The Impact of Natural Resource Exploitation on Balanced Development with Modified Reproduction Scheme Based on Supply Chain Management

Yadulla Hasanli[1], Nazim Hajiyev[2], Fail Kazimov[3]

[1]*Scientific Research Institute of Economic Studies, Azerbaijan State University of Economics and Head of Laboratory of Modeling the socio-economic processes in Institute of Control Systems of ANAS, Baku, Azerbaijan, Istiglaliyyat str. 6, AZ1001*

[2]*Department of Economics and Business management in UNEC Business School in Azerbaijan State University of Economics, Baku, Azerbaijan, Istiglaliyyat str. 6, AZ1001, Visiting Scholar, Davis Center for Russian and Eurasian Studies, Harvard University (01.11.2017-31.08.2018), Boston, USA,*

[3]*Azerbaijan National Academy of Sciences, Institute of Economics*

***Abstract*- In the scientific work has been modified the impact of the exploitation of natural resources (non-renewable oil and gas reserves) on balanced economic development and been researched Karl Marx's production scheme. Marx's simple and extensive reproduction scheme based on supply chain management, rather I-capital sector was divided into 3 parts for physical, natural and human capitals, and at first, theoretically modified and analyzed added value from the exploitation of natural capital (oil and gas reserves). The literature review, results, and statistical figures of carried out necessary research have been substantiated. The result of analysis proved that the added value generated from the exploitation of oil and gas resources mainly in the consumer sector has created additional demand and as a result, have emerged the interdisciplinary demand and supply sequences. In the scientific work carried out analysis of the results obtained from the model of realization and are given specific directions and calculations of creating balanced development of revenues received from exploitation oil and gas resources.**

Key words: *Natural capital, supply chain management, human capital, oil and gas resources, supply chain.*

1. Introduction

In countries rich in natural resources increasing exploitation of natural resources shows that in incomes the share of the oil sector is very high. And it leads to one-sided (towards the oil sector) development direction of the economy, and this is regarded as a sign of "Dutch syndrome". Oil and gas resources are depleted natural resources and after its exhaustion the volume of production of the same sector of economy sharply falling. So accumulated physical capital and labor resources in the oil and gas sector becomes ineffective, therefore, employment levels of both capital and LFP are falling. As a result of exploitation of exploited natural resources in that sector increment rate of added value compared to other areas the main reason for being too high, in our opinion, not fully paid of income share of natural capital. This factor reduces exchange demand to intermediate productions and non-oil sector than oil sector (but, increases the demand for the final production), as a result the growth rate of non-oil sector is falling for regulation of market demand and supply. As a rule, in the oil sector the norm of added value being so high in comparison with non-oil sector is the reason of not returning its revenue share in natural wealth. It should be noted that reflecting the inter-industry relations of the economy unlike the "Input-output" model there is a balance of demand and supply of inter-industry in the reproduction model of Marx. In order to scientific substantiation of these provisions and estimation with concrete figures modified and investigated the issues of the reproduction scheme based on supply chain management by Marx.

2. Purpose of investigation

Our goal is carrying out the analysis in the reproduction scheme based on supply chain management by Marx in accordance to replacing I (natural resources) and II (non-natural resources) sectors and investigate the balance, value added and analysis of its distribution problems.
The study level of the problem of impact of richness of natural wealth on economic development and human capital. In the scientific literature has a wide range of

International Journal of Supply Chain Management
IJSCM, ISSN: 2050-7399 (Online), 2051-3771 (Print)

research on economic development problems in countries rich in natural resources. Especially in countries rich in oil and gas resources the "Dutch syndrome" has become a major research object. The richness of natural wealth created the problems in the economic development of country and concerns the "resources curse" problems. Thus, the level of economic growth is low in countries with rich natural resources. Investigation of this phenomenon, the richness of natural resources determined the negative impact in some directions of economic development. These problems are followings [20]:

- Dutch syndrome;
- Renaissance behavior and degradation of institutions;
- Political instability, decline of physical and human capital;

Most researchers believe that "resources curse" is the most important factor of deficit of human capital and its accumulation. The effect of this factor is estimated around 11-25% [19].

Contemporary researchers believe that human capital is the main driving force behind economic growth. For example, for production of any productions has invested in purchasing machinery and equipment, construction of buildings and facilities. Of course, over time, these buildings and structures, machinery and equipment are exposed to physical or moral wear and as a result production yield is falling down. As an example, we can show, when selling the car, the prosperity of this commodity completely goes to the buyer and time by time, its benefits going down. However, when the trainers receive their knowledge to the student the same knowledge does not disappear from the trainers and create additional effects. A higher level of education enhances knowledge and innovation, as well as the effects of scientific and technical progress too. According to many researchers, human capital development determines the quality of management institutions. In countries with high human capital, the level of democratic governance is growing, and it increases the inviolability of private property and its level of protection at the same time, reduces the corruption [1].

The phenomenon "resources curse" has recently been investigated in Russia, which is rich in natural resources. In [2] works, researched the impact of the richness of natural resources on human capital accumulation. A number of studies have shown that in countries with rich natural resources, tuition costs are lower compared to those in the same level of income. In other words, natural capital compresses human capital. Inadequate investment in human capital in countries rich in natural resources mainly due to the low demand for classification. This is due to the effect of the Dutch syndrome, as well as rent organic behavior. The increase in rent revenue leads to the development of the mining sector and non-commodity goods and services sector, including leads to reducing the processing and agricultural sectors where produced trade goods are. As a rule, growth of mining sector does not have sufficient demand for classification labor. Decreasing in processing and agricultural sectors leads to a decline in jobs with classification and higher education. If incomes of institutions realizing revenues' redistribution are more than incomes of production areas or entrepreneurial activity (for example, workers in the public sector), then workers prefer to work in government agencies. Because the public sector does not feel international competition. Thus, the public sector is less sensitive to the quality of human capital. Another reason is that rents in the areas that are protected from international competition create ineffective workplaces in accordance to "elite" policy. So, in the public sector, for example, the consumption requirements of the army and law enforcement agencies (food, clothing, etc.) are preferred goods and services that is produced by the local entrepreneurs. Here, low-level competition also reduces the demand for quality of labor resources. Because the entrepreneur knows that by increasing the state customs tariffs or with subsidies will protect even ineffective domestic.

High level of inequality is characteristic for the countries with dependency on natural resources, which also contributes to human capital. The social inequality in society reduces investment in human capital even in poor labor conditions, and there is more demand for higher education in the labor market.

It is known that exploitation and export of abundant natural resources creates abundance of foreign currency in the country, which increases the value of the national currency. Increasing the value of national currency and the depreciation of the foreign currency stimulates the imports. Strengthening the flow of cheap capital to the country creates stimulation for the capital-intensive modernization. In other words, cheap physical and financial capital lowers demand to labor and human capital.

The richness of natural wealth leads to the accumulation of less human capital in the country and a large number of studies have been devoted to this problem. However, there is no single conclusion in these studies [3], [4], [5], [6]. Even there is an idea that in developing countries, rich in natural resources we can find such countries that the level of human capital is higher. The numerous investigations with statistical figures of hypothesis "the abundance of natural resources is a waste of human capital accumulation" did not yield a single result. For example, [7], [8], [9], thought that the same relationship is negative, [10], though it is positive, but [11], [12] received mixed results. In the carried-out investigations by [13], [14] came to this conclusion that in developing countries and in countries rich in natural resources the human capital has a higher accumulation. However, the vast majority of carried out studies resulted with negative correlation between the richness of natural resources and human capital accumulation.

Let's note that by Prof. Y. Hasanli the result of research of CES production function of the economy of Azerbaijan showed that there is a shortage of existing physical capital being able to deal with qualified

workforce (human capital). Richness of natural resources, including hydrocarbon reserves and contradictions created by its exploitation (in particular the "Dutch Syndrome"), were devoted a number of works in the sample of Azerbaijan [15], [16], [18].

Modification of reproduction scheme based on supply chain management: Now on the basis of Marx's recycling scheme explore the relationship between natural resources and non-natural resources sectors. Let's note that, (I) section of the oil sector, (II) section of non-oil sector as a part of initial analysis of K. Marx's reproduction scheme has carried out the initial analysis on the base of hypothetical figures [21]. However, non-oil natural resources and human capital analysis were not included in this study. On the other hand, the modified Marx scheme was implemented with experimental figures rather than with real statistical figures. For simplicity of analysis, let's take the followings according to the conventional markings used by K. Marks:

I - sectors of physical, natural and human capital, in short, the capital sector;

II - sector of consumer goods production, in short, the consumer sector;

c_i'- costs of physical capital in I or II sectors (i = I, II);

c_i'' - costs of natural capital in I or II sectors (i = I, II);

c_i''' - costs of human capital in I or II sectors (i = I, II);

v_i - Wages fund in I or II sectors (i = I, II);

m_i - value of productions in I or II sectors (i = I, II);

p_i-volume of production in I or II sectors (i = I, II);

Thus, we can write a Mark's scheme between natural resources and non-natural resources sectors as follows:

$$\begin{cases} c_1(c_1' + c_1'' + c_1''') + v_1 + m_1 = p_1\text{: I} \\ c_2(c_2' + c_2'' + c_2''') + v_2 + m_2 = p_2\text{: II} \\ \mathbf{c}(c' + c'' + c''') + \text{v} + \text{m} = \text{p:} \end{cases} \quad (1)$$

(I) and (II) sectors, m_1 and m_2 sits the amount (cost) whose value is no longer paid (respectively, c_1'', c_1''' and c_2'', c_2''' not paid for the factors) for the role that natural and human capital plays in the production process.

In the simple reprocessing process, ie the production of the previous scale, the output of the sector (I) should be equal to the sum of the capitals of both sectors.

$$c_1(c_1' + c_1'' + c_1''') + c_2(c_2' + c_2''+c_2''') = p_1 \quad (2)$$

It means:

$$c_2(c_2' + c_2'' + c_2''') = v_1 + m_1 \quad (3)$$

In other words, a simple recycling process can take place when the sum of the cost of living in the sector (I) is equal to the total physical, natural and human capital payments in the II sector. Under the condition of K. Marks's extensive recycling process takes place:

$$c_1(c_1' + c_1''+c_1''') + c_2(c_2' + c_2''+c_2''') < p_1 \quad (4)$$

Or:

$$c_2(c_2' + c_2''+c_2''') < v_1+m_1 \quad (5)$$

However, (I) the newly created value of the sector (v_1+m_1) if is much higher from the fixed capital (c_2) of the sector (II) cannot afford the sector's exchange offer. As a result, there is a second sector debt owing to equilibrium in mutual exchange.

Thus, the equilibrium condition for large recycling production (I) should be smaller than the sector's recoverable capital (II). (I) the accumulation of variable capital in the sector (I) and (II) constitute the balance of demand for the sector's productions. This balance equals the fixed capital accumulation in the sector, which is part of the surplus value. (II) The relative value of the sector is smaller than this one, and of course it is impossible to do so without any borrowings.

(I) and (II) sectors for a balanced distribution of productions,

$$0 < (v_1+m_1) - c_2(c_2' + c_2'' + c_2''') < m_2 \quad (6)$$

Let's just figure 6,

$$0 < ((v_1 + m_1) - c_2(c_2' + c_2'' + c_2'''))$$

$*$ (I sektordadəyişən kapitalın yığımına gedən hissə) $< m_2$

Part of the variable capital accumulation in the sector (7)

Thus, (7) shows the large re-production and the balance (I) and (II) sectors' equilibrium conditions.

As it seems (7), it depends on the payment v_1, m_1, c_2 of inequality and (i) the amount of capital accumulated in the sector. These indicators (I) and (II) depend on the collecting norm in the sectors. So, the basic control parameter can be set as the setpoint (n) from the subtotal value. According to figures given in K. Mark's wide re-production scheme for balanced sharing of (I) and (II) units, in the section (I) of the rate of collection from the surplus value in the section (n_1) the change boundary is between 41.7 and 62.5%. If the collecting norm is taken as the controlling parameter (II) from the surplus value of the unit for (I) and (II) balanced sharing in the section (II), (Ii) the rate of accumulation at a surplus value in the section is between 0 and 100%.

The equation of functional dependence between the collections of both units is as follows:

$$1.6\, n_1 + n_2 = 1 \quad (8)$$

Bearing in mind that (1) the classification of "clean" areas in the classification of economic activity is associated with a number of difficulties. So, the types of economic activity in the classification Areas that are separated from the NAS and the Cost-Release tables are not "clean". But we should note that, in the K. Marks re-production scheme (I) and (II) sectors are organized from "clean" areas, it means, supply of production equipment of both sectors (to say according to current

NAS indicators, intermediate consumption goods except amortization costs), realizes through the (I) sector. In other words, the fixed capital repayment fund of both sectors (I) create demand to the productions of the (I) sector. Consumption goods productions of both sectors are implemented through the (II) sector. In other words, the demand for consumer goods is part of the wages and surplus of both sectors (Table 1) [17].

Table 1. Writing the Marx's extensive reproduction scheme based on supply chain management in the "input-output" model

Sectors		Payment fund (Intermediate consumption)			Accumulation fund (Collection of fixed assets)			Consumption fund (consumption costs)	Total
		I- production tools I- production sector	II- production of consumer goods	Total	I	II	Total		
		1	2	3	4	5	6	7	8
I- production means of production sector	1	4000	1500	5500	400	100	500		6000
II- production of consumer goods	2				100	50	150	2850	3000
Total	3	4000	1500	5500					
v-salary	4	1000	750					-1750	0
m- offset value	5	1000	750		-500	-150	-650	-1100	0
Total	6	6000	3000	9000	0	0	0	0	9000

Columns 1 and 2, which constitute the maturity fund of fixed capital, show intermediate consumption costs. In general, I and II columns, 1-2 lines are in accordance with the first Quadrant of the "Input-output" scheme, and all intermediate productions c1 and c2 are repayable. IV-V columns (collecting fund) and VII columns (consumption fund) corresponds to the second quadrant of the "Input-output" table and creates the composition of the final production. The final production is from the collecting fund and the consumer funds, in other words forms based on the (II) sector's total release. Crossing IV-V columns (salary and expense value) with I-II columns on the table shows the new created value (according to the cost of the MHS), corresponds with the III quadrant of the "Input-output" scheme. Negative signals in the VII columns shows the elements of distribution of newly created value. Therefore, 0 – in the last row and columns seems that there is not any deficits or profits. Taking into account the problems of separating sectors of "Clean" capital wealth (I) and non-capital wealth (II), we can write as following the (I) and (II) sectors, which appropriate with the K. Marx's scheme:

$$\begin{cases} c_{11} + c_{21} + v_1 + m_1 = P_1: \text{I} - \text{capital welfare sector} \\ c_{12} + c_{22} + v_2 + m_2 = P_2: \text{II} - \text{non} - \text{capital welfare sector} \\ c + v + m = P: \text{Total} \end{cases} \quad (9)$$

1. Capital rehabilitations; 2.non-capital rehabilitations; 3.total.

Here, $c_{11} + c_{21} = c_1$; $c_{12} + c_{22} = c_2$; $c_1 + c_2 = c$; $v_1 + v_2 = v$;

$m_1 + m_2 = m$; $P_1 + P_2 = P$

C_{11} – represents the capital rehabilitations receiving from I sector of itself;

C_{21} - represents the capital rehabilitations receiving of I sector from II sector;

C_{12} - represents the capital rehabilitations receiving of II sector from I sector;

C_{22} - represents the amount of capital wealth, which receives from the sector itself.

In order to write a condition for the exchange and equilibrium between I and II sectors, please accept the followings:

$h_1 = \frac{c_1}{v_1} = \frac{\Delta c_1}{\Delta v_1}$ - I is a relation of the capital in the sector;

$h_2 = \frac{c_2}{v_2} = \frac{\Delta c_2}{\Delta v_2}$ - II is a relation of the capital in the sector ;

Q_1 - Volume of I sector's products realization in the sector II;

Q_2- Volume of II sector's products realization in the sector II;

D_{21}- Volume of demand for non-capital welfare of sector I to sector II;

D_{12} - Volume of demand for non-capital welfare of sector II to sector II;

S_{12}- The scope of the offer of capital welfare of sector II to sector I;

S_{21} - The scope of the offer of non-capital welfare of sector II to sector I;

$\alpha_{1c} = \frac{c_{21}}{c_{11}} = \frac{\Delta c_{21}}{\Delta c_{11}}$ - is a relation of the fixed capital of the sector I;

$\alpha_{2c} = \frac{c_{22}}{c_{12}} = \frac{\Delta c_{22}}{\Delta c_{12}}$ - is a relation of the fixed capital of the sector II;

If we accept the change of the collecting norm (n_1) in the sector as the regulator of the system, exchange and balance terms of I and II sectors can be written as follows:

1. $n_1 = \frac{m_{1s}}{m_1}$; $m_{1s} = n_1 m_1$; $m_{1c} = (1 - n_1)m_1$; $m_1 = m_{1c} + m_{1s}$
2. $\Delta c_1 = \frac{h_1}{1+h_1} n_1 m_1$; $\alpha_{1c} = \frac{\Delta c_{21}}{\Delta c_{11}}$; $\Delta c_{11} + \Delta c_{21} = \Delta c_1$;

$$\Delta c_{11} = \frac{1}{1+\alpha_{1c}} \Delta c_1 = \frac{1}{1+\alpha_{1c}} * \frac{h_1}{1+h_1} n_1 m_1$$

$$\Delta c_{12} = \frac{\alpha_{1c}}{1+\alpha_{1c}} \Delta c_1 = \frac{\alpha_{1c}}{1+\alpha_{1c}} * \frac{h_1}{1+h_1} n_1 m_1$$

$$\Delta v_1 = \frac{1}{1+h_1} n_1 m_1$$

3. $Q_1 = c_{11} + \Delta c_{11} = c_{11} + \frac{1}{1+\alpha_{1c}} * \frac{h_1}{1+h_1} n_1 m_1$
4. $D_{21} = S_{12}$

3. Results and Analysis

The residual value of the I sector is estimated to be around $ 10 billion. It is clear from the scheme we show that returning the unpaid share of the natural capital to the revenues generated in the oil sector can be a prerequisite for balanced economic development. Reimbursement of the right of natural capital to the share of income could be equilibrium costs to natural environment and ecological protection. The fund of these sources should be the mining tax, land, ecological taxes and a part of profit tax from the oil sector. Here understands that the introduction of environmental taxes is a necessity in countries rich in natural resources. In the system of modern market relations, are included to natural social functions. The main reason for the efficient use of oil revenues in the economy needs to seek a socially-oriented market relationship.

The practical significance of the obtained result is that there determines the mechanism of the excess money that violates the balance of oil and gas resources exploitation and its specific volume. It should be noted that if increased the demand for intermediate productions of non-oil sector then the non-oil sector would increase its production, not imports. Therefore, for achieving efficient use of oil revenues, in other words for balanced development of oil, gas and non-oil and gas sectors there are two main directions:

1. Decrease the norm of value added in oil sector;
2. Increase the norm of value-added in non-oil sector;

Thus, as a result of exploitation of exhausted natural resources the main reason of being much higher of growth rate of value added in that sector than other areas are not full-payment of the share of natural capital. This factor reduces the demand for oil and gas sectors to non-oil-gas sector and as a result, the growth rate of the non-oil sector is declining, due to the equality of demand and supply.

From the scheme we show, it is clear that, in income from oil and gas sector the repatriation of unpaid share of natural capital can be a key condition for balanced economic development. Reimbursement of the right of natural capital to the share of income could be the protection of natural environment, ecological balance and expenditure on agriculture and human capital development. This is the source of expenses should be the mining tax, land, environmental taxes, and a part (more than the profit tax) of profits in the oil sector.

Reference

[1] Acemoglu, D., Johnson, S., Robinson, J.A., Yared, P. *"From Education to Democracy. American Economic Review",* Vol. 95, No 2, p. 44-49, 2005.

[2] Alexeev, M., Conrad R. *"The Elusive Curse of Oil Review of Economics and Statistics*", Vol. 9, No. 3. p. 599 – 616, 2009.

[3] Alexeev, M., Conrad, R. "*The Natural Resource Curse and Economic Transition*", Duke Sanford School of Public Policy Working Papers Series. SAN, pp. 09-04, 2009.

[4] Auty, R. *"Resource Abundance and Economic Development", Oxford: Oxford University Press,* Published to Oxford Scholarship Online, 2005. http://www.oxfordscholarship.com/view/10.1093/0199275785.001.0001/acprof-9780199275786

[5] Birdsall, N., Pinckney, T., Sabot, R. "*Natural Resources, Human Capital, and Growth*", Resource Abundance and Economic Growth, R. M. Auty (ed.). Oxford University Press, p. 57-75, 2001.

[6] Blanco, L., Grier, R. "*The (Non) Effect of Natural Resource Dependence on Human and Physical Capital in Latin America".* Vol. 37, No. 3, p. 281-295, 2010.

[7] Corden, W.M., Neary, J.P. *"Booming Sector and De-Industrialisation in a Small Open Economy*", The Economic Journal. Vol. 92, No. 368. P. 825-848, 1982.

[8] Davis, G. *"Learning to Love the Dutch Disease: Evidence from the Mineral Economies*", World development. Vol. 23, No. 10, p. 1765 -1779, 1995.

[9] Engerman, S., Sokoloff, K. *"Factor Endowments, Inequality and Paths of Development among New World",* NBER Working Paper, No. 9259, p. 55, 2002.

[10] Granberg, A.G. *"Modeling of socialist economy"*, M.Economika, p. 317-326, 1988.

[11] Guriev, S., Plekhanov, A., Sonin, K. *Economic mechanism of the raw material development model*, Issues of economics. No. 3. P. 4-23, 2010..

[12] Gylfason, T. *"Natural Resources, Education, and Economic Development*", European Economic Review. Vol. 45, No. 4-6, p. 847-859, 2001.

[13] Gylfason, T. "*Development and Growth in Mineral-Rich Countries*", CEPR Discussion Paper, No. 7031, p. 46, 2008.

[14] Hasanli Y.H. *"The evaluation of mutual substrution elasticity of capital and labourfactorsbyapplication CES functionforeconomy of Azerbaijan",* The jurnal of economicsciences: Theory and practice, Vol. 70, No. 1, p.77-96, 2013.

[15] Hasanli Y. *"The effectiveness of the impact of oil revenues on Azerbaijan economy (currency crisis: "destructive growth"*, "Dutch disease" and "Asian financial virus")", Materials of the International Conference on "In the Globalization Process the Caucasus and Central Asia", Caucasian University, Baku, p. 217-219, 2003.

[16] Hasanli, M.M. *"Calculation and analysis of the nominal and real effective exchange rate of manat"*, Application of information and communication technologies in science and education, materials of the international conference, 2nd book, Qafqaz University, Vol. 1-3, pp. 509-513, 2007.

[17] Hasanli, Y.H., Hasanov, F., Aliyeva, H. *"Competitiveness of commercial and non-commercial products in Azerbaijan. Ballass-Samuelson Effect",* Information and communication technologies in science and education, The International Conference Materials, 2nd Book, Caucasus University, Vol. 1-3, pp. 469-473, 2007.

[18] Hasanli, Y. *"Exchange rates and assessment of the exchange rate regime applied in Azerbaijan",* Looking at the World scientific-practical journal, No. 1, pp. 207-219, 2008.

[19] Hasanli, Y. *"Some issues of modeling of social and economic processes in Azerbaijan and the directions of rational use of oil revenues"*, "Himayyat" magazine, Baku, 2003.

[20] Hasanli, Y. *"Analysis of economic development of natural resources in rich countries"*, Scientific-practical magazine "Look at the world", No. 5, p. 152-164, 2007.

[21] Kalaitzi, D., Matopoulos, A., Bourlakis, M. and Tate, W. *"Supply chain strategies in an era of natural resource scarcity,"* International Journal of Operations & Production Management, Vol. 38, No. 3, pp. 784-809, 2018.