is also the world seven largest gold producer. Botswana is specialized in diamond mining (89 % of total exports). Chile is the largest exporter of copper in the world (25 % share in export). Secondly, two countries described as «failure stories» (Nigeria, Mexico) and two countries described as «success stories» (Botswana, Chile) were chosen for maintaining the objectivity of research (as for example in [17]). Thirdly, two African countries (Nigeria, Botswana) and two developed countries (Chile, Mexico) were chosen to facilitate drawing policy comparisons for both developing and developed countries. The chosen period of research is 2008–2018. The detailed information about the average economic growth in decades since the oil shocks is included in Appendix A. In the selected period, Mexico has been growing the slowest, Botswana the fastest. The detailed information about the export of natural resources is included in Appendix B. We are focusing also on the drop of commodity prices in 2015. As the demand for the fuels had grown before 2015 (because of growing demand by for example China), USA and Canada started to draw fuels from technologically more difficult accessible deposits, so the supply went up while demand by Europe decreased because of slower economic growth and energetic regulation.

The comprehensive analysis of each country is following. For each country, the reaction of the budget to commodity price changes of the main natural resource, capital formation and value-added in economic sectors as a proxy of diversification of economy are provided. Finally, index rankings including the management of resource revenues, human capital, corruption, and environmental burden are shown.

Nigeria. Nigeria is a typical country on which the resource curse is illustrated. The reason for choosing this country is the combination of a large share of natural resources in GDP along with low growth performance in decades after the liberation of Nigeria in 1960. The transmission mechanisms of the resource curse, which were described in the theoretical part of the paper, were almost all manifested in Nigeria. The key problem has been the low quality of institutions. The Nigerian population is ethnically fragmented. Nigerian politics has been regionally fragmented too. After the discovery of oil resources, revenues from resources were used mainly for military purposes. Even though Nigeria had drawn on oil revenues, it had failed to reduce poverty. Public expenditures were not oriented to pro-growth investments [23].

In response to the afore-mentioned problems, Nigeria put into effect the so-called Nigeria Sovereign Investment Authority Act in 2011 to give an incentive to the government to invest reasonably. Further, the government of Nigeria introduced a fiscal rule based on the oil price. Fiscal spending was limited by the reference oil price counted as a long-term average based on a prudent analysis. In case of a surplus (if the price of oil was above the reference price), revenues were supposed to be converted into the Excess Crude Account (ECA). In case of a deficit, withdrawals

were allowed. In reality, the Nigerian government made withdrawals in periods when oil prices were below its reference price. It led to complete depleting of the ECA. However, it has been useful in mitigating the impact of the global financial crisis in 2008, when the oil price has fallen sharply [24].

Nowadays, the ECA is the most poorly managed sovereign wealth fund according to the NRGI. The Nigerian government discloses almost no rules or practices which govern deposits of the ECA (Nigeria has a larger number of natural resource funds, but the ECA is the largest one).

Figure 1 illustrates the development of price of oil according to the Central Bank of Nigeria (left axis), annual real GDP growth (right axis) and the reaction of the state budget shown as the budget balance in % of GDP (right axis). The Nigerian budget balance is following the price of oil so the huge impact of the price of oil on the fiscal policy in Nigeria is evident. The Nigerian government has been acting pro-cyclically, it means the budget balance copies the annual real GDP growth rather than to be countering it. Additionally, the Nigerian budget has been in deficit since 2008. The Nigerian economy declined only in 2016 (-1.5 % of GDP) so the Nigerian government has not done any savings during economic growth. However, the recommendation for the developing country is primarily to invest funds from the natural resource's revenue, so we will analyze capital formation in the following text.

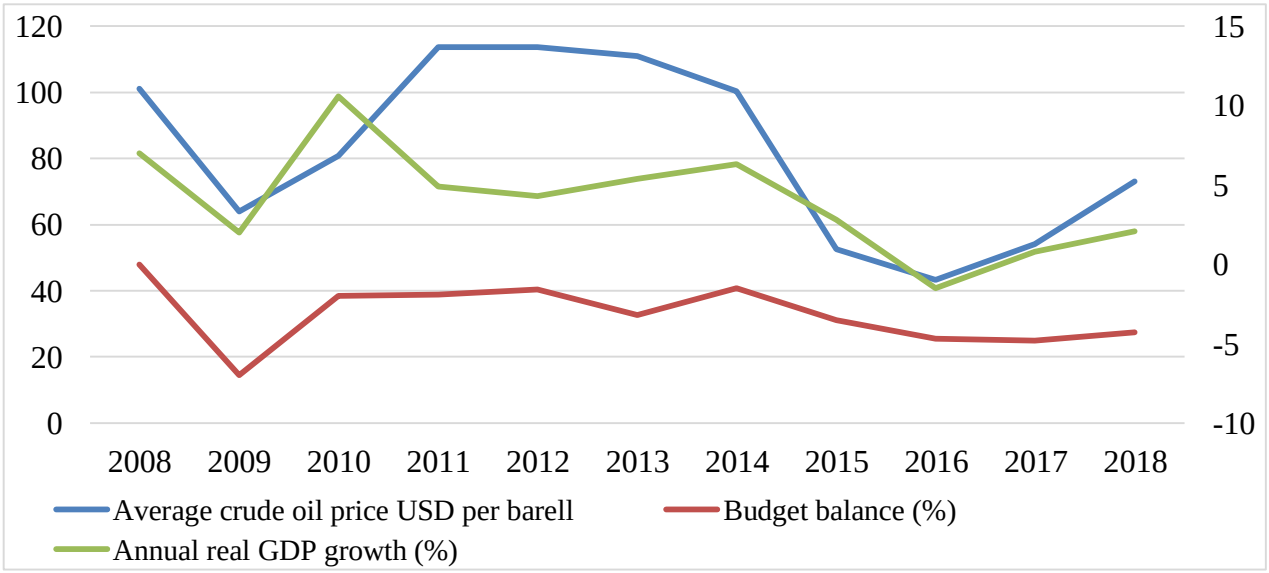

Fig. 1. Nigeria: Response of budget crude oil price

Source: average crude oil prices calculated based on data from Central Bank of Nigeria [25], budget balance and annual real GDP growth data used from Open Data for Africa [26].

Both figure 1 and 2 illustrates the annual GDP growth. Nigerian economy was affected more by the fall in the prices of oil than by the global financial and economic crisis in 2009.

In figure 2, the capital formation in Nigeria is shown. Surprisingly, the capital formation was highest during the reporting period in 2009, when the Nigerian economy grew only by 2 %. Nigeria's capital formation has not been rising since 2008, it is holding around 15 %. In 7 years from 10 years, capital formation declined

in comparison with previous year. The Nigerian government has not been changing its approach to addressing the resource curse more reasonably.

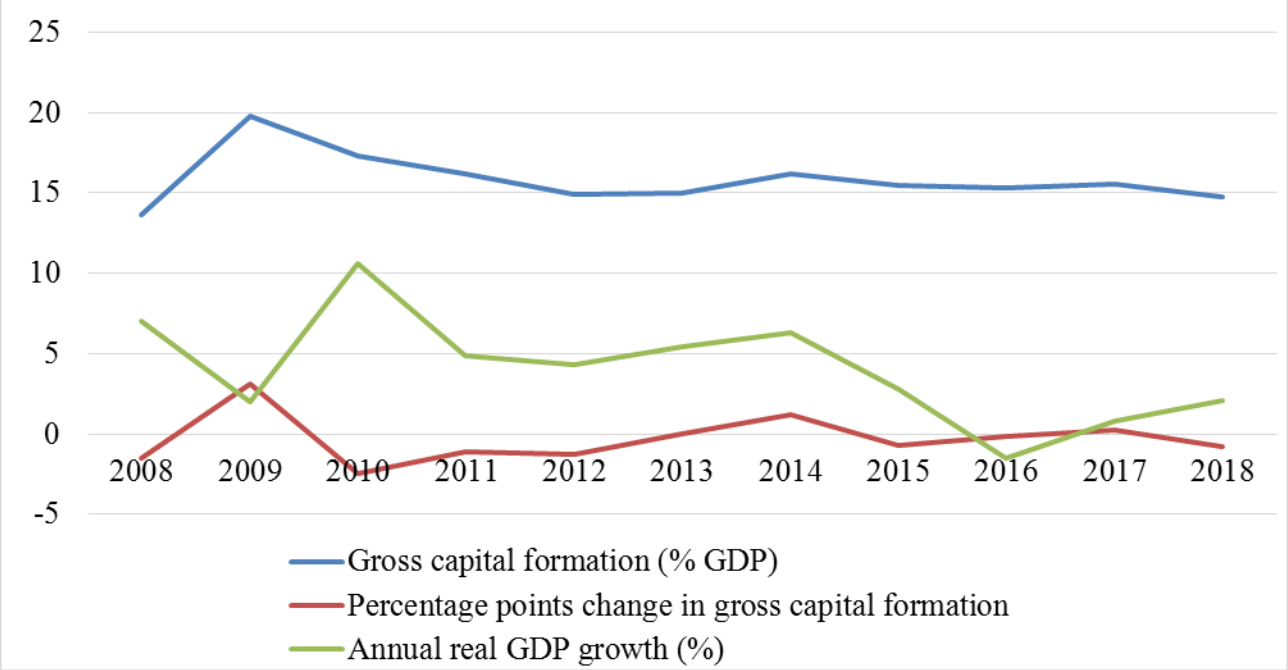

Fig. 2. Nigeria: Capital formation

Source: own construction using data from Open Data for Africa [26], own calculations of percentage points change.

However, some progress has been made in case of diversification of the Nigerian economy (see Appendix C. for development of the value-added by sectors). The share of agriculture declined during the reporting period from 25.3 % of GDP to 20.8 % of GDP but still it is a huge share. Industry sector fell from 24.7 % in 2008 of GDP to 22.3 % of GDP in 2017. Manufacturing (as one part of the industry sector) slightly grew (from 8.2 % to 8.7 % of GDP). Services grew from 49.0 % to 55.8 %. It can be regarded as a success for the Nigerian economy.

In table 1, index rankings for Nigeria are provided. The rankings are not favorable for Nigeria. The worst is rated the Human Development Index, followed by the Corruption Index.

Table 1

Nigeria: Index Rankings

Index	Ranking	Score
NRGI score	55th (out of 89), 2017	42 (out of 100)
NRGI score in Revenue management	40th (out of 89), 2017	44 (out of 100)
Human Development Index	157th (out of 189), 2018	0,532 (out of 1)
Corruption Index	144th (out of 180), 2018	27 (out of 100)
Environmental Performance Index	100th (out of 180), 2018	54,76 (out of 100)

Source: NRGI (2019) [27], United Nations Development Programme (2019), Transparency International (2019) [28], Yale – Center for Environmental Law and Policy (2019) [29].

Mexico. Mexico is one of the priority countries of NRGI. Mexico can be evaluated with a focus on the oil and gas sector and on the mining sector. We consider the oil and gas sector in this analysis since it has a bigger impact on the

Mexican economy. The Petroleum Mexicanos (Pemex) is a state-owned company which had a monopoly on the crude oil exploration and extraction since the late 1930s [21]. In reaction to the boom of the price of crude oil during the 1970s, the Mexican government invested in overly ambitious and low return projects. For example, GDP grew by about 20 % after the second oil shock (1979). The investment was directed primarily at Pemex. Mexico had to import more capital and intermediate goods. Additionally, the Mexican government increased borrowing which had led to increasing in the external debt [30].

Nowadays, production and exports are slowly declining [31]. Fields that have been used for years have exhausted themselves. Conversely, domestic energy consumption is rising. However, due to declining oil revenues (because of a fall in prices), the government could not provide Pemex with the necessary funds for investment (34 % of revenues in 2009 compared to 21 % in 2016). In 2013, President E. Pena Nieto began to promote energy reform in order to lure private investment. It was a big step for the Mexican economy, as it means moving from the oil industry to the energy industry. Energy reform has also touched on Pemex in many ways. It can now cooperate with the private sector. The reform gave to Pemex greater autonomy and less tax burden. The reform has also brought Pemex a limitation, for example, it now has debt ceilings and caps on the salaries for employees. Its participation in the natural gas sector was limited and Pemex must now compete in bidding processes.

Mexico also established the sovereign wealth fund called the Oil Revenue Stabilization Fund with 5 901 million assets under management in 2016. The Fund is evaluated 17th from 34 funds by NRGI. Annual reports are not audited by a legislature.

Figure 3 is illustrating the reaction of budget balance to the changes in prices of crude oil and natural gas. Mexican budget has been in deficit since 2009. Even though the crude oil price has been high, and the Mexican economy was growing in the period 2011–2014, fiscal revenues were drawn. In reaction, the Mexican government set the annual expenditure ceiling in the Budget and Fiscal Responsibility Law in 2015. Budget balance improved the following year, but it was still in deficit. In addition, there is no requirement for external control of compliance with the rule (only internal control by the supreme audit office and Center for Public Finance Studies). This is one of the reasons for pro-cyclically fiscal policy.

The response of the budget to the changes in gold price is shown in Appendix D.

The capital formation shown as the annual change in gross fixed capital formation in Mexico (Fig. 4) has been copying the annual growth rate, only with higher amplitude. It is a sign of an absence of the long-term investment strategy. Additionally, the percentage share of the gross fixed capital formation in GDP is very low especially with regard to deficit budgeting in the period of economic growth.

As is shown in figure 3 and 4, the drop in prices of oil and natural gas in 2015 had a worse impact on the annual real GDP growth than the global economic crisis.

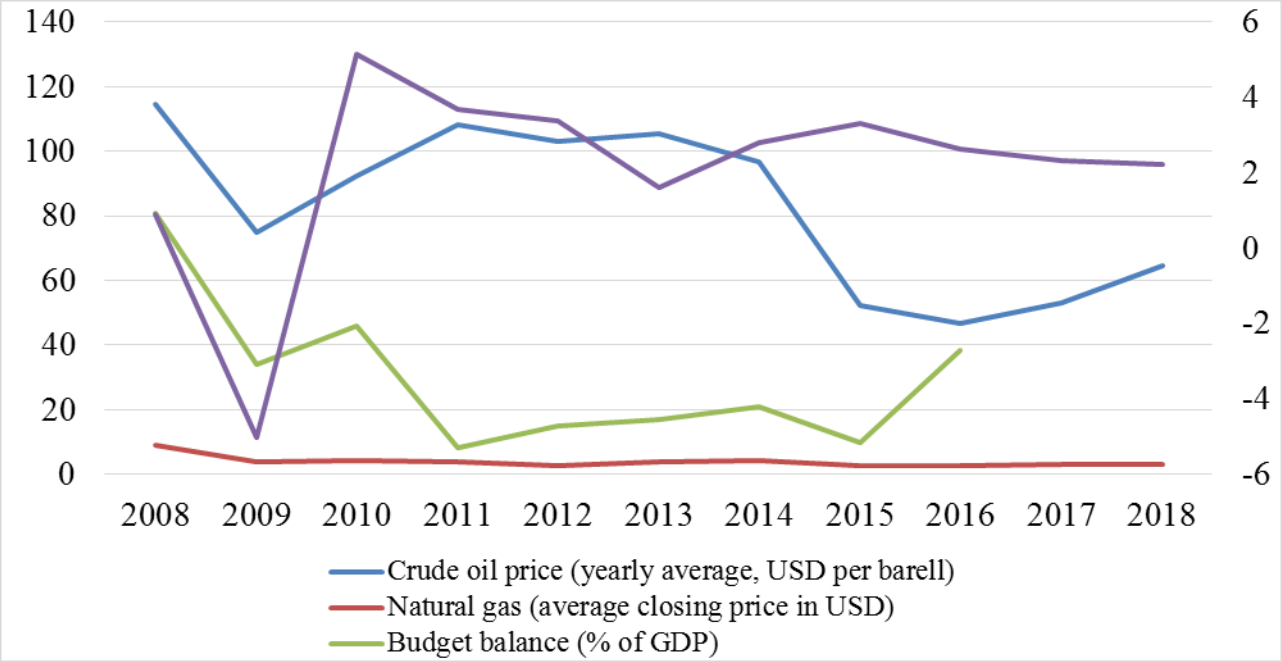

Fig. 3. Mexico: Response of the budget to the price of oil and price of gas

Note. Data on budget balance in 2017 and 2018 are not available on OECD [32].

Source: own construction based on data on crude oil price (Macrotrends, 2019 [33], own calculations), natural gas (Macrotrends, 2019 [33]) and budget balance (OECD, 2019 [32]).

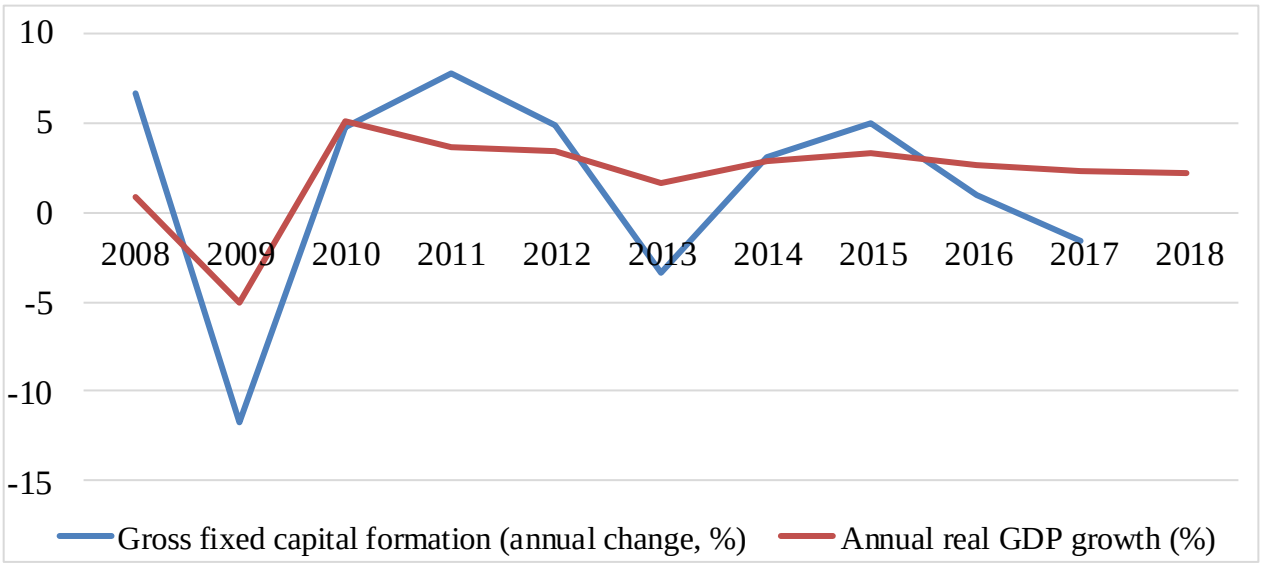

Fig. 4. Mexico: Capital formation

Source: own construction based on data from OECD (2019) [32].

The diversification of Mexican economy has changed slightly since 2008 (Appendix E). Value-added in manufacturing sector grew from 15.8 % (2008) to 17.2 % (2017). Valued-added in industry sector declined from 34.8 % (2008) to 30.0 % (2017). Agriculture sector has constituted around 3 % value-added and services around 60 %. Table 2 is providing information about other institutional aspects. The weakness of the Mexican economy is mainly high corruption.

Table 2

Mexico: Index Rankings

Index	Ranking	Score
NRGI score: Oil and gas	17th (out of 89), 2017	61 (out of 100)
NRGI score in Revenue management: Oil and gas	26th (out of 89), 2017	54 (out of 100)
NRGI score: Mining	19th (out of 89), 2017	60 (out of 100)
NRGI score in Revenue management: Mining	28th (out of 89), 2017	53 (out of 100)
Human Development Index	74th (out of 189), 2018	0,774 (out of 1)
Corruption Index	138th (out of 180), 2018	28 (out of 100)
Environmental Performance Index	72th (out of 180), 2018	59,69 (out of 100)

Source: NRGI (2019) [27], United Nations Development Program (2019), Transparency International (2019) [28], Yale – Center for Environmental Law and Policy (2019) [29].

Chile. Chile was selected as the success story for the following reasons. The state-owned mining company named Codelco is ranked as the number one in state-owned enterprises rated in the NRGI index. Chile has managed what other countries (i.e. Nigeria and Mexico) have failed, a pro-cyclical fiscal policy.

A new institutional framework was introduced in Chile in 2000. During the boom in 2003–2008, this framework has managed to maintain surplus budgets and then allow the budget in 2009 in the wake of the global crisis. Until the crisis, when the government could use the saved copper income, this policy was also valued by people (during the investigation period, the government faced intense pressure to abandon the commitment). The fiscal framework includes 3 rules: Firstly, the total budget must be at least equal to 0 (or positive). This condition may be relinquished if: (i) recession (output is below its potential); or (ii) price of copper is below its 10-year equilibrium. Output gap and equilibrium price are counted by two panels of expert without any connection to politics. Law also requires regular monitoring of the government's adherence to the fiscal rule, with monitoring being carried out without exception. Data on state budgets, revenues from mining and debt are available to the public.

Chile operates a sovereign wealth fund called the Economic and Social Stabilization Fund. Its value was 13966 million USD [27]. It is placed among the best funds of this type. Poor investment rules are according to NRGI the only weakness of the fund. Figure 5 is proving the counter-cyclical character of fiscal policy in Chile. When the growth rate started to slow down, the budget balance went to the deficit. In contrast to the previous countries, Chile was not affected more by the drop of price of copper (from 2011 to 2016, it dropped by 364.4 %). The Chilean government stimulated the economic growth by wise expansive fiscal policy.

Figure 6 is illustrating capital formation measured as the growth rate of the gross fixed capital formation. In the year 2008, gross fixed capital grew by an enormous 18.5 %. During 2009, due to the global economic crisis, gross fixed capital fell by 13.3 %. However, investment was recovered very quickly, in the following year, it grew by 13.1 %. The drop of prices of copper and slower economic growth

negatively affected the gross fixed capital formation which has been declining since 2014.

The diversification of the Chilean economy has changed since 2008. Value-added in the agriculture sector held around 3.7 % in 2008–2017. Industry value-added declined from 34.2 % (2008) to 30.0 % (2017). Manufacturing slightly declined (from 11.1 % in 2008 to 10.2 % in 2017). The progress has been done in the service sector, value-added in services grew from 53.5 % (2008) to 57.6 % (2017). For more information, see Appendix F.

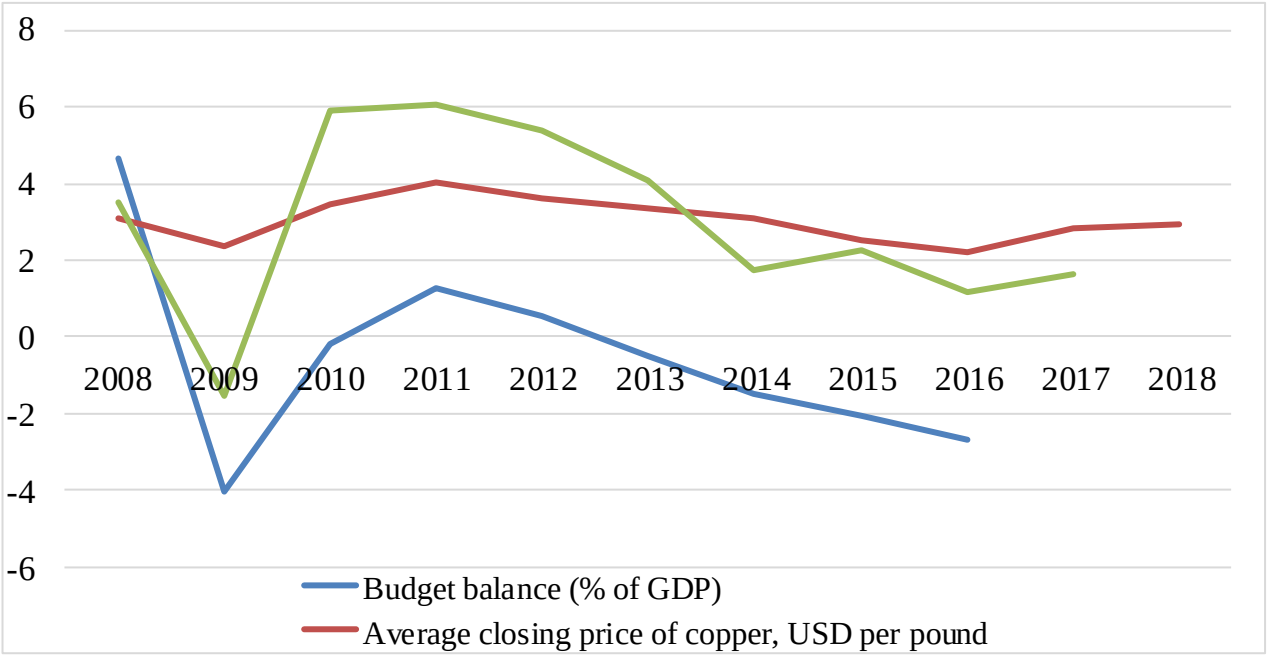

Fig. 5. Chile: Response of the budget balance to the price of copper

Note. Data on the budget balance for 2017–2018 and the annual real GDP growth for 2018 are not available from OECD [32].

Source: own construction based on data on budget balance (OECD, 2019) [32], average closing price of copper (Macrotrends, 2019) [33] and annual real GDP growth (OECD, 2019).

According to NRGI [27], Chile is the second-best performer in natural resources governance. Despite the high share of natural resources in the exports, Chile has mastered its corruption level and it has not neglected the investment into the human capital. The only concerns can be directed to the environmental impact of mining. Overall, Chile is an example of the country, which turned the natural resources to be a blessing for them and the fiscal policy can be an example for other countries.

Table 3

Chile: Index Rankings

Index	Ranking	Score
NRGI score	2nd (out of 89), 2017	81 (out of 100)
NRGI score in Revenue management	4th (out of 89), 2017	81 (out of 100)
Human Development Index	44th (out of 189), 2018	0,843 (out of 1)
Corruption Index	27th (out of 180), 2018	67 (out of 100)
Environmental Performance Index	84th (out of 180), 2018	57,49 (out of 100)

Source: NRGI (2019) [27], United Nations Development Programme (2019) [34], Transparency International (2019) [28], Yale – Center for Environmental Law and Policy (2019) [29].

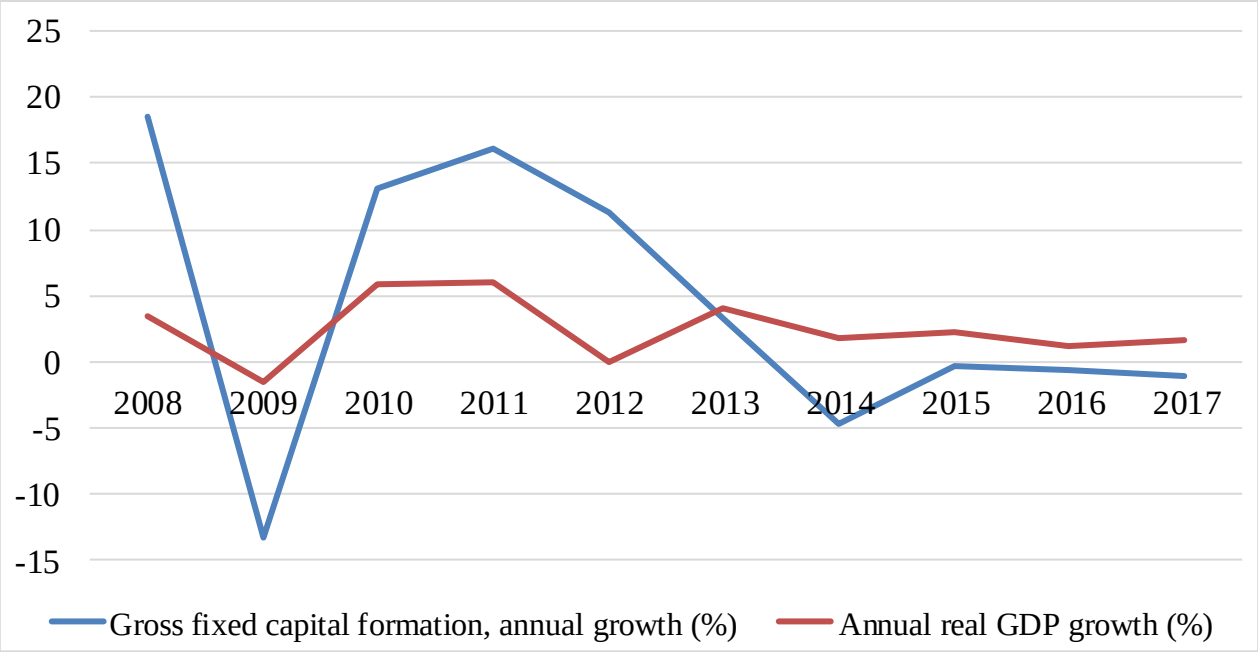

Fig. 6. Chile: Capital formation

Source: own construction using data from OECD (2019) [32].

Botswana. Botswana's success in averting the curse of natural resources is particularly remarkable. Like other African countries, Botswana was liberated in the 1960s and its prospects were not too optimistic. By 2007, this country has managed to get into the category of middle-income countries, including, for example, Chile analyzed above.

Botswana can be demonstrated as an example to investigate the resource curse, as its economy is highly dependent on diamonds. Inventories of diamonds are estimated at 300 million carats, but their drawdown raises the importance of intergenerational solidarity [27].

The Botswana government has taken a number of measures that can serve as an example for other countries. In the front row, this government has a high degree of transparency. In order to avert the threat of low diversification and Dutch disease, it has made a number of investments in public goods and infrastructure. The government has avoided introducing of import substitution policies. The government has tackled the problems associated with revenue volatility by introducing a savings fund [35].

The so-called Pula Fund is one example of sovereign wealth funds. Botswana has been involved in the discussions about managing this fund internationally. It takes a form of a long-term investment portfolio. Its aim is to save money from diamonds for future generations. Money is held in the form of investments in securities denominated in other currency than national currency [36]. The fund serves as a cushion for balancing economic fluctuations, namely offsetting depletion of diamonds. Fund management is delegated to professionals who are independent of any political goals. They focus only on the financial interest of the Botswana population [16].

For assessing the volatility in the revenues from resources, change in the export of diamonds is used (Fig. 7). The price of diamonds is highly connected with the quality of exported diamonds, so change in exports of diamonds is a better proxy in this case. It is visible that the Botswana's government has been facing very volatile revenues from export. Exports of diamonds dropped by almost 31 % in 2009 in response to the freezing of global market. It recovered right the next year and dropped again in 2015 and 2017. The budget balance has been almost perfectly responding to the annual real economic growth, in other words, it has been acting counter-cyclically.

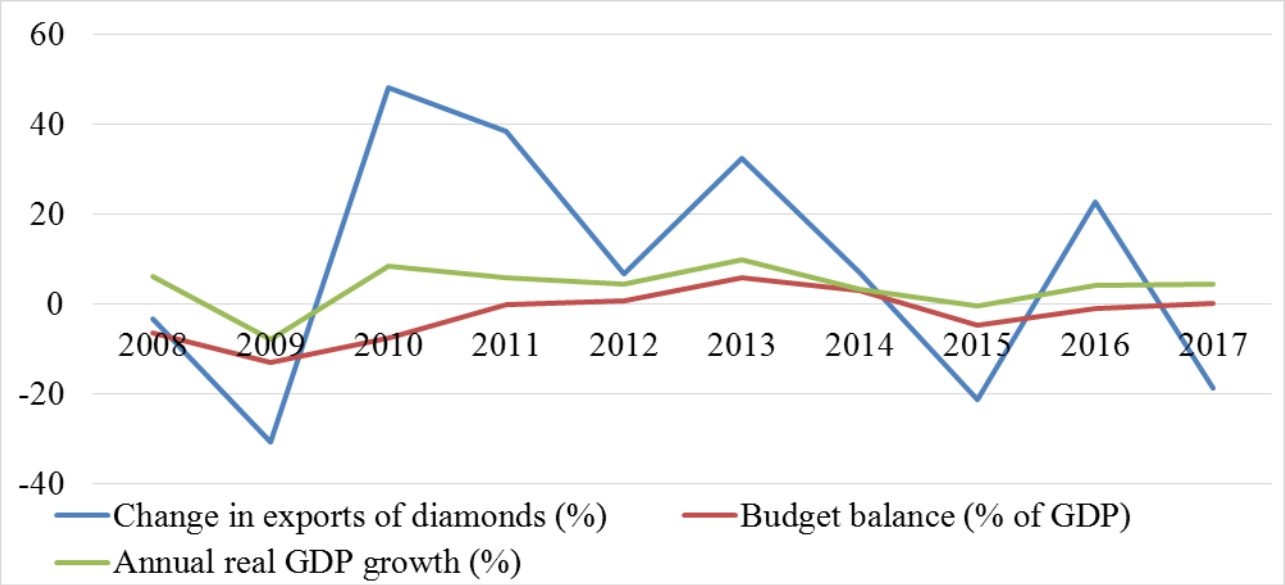

Fig. 7. Botswana: Response of budget to changes in export of diamonds

Source: own construction based on data from UN Comtrade (2019, own calculations) [8] and Open Data for Africa (2019) [26].

The annual real GDP growth decreased during the global crisis more than during the commodity prices drop. The price of diamond was not affected by the triggers of drop in fuel prices. However, diamonds are luxury good so if there is a period of slower growth in countries on the demand side, sales of diamonds can go down. Figure 8 is showing development of share of capital formation in GDP in Botswana. Gross capital formation has been declining since 2010 (from 41.4 % to 22.3 % in 2017). The share of gross capital formation is still very high in comparison with other countries, however, if the decline in investment continues, it can pose a threat to Botswana in the long run.

Botswana made huge progress in the structure of its economy from 2008 to 2017 (see Appendix G). The value-added in agriculture declined from 2.5 % of GDP to 2.0 %. Industry sector value-added decreased from 36.5 % to 30.3 %. During the global economic crisis, it dropped to 28.2 % (2009). Value-added in manufacturing slightly declined (from 5.7 % to 5.1 %). Decreases in other sectors were offset by growth in value added in the services sector (50.9 % to 58.4 %).

Finally, Table 4 provides information about the index rankings of Botswana. Botswana achieves pretty good results in corruption index and revenue management.

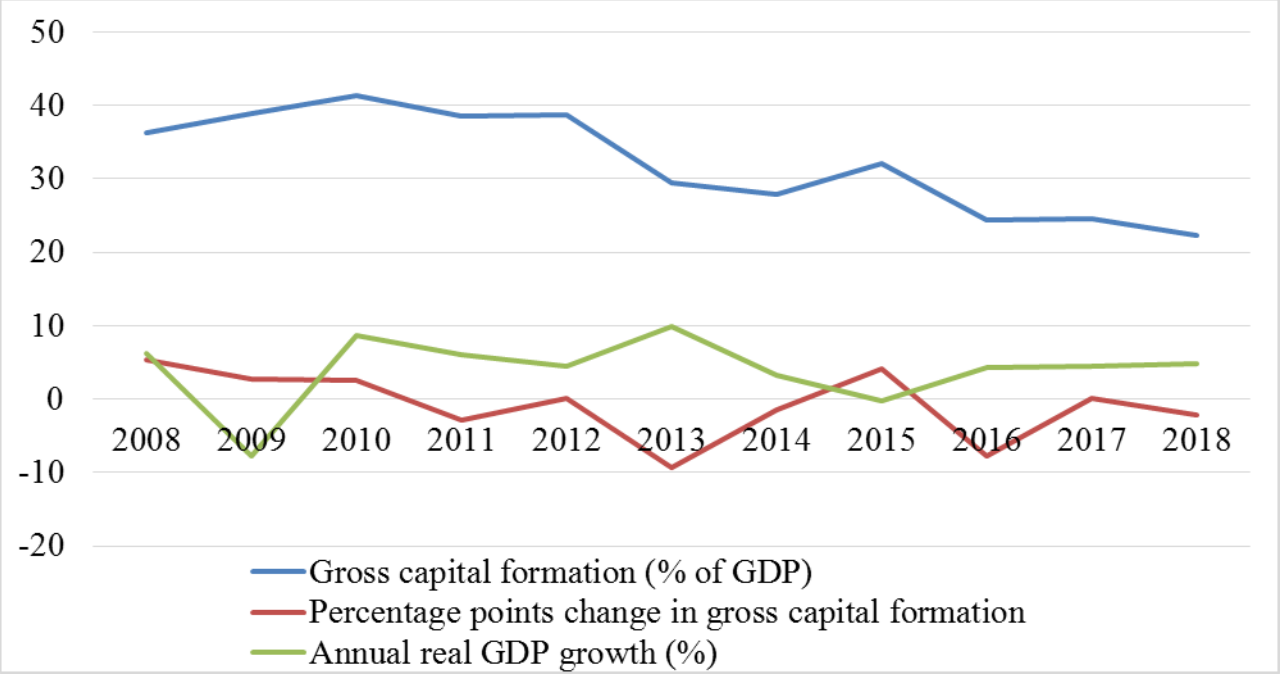

Fig. 8. Botswana: Capital formation

Source: own construction based on data from World Bank (2019) [37] and Open Data for Africa (2019) [26].

The Botswana's government should care more about the impact of mining on the environment and invest more in the human capital.

Table 4

Botswana: Index Rankings

Index	Ranking	Score
NRGI score	18th (out of 89), 2017	81 (out of 100)
NRGI score in Revenue management	14th (out of 89), 2017	62 (out of 100)
Human Development Index	101st (out of 189), 2018	0,717 (out of 1)
Corruption Index	34th (out of 180), 2018	61 (out of 100)
Environmental Performance Index	113th (out of 180), 2018	51,70 (out of 100)

Source: NRGI (2019) [27], United Nations Development Programme (2019) [34], Transparency International (2019) [28], Yale – Center for Environmental Law and Policy (2019) [29].

Conclusions. The paper has demonstrated that the theme of the resource curse is still highly significant. This study has focused on one of the aspects of the complications associated with the ownership of natural resources, to its impacts on fiscal policy. As has been displayed in the last decade, commodity prices (not just fuels) are prone to a number of factors and show high volatility, making economic-policy decision making more complicated. For this reason, the theoretical part of this study focused on the research of previous literature to identify the most frequently mentioned challenges related to the ownership of natural resources, and then summed up recommendations for the decision-making sphere to achieve fiscal sustainability in countries rich in natural resources.

A key recommendation is to make a fiscal commitment that is resilient to changes in the political establishment that would make additions to the chosen rule.

The fiscal commitment should be of such a nature as to offset fluctuations in commodity prices and address intergenerational solidarity too. An alternative (or supplementary) way is to distribute part of the resource revenues directly to people in order to minimize the state's redistributive function (and minimize the government failure for example in form of high corruption).

In the case of developing countries, it has been recommended to invest current resources rather than saving them for future generations, so that the country could get on a higher growth trajectory from which later generations will draw higher incomes. Apart from that, all countries should at least offset drawing of the natural capital by creating another form of capital, especially human capital.

The selected methodology for research in the analytical part of the paper was a qualitative analysis of selected countries. Compared to other articles that only deal with the description of partial economic policy measures, this article provides an analysis of the most up-to-date data. This method was also recommended by a number of economists, for example Ploeg [23]. The analysis was complicated by the availability of data, majority of data being available from one portal for Nigeria and Botswana as African countries, and for Mexico and Chile as OECD members. This complicated the possibility of accurate comparison. However, this also illustrates the problem of low transparency.

The analysis of Nigeria illustrated the problem of low transparency of the entire resource revenue management system, coupled with high corruption. Even in the period of rising commodity prices, the Nigerian government pursued an expansionary fiscal policy while neglecting the necessary investment. The poor management of natural resources in Nigeria is also testified by the poor ranking in all selected charts.

Although the share of natural resources on exports in another selected country, Mexico, is the lowest among the selected countries, the problem of managing natural resources has been illustrated here too. As in Nigeria, deficit financing was present even in the period of rising fuel prices. Although a spending ceiling has been set here, compliance with the rule suffers by a lack of external control. Like the Nigerian government, the Mexican government has neglected investments and has achieved a very bad result in the assessment of corruption.

Chile is an example of strict compliance with the fiscal rule, which has been in place for almost 20 years. Data on the last decade has proven a countercyclical character of fiscal policy. Chile is well-rated in case of revenue managing, for running of the sovereign foreign fund, low level of corruption and relatively high human capital development. However, the decline in commodity prices could also have affected Chile, whose gross capital formation has been declining since then, and Chile is also receiving a relatively poor assessment of the impact of mining on the environment.

Although Botswana did not have a positive outlook after its liberation, the government succeeded in gradual transformation the ownership of diamonds into a blessing. It has been shown that the government has faced significant fluctuations in diamond export earnings. The revenue from diamonds has been used for investments

(at the beginning of the survey period reached more than 40 % of GDP). Since 2010, investment has been decreasing, which should be further avoided. Botswana should focus on investing in human capital, with HDI ranked 101st in 2018.

It has been shown that the governments of all selected countries had to face the volatility of income from natural resources in the last decade. Those countries that have introduced a fiscal rule in time have been able to save the funds in advance that could have been used during the global economic crisis and then in the period of falling commodity prices. All countries surveyed have made progress in the structure of the economy, with the share of the service sector growing.

This study can be further extended by the analysis of other countries. This paper (as well as research by other authors) has diverged from the question of reducing the state influence on the extraction of natural resources. In the future, research should address the potential impacts of privatization of mining companies or the direct distribution of funds to citizens as they know the best how to use them for pursuing their own goals and welfare. In addition, the work of international organizations could be analyzed in light of the impacts and effectiveness of implementing the measures proposed by them.

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Appendix A

Table 5

Economic performance of selected countries

Country	1970-1979	1980-1989	1990-1999	2000-2009	2010-2018	Current GDP per capita (USD, 2017)
Nigeria	6.67	-1.16	2.25	7.64	4.01	1968.4
Mexico	2.48	0.17	0.49	0.02	1.67	8910.3
Chile	0.57	1.72	4.52	3.03	2.58	15346.4
Botswana	15.51	11.41	5.35	3.45	4.87	7595.6

Source: own calculations using data from World Bank [37], World Development Indicators (2019).

Appendix B

Table 6

Share of natural capital in export and GDP

Country	Trade value of natural resources	Total export	Share of resources in export	Nominal GDP (thousands USD)	Share of resources in GDP
Nigeria	42 701 824 925	44 466 366 757	96.03 %	375 745 487	11.36 %
Mexico	22 617 826 177	409 451 378 170	5.52 %	1 150 887 823	1.97 %
Chile	17 404 251 332	69 229 257 332	25.14 %	277 075 944	6.28 %
Botswana	5 249 997 694	5 898 102 750	89.01 %	17 406 566	30.16 %

Source: own calculations using data from UN Comtrade [8] and World Bank (2019) [37].

Appendix C

Table 7

Nigeria: Diversification of economy (value added in sectors as % of GDP)

Sector/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture	25.3	26.7	23.9	22.2	21.9	20.8	20.0	20.6	21.0	20.8
Industry	24.7	21.2	25.3	28.3	27.1	25.7	24.6	20.2	18.2	22.3
Manufacturing	8.2	7.8	6.6	7.2	7.7	8.9	9.6	9.4	8.7	8.7
Services	49.0	51.0	50.8	49.2	50.2	52.4	54.2	58.1	59.8	55.8

Source: World Bank [37], World Development Indicators (data for 2018 not available).

Appendix D

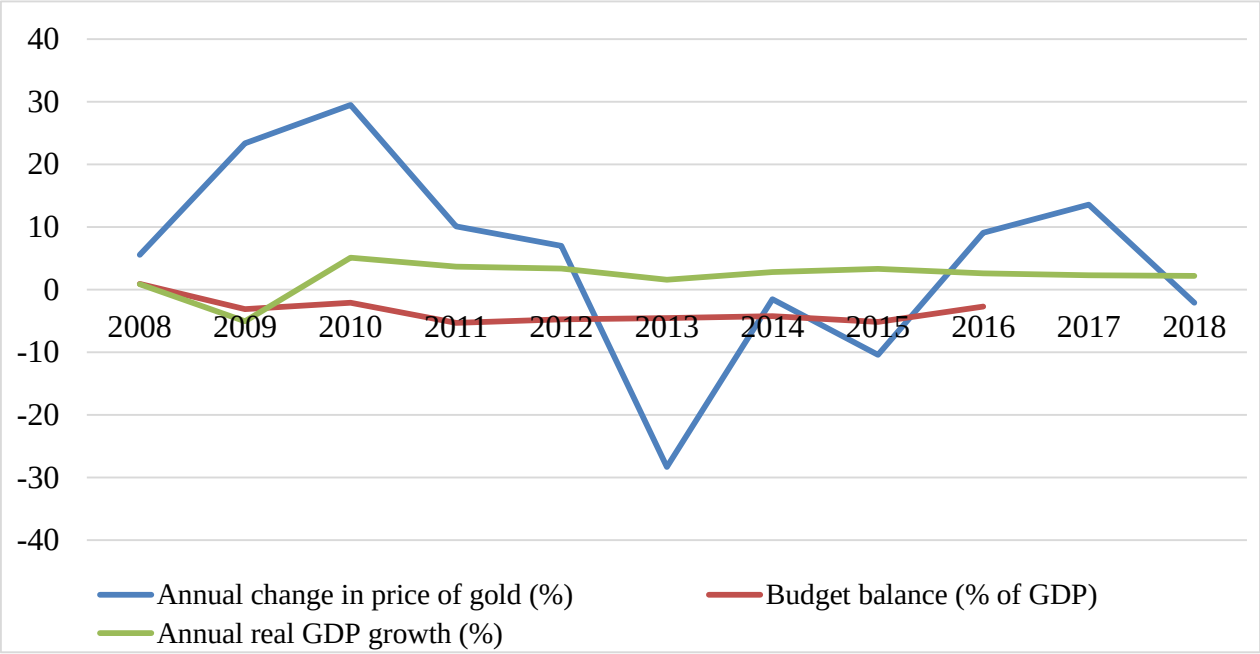

Fig. 9. Mexico: Response of the budget to the change in price of gold

Note: data on budget balance in 2017 and 2018 are not available on OECD.

Source: own construction using data on price of gold (Goldprice, 2019) [38] and budget balance (OECD, 2019) [32].

Appendix E

Table 8

Mexico: Diversification of economy (value added in sectors as % of GDP)

Sector/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.2	3.3	3.4
Industry	34.8	31.9	32.4	33.6	33.8	31.9	31.5	30.0	29.4	30.0
Manufacturing	15.8	15.1	15.6	15.4	16.3	15.8	15.9	17.1	16.9	17.2
Services	59.5	60.7	60.4	59.9	60.0	61.1	60.2	61.0	61.0	60.9

Source: World Bank [37], World Development Indicators.

Appendix F

Table 9

Chile: Diversification of economy (value added in sectors as % of GDP)

Sector/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture	3.7	3.7	3.6	3.7	3.3	3.4	3.9	3.8	4.0	3.8
Industry	34.2	34.4	35.7	34.7	32.5	31.2	30.8	29.7	28.9	30.0
Manufacturing	11.1	11.2	10.8	11.0	10.8	11.1	11.1	11.6	10.8	10.2
Services	53.6	54.0	52.8	53.5	55.6	56.9	56.7	57.9	58.5	57.6

Source: World Bank [37], World Development Indicators.

Appendix G

Table 10

Botswana: Diversification of economy (value added in sectors as % of GDP)

Sector/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture	2.5	2.8	2.5	2.5	2.7	2.3	2.1	2.2	2.0	2.0
Industry	36.5	28.2	31.9	35.0	29.7	31.5	33.1	30.0	32.1	30.3
Manufacturing	5.7	6.3	6.4	5.8	5.9	5.8	5.3	5.8	5.2	5.1
Services	50.9	57.5	55.3	52.5	57.2	56.6	55.7	57.9	56.7	58.4

Source: World Bank [37], World Development Indicators.

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