THE IMPACT OF KNOWLEDGE ON THE EXPORTS DIVERSIFICATION - A COMPARATIVE STUDY BETWEEN RENTIER COUNTRIES AND NON-RENTIER COUNTRIES OVER THE PERIOD 2008-2018

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ABSTRACT

The aim of this study is to analyze the knowledge impact on the exportations diversification by comparing two samples of the rentier and non-rentier states, and using the generalized moments method of Panel data. As a result, there is a significant impact of training and creativity in the two samples, the variables of education quality and transfer technology, throughout the foreign investments, have just impacted the rentier state's economy. Due to its advanced creativity, knowledge has more impact on the exportations diversification in the non-rentier states than in the rentier ones.

KEY WORDS

Export diversification, knowledge, rentier countries, non-rentier countries

JEL CLASSIFICATION : F16 ; F23; I21; O33; Q32.

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أثر المعرفة على تنويع الصادرات–دراسة مقارنة بين الدول الريعية وغير الريعية خلال الفترة 2008–2018

ملخص

تهدف الدراسة إلى تحليل أثر المعرفة على تنويع الصادرات من خلال المقارنة بين عينة من الدول الريعية وعينة من الدول غير الريعية خلال الفترة 2008-2018، وباستخدام طريقة العزوم المعممة لبيانات البانل. وقد تم التوصل لوجود أثر ذو دلالة معنوية لمتغير التدريب والإبداع في كلا العينتين، أما بالنسبة لمتغيري جودة نظام التعليم ونقل التكنولوجيا عبر الاستثمارات الأجنبية المباشرة فقد تبين أن لهما تأثير ذو دلالة معنوية في الدول الريعية وليس لهما تأثير ذو دلالة معنوية في الدول غير الريعية. وخلصت الدراسة إلى أن للمعرفة تأثير على تنويع الصادرات في الدول غير الريعية أفضل من الدول الريعية بفضل تفوقها بخصوص الإبداع.

كلمات مفتاحية

تنويع الصادرات، المعرفة، الدول الريعية، الدول غير الريعية.

تصنيف جال: F16-F23-I21-O33-Q32

L'IMPACT DU SAVOIR SUR LA DIVERSIFICATION DES EXPORTATIONS - UNE ETUDE COMPARATIVE ENTRE PAYS RENTIERS ET NON RENTIERS - SUR LA PERIODE 2008-2018

RÉSUMÉ

L'étude vise à analyser l'impact du savoir sur la diversification des exportations sur deux échantillons provenant des pays rentiers et non rentiers au cours de la période 2008-2018, en utilisant la méthode des moments généralisés des données du panel. Un effet significatif a été trouvé pour la variable de formation et de l'innovation dans les deux échantillons. Quant aux variables de la qualité du système d'éducation et de transfert de technologie par le biais des investissements directs étrangers, il a été constaté qu'elles avaient un effet significatif dans les pays rentiers et n'avaient pas d'effet significatif dans les pays non rentiers. L'étude a conclu que le savoir a un effet sur la diversification des exportations dans les pays non rentiers mieux que dans les pays rentiers grâce à sa supériorité en termes d'innovation.

MOTS CLÉS :

Diversification des exportations, savoirs, pays rentiers, pays non rentiers

JEL CLASSIFICATION:F16-F23-I21-O33-Q32

INTRODUCTION

Natural resources are a curse that the rentier countries suffer from, their only dependency on exporting the natural resources. (Sachs & Warner 2001). Those countries decided neither to follow this economic sector nor depend on exporting thir natural resources, as an alternative solution, they diversify sectors and resources. The natural resource price dependency makes the politicians of these countries deviate from the industrialization track, after having adopted it, to find arbitrary economic balance that's why the industrialization policy cannot succeed. During the price increasing period, the

diversification of the natural resources exportation is unsustainable because of the price shocks; their ups and downs. (Busch, 2011; Love 1986). It's undeniable that some countries, somehow, were able to diversify their economy such as Oman, Malaysia, Colombia, and New Zealand, however there are also unsuccessful countries like the North Africans and Sub-sahariannsones . (Roses 2019).

There are factors of success and failure that distinguish one country from another. Depending on Humphrey, Sachs and Stiglitz, in 2007, the investment is the way to overcome the failure. It's recommended to invest in the financial, human, exportation, agriculture and education sectors. The current study focuses on the knowledge variable in adopting a successful diversification policy that helps the promoted, prosperous economic sectors, during the prosperous periods, to maintain, and continue. There are requirements that must exist to diversify the economy. To study the knowledge impact in the diversification, the comparative method is adopted, sample of rentier and non-rentier countries are are taken into account .

The problematic of the study:

Does knowledge has different impacts on the exportation diversification in the rentier countries in comparison to the non-rentier ones?

Knowledge doesn't consist of only one component, but it is the accumulations of fundamental and university education, research and development etc. We try to analyze the impact of knowledge components on the exportations diversification.

1- LITERATURE REVIEW

There are four axes in this study; the first is about the discussion of the literature review, by explaining the definition of the economic diversification and knowledge, then exposing all the studies which are about the knowledge impact on the exportations diversification. The second is about the adopted method in the study, the third is about the results, and the fourth one is about the results analysis and discussion.

Is all that is taken into account related to diversification?

1.1- The economic diversification

The external trade's theories, in the conceptions of diversification, its indexes and importance are studied in this part.

1.1.1. Diversification in economic schools

The positive impact of growing exportation on the economic growth is confirmed (Balassa 1978). Exportation is a part of the gross domestic product GDP. Each theory has a different point of view about how to take advantage of it.

There are two types of theories explaining the reasons of the external trade and its mechanisms to take benefit of it, according to the international economy references. (Krugman, Obstfled, & Merlitz, 2018; Sawyer & Sprinkle, 2020). The first type is about the international specialisation, that is adopted by the classical theory which insists on the international specialisation of the relative distinction of Ricardo, the neoclassical theory (the production factors) adopts this idea also, and insists on the specialisation of the relative intensity of the production factors. It was developed by Samwilson to deal with the equality of the production factors outcome. Some conflicting points are found in these theories, as Lionitive said. This contradiction exists because of the existence of other production factors, not just the classical ones; labour and capital, such as the difference in the nature and components of work where there are skillful and unskillful workers. There's also an explanation of establishing the international trade depending on the technological gap (Posner, 1961).

The second type of theories, that is against the international specialisation idea, the intra-industry trade theory is followed in the international exchange where countries exchange the same products of the same industry, according to the indexes of the industries exchange. Simultaneously, being a producer and exporter country is possible, regardless of the production factors availability or their intensity, with gaining from the external trade. The most common style of the international trade is the sectors two-way trade. (Melitz & Trfler, 2012).

Countries that are relying on oil, minerals, and agricultural products, the extractive industries, are distinctive for the specialisation in production. These economies live the curse of resources due to the flourishment and prosperity when the prices are high and the recession, weakness and corruption when the prices are low . The income of one sector is used to cover the fees, and the loss of the other non-producing sectors.(Brooks& Heidjra, 1988). In order not to depend on one sector, they become exposed to the idea of the economic diversification.

1.1.2. The conception of the economic diversification

It's the transfer process of an economy from one source income to multi-source income of increasing set of sectors and markets (UNFCCC, 2020). The diversification contains policies that aim to minimize the dependency on one sector, or industry, such as oil, and decrease its contribution to GDP, the exportation revenues, and the governmental incomes. Establishing policies and strategies that rely on a dominant sector (by redistributing the available resources, for exploitation, rather on different sectors). Thus, the economic diversification is called the reconstruction of the available economic recourses.

In a fully functional economy, the resources transfer go from the dominant sector A to the others B, C, D, while in economies with less efficiency there is an exploitation of the unuseful resources to promote the other sectors B,C,D. The opportunity to expand the sector activities outside the country that means the incomes increasing, changing the employment level and the consumption attitudes, all of these happen in an open economy by adopting the changes towards the diversification. (Freire 2019).

Economic diversification is simply the redistribution of the resources on the other sectors that contribute to GDP, and leads to diversify the exportations. In this case, there are two types of diversification exportations:

1. Diversification of products,
2. Diversification of markets; geographic diversification.

They both can be adopted, throughout our study, we concentrate on the products diversification.

1.1.3. Indexes of the exportations diversification measurement.

There are three indexes of measuring the diversification (UNCTAD, 2019).

- The products number index

The exported products by the state and their data is exported by UNCTAD, in accordance to CTCI with three numbers.

- The concentration index

It's also know Herfindahl -Hirschmann, and is expressed by this equation:

$$H_j = \frac{\sqrt{\sum_{i=1}^{n}\left(\frac{x_{ij}}{X_j}\right)^2} - \sqrt{1/n}}{1 - \sqrt{1/n}}$$

H_j is Herfindahl -Hirschmann index, x_{ij} is the states j exportation rate of product i .

$X_j = \sum_{i=1}^{n} x_{ij}$ The total exportations over the world of the state j, n the verified exported products number total in SITC with three numbers. The index rate is between 0, 1. The concentration on small numbers of products, is shown when the index rate is close to (1), whereas being close to (0) means the participation of different products.

- The diversification index

This index is used to measure the exportations structure of a state, in comparison to the international structure of exportations; it is expressed in this equation:

$$S_j = \frac{\sum_i |h_{ij} - h_i|}{2}$$

*S_j The diversification index

*h_{ij} The product's i portion of the state's j exportations.

*h_i The product's i portion of the total international exportations.

The index rate is between 0-1, when it's close to (1) means there's concentration of exportations while getting close to (0) means the diversification of products. (UNCTAD, 2019).

1.1.4. The diversification importance:

The importance of diversification is about how to find new resources of income and expenditures; those minimize the dominant sector risks, low prices that can be lived because of the political conflicts, climate change, natural circumstances, and the emergence of relative products. For this reason, the economic diversification is a request to minimize the instability of the exportations. In accordance to that, the importance of diversification is to increase the economic growth, support and enhance the employment rates. In other points of view, this importance is not common. Depending on experimental proofs, the positive impact of the exportations diversification is confirmed, but not the linear impact. (Hesse, 2008).

There is an impact in two sides, the strongest one towards the economic growth, and the two internal variables are in relationship with the technological changes and the international trade. (Mau, 2016).

This impact is not linear in the emerging countries, with their benefit of the exportations diversification, not like the developed countries that work better with the exportations specialisation. (Vador, Carrere, & Strauss-Kha, 2011). The diversification is different between countries, low in the low-income countries that face difficulties to get the resources. (Lee, Zhang, 2019).

The two reaserchers confirmed that to realize economically stability, and achieve economic growth, the exportations must be positively influenced by diversification. In the set of low-income countries, the big countries and the poorest countries benefit of the diversification, in fact, there is a general approval of the positivity of exportations diversification to realize economic growth, and development in the emerging countries.

1.2- Knowledge

In the last three decades, knowledge has become one of the pioneers in economy. Its importance has led to the emergence of new conceptions; the human and intellectual capitals(Lucas, 1988)(Romer, 1990)(Barro & Lee, 1994). "Knowledge economy"is also important,it is based on human and intellectual capitals. .

1.2.1. Knowledg conception

There are several terms that are in overlap with this conception. From unmeaningful numbers, stats, and data by processing to information that must be organized and accumulated in order to become acquired knowledge. It's totally wrong to consider that knowledge is what stored in the individuals mind as long as it can be seen in their acts. That is why the intellectual knowledge is different from the operational one. After having added some accumulations to the individuals personalities, we get another type that is "the self-knowledge", in that way the conception of competence is formed. These conceptions have moved from the individual to the society, in passing through the human group, and his/her job establishment.

The knowledge importance is due to two features:

1. Undeplted resource
   it's increasing with its exploitation.
2. Its increasing leads to the revenues increase.

It’s different from the other resources, their income decrease, by using them, in relation to the income diminishing law.

1.2.2. The knowledge indexes:

The data bases of the International Bank, the International Economic Forum, UN trade and development organisation, the Economic Development and Collaboration Organisation, and EU have introduced a lot of indexs in relation to knowledge. One of the complex indexes, the International Bank index that is called the knowledge economy index "KEI", contains 109 variables of 146 states. It stands on four foundations:

1. The economic stimulus, and the organisational system,
2. Education,
3. Innovation,
4. The Information and Communication Technology,each one of them has secondary indexes. There is also another knowledge complex index that is named KEI, contains 38 variables which are divided into 4 foundations and mainly relying on creativity. As following:

- Creativity establishments,
- Creativity skills,
- Creativity system,
- The Information and Communication Technology Infrastructure.(Pospisil, Foiadelli, Anton, and Dorvak 2019).

1.2.3. The importance of knowledge

Many researches were about the knowledge impact on the growth averages, regardless of the economy nature; rentier or not. In this study, the researches results are shown in relation to the rentier economies. (Lucas 1988) (Romer 1990) (Barro & Lee 1994).

A study of the knowledge task is to achieve economically growth in the Latin American countries. As a result, there are two factors related to this role. They are :

1. The national ability of learning or innovation:

The weak investment in the human capital and the scientific infrastructure leads to the weak ability to innovate and to benefit of the external technological development.

2. The developmental policies are towards the manufacturing industries, instead of concentrating on the new technologies adoption with keeping the most exploiting sectors of resources. (Maloney, 2002).

The importance of the human capital, as an effective variable in realizing growth in the countries that rely on resources, has been demonstrated. For overcoming the negativity of the consequences of the resources curse, it's important to establish good interaction

between high level human capital, and the natural resources, such as the experiences of the Scandinavian countries that reached high averages of growth despite of their possession of natural resources. (Bravo & De Gregorio, J., 2003).

The relation between the usage of oil revenues and the expenditure on education, has been studied and a contrary relation has been found. In other words, when the expenditure rises up, the expenditure of education sector comes down. Obviously, the oil expenditures are distributed on other sectors. (Cockx & Francken, 2016).

1.3- Knowledge as a reason to diversify the exportations:

Knowing the factors that help to diversify, is the way to have the diversification advantages. One of these factors, is the customs duty reduction. Applying it from one side, assists the initiative country to benefit of the diversification, whereas the mutual reduction is helful for the country that has relative distinction concerning the wages. (Aditya & Achaeyya , 2015). The absence of diversification in the production structure of economy and the resources concentration have a negative impact on the exportations diversification. (Osakwe & Kilolo, 2018). There is a contrary relation between the oil exportations and diversification, after a study of 35 countries that rely on oil. (Alsharif, Bhattacharyya, & Intartaglia 2017).

There is an impact because of the accumulation of the human capital, minimizing the hurdles of trade, enhancing the enterprises quality, developing the financial sector, and education. (Giri, Quayyum, & Yin, 2019). The production structure has an impact on diversification and growth. In vertical relationship, the transferred technology, by the multi-national companies of the developed countries to the hosting ones has also an influence to the economic growth, though it doesn't transform the economic shape of the sustainable growth in the long term.. It forms the integration between the international rates series of countries to diversify exportations, and industries of their economies. (Maria & Rieber, 2019). Diversification is not possible because of the presence of several factors, such as flexible, low demand, lack of finance, bureaucracy, the

hurdles of markets entrance, insufficient infrastructure, and lack of skillful workers. (Sannassee, Seetanah, & Lamport, 2014).As hypothesis, imitation threatens diversification and new exportations exploration, the new exportations exploration increasing causes the revenues increase . The absence of new inventions stops the diversification because the concentration is on the imitation. It's undeniable that imitation is the reason of discovering new production costs, the foreign demand features and investments that meet that demand, and teaches the mandatory redesigning to follow the foreign safety instructions.Then, imitation is a tool to review the necessity of creativity. (Klinger & Lederman, 2006).

The part of creativity of the precedent study, is similar to the coming idea of this study that confirms the importance of exporting the high technological products, by this way the developed countries retain the increasing of their income and relative advantages in comparison to the southern countries. (Krugman, 1979)

2- METHODOLOGY

A presentation on data sources, the stages of selecting the two study samples, an explanation of the study variables, and the method of data processing represented by the generalized moments method (GMM) are all included in this axis.

1.2- Study and sample of population:

The study population was based on the countries of the United Nations Trade and Development Organization database; 224 countries. The variables, classified into into rentier and non-rentier countries, are the Hirschmann-Ferhendal diversification index and the ratio of exports of primary products to total exports. By using discrimination and classification methods, where we relied on the two-stage clustering method, we reached acceptable results.

After, we deleted some countries, using the database of the International Economic Forum to extract the study variables, with only 144 countries. Data about some countries were scarce, so were deleted.

With the data of 125 countries, 44of them are rentier countries and symolized with Rent, the rest of 81 countries are non-rentier countries and symbolized with N- Rent.For having convergence in the size of the two samples, at the end, the OECD countries were chosen, but Norway, Chile and Iceland were excepted because we considered them rentier countries according to the results of the classification stage.

2-2- The study variables

To study the knowledge impact on the exportations diversification that is symbolised DI, we chose the diversification variable of exportations, as follower variable. The explanatory variables of the exportations diversification are, as following:

1. GDP with fixed prices of 2010, with GDPCo symbol.
2. The variable of the prices record, fixed prices of 2010 were extracted from the UN Development and Collaboration Organisation. Its symbol CPI.

In terms of the variables related to knowledge, we relied on the data base of the International Economy Forum, from 2008 to 2018, five variables were chosen:

3. The quality of education, as a trainer of the human capital, is a complex index containing the education system quality in the different educational phases. Its symbol Qtyedu.
4. The rest represents:

The transfer of technology by the direct foreign investments, its short name FDItech.

5. Training, the training activities evaluation organised by the companies, its symbol Tra.
6. The creativity variable represents the creativity environment, is a complex index containing the companies' ability to search and develop, the availability of researchers, and the governmental expenditure. Its symbol INNG.
7. The partnership between research and business sectors variable, is shortly named "partnership", as a part of creativity indexes, its symbol Coll.

2.3- The study hypotheses

Just as a reminder before mentioning the hypotheses, the diversification index is good when arrives at "0", and bad by getting closer to "1".

H: Enhancing in knowledge leads to the diversification, this enhancement is better in non-rentier countries than in the rentier ones.

It's the same for the knowledge secondary indexes, the increasing, spreading, and acquisition of generated knowledge lead to a good index of the exportations diversification. Depending on the study variables, the derived hypotheses of H are, as following:

1. H_1, in the non-rentier countries, the educational quality index leads to better index of the exportations diversification than in the rentier ones.
2. H_2, the improvement of transferred technology, throughout the foreign direct investments, enhances the exportations diversification index in the non-rentier countries more than in the rentier ones.
3. H_3, the training index training enhances the exportations diversification index in the non-rentier countries more than in the rentier ones.
4. H_4, in the non-rentier countries the index of the exportations diversification is better than in the rentier ones, in case of improvement of the creativity environment.
5. H_5, the improvement of partnership between the business field and universities, ensuresa good index of the exportations diversification in the non-rentier countries more than in the rentier ones.

Statistically, the knowledge index leads to the exportations diversification, that means its regression coefficient is negative as long as the exportations diversification index decreases, the knowledge rate increases, and vice versa.

2.4 - The study model

Our study deals with a period of 11 years (from 2008 To 2018) , it focuses on the data analysis of two samples : 44 non-rentier countries; and 38 rentier countries. Then, there is the panel data, it shows the following :

N_1: 44, N_2: 38, Time series T: 11, these data are processed in depending on the statistical panel models, or the dynamic ones. Because the static models often suffer of the problem of cross-sectional dependent correlation, we rely on dynamic models. We deal with these data : N1>T and N2>T, thus the method that can be applied to these data is the generalized moments method GMM which allows the use of instrumental variables IV, taking the following general form:

$$y_{it} = \alpha_j y_{i,t-j} + x_{it}\beta_1 + w_{it}\beta_2 + v_i + \epsilon_{it}$$

$$\text{for} \quad i = \{1, \dots, N\} \quad t = \{1, \dots, T\}$$

α_j are p the regression parameters of the dependent variable hysteresis, y_{it}must be estimated,

$x_{it}$is the 1xk1 the external covariates ray,

$\beta_1$is the k1GDPCo of the parameters (planes) ray those must be estimated,

w_{it} is a 1xk2 ray of the predefined and internal covariates,

$\beta_2$is the k2GDPCo ray of the parameters that must be estimated,

$v_i$are the effects on the panel (which may be associated with covariates),

$\epsilon_{it}$are i.i.d stochastic errors. Over the entire sample with variance σ_ϵ^2.

(Pesaran, 2015), (Arellano) & Bond, 1991) (Arellano & Bover, 1995)

The unobservable Effects on Panel (state or stochastic) and the dependent variable hysteresis,as covariate, are included in the Dynamic Panel Data models. The unobservable Effects on Panel are related to the delayed dependent variable, in contracting, that makes the estimations incompatible. Therefore, GMM Generalized Moments Method was invented by (Arellano & Bond, 1991). It's one of the methods with three explanatory variables; Exogenous, Endogenous,

and predefined variables, these latter can be one of the precedents. The division of GMM is into two methods, according to the guide of (StataCorp, 2019), as following:

2.4.1. Difference GMM estimator

L derived from the one and two steps GMM estimations, with the use of the delayed moment's conditions, and the previous, predefined, and dependent variables were used as tools to their difference equation. (Arellano & Bond 1991) .The auto-regression is very constant or the ratio of the Panel level impact * to the stochastic error variance* very big.

2.4.2. System GMM estimator

Depending on Arellano & Bond work, a suggested system, by Blundell & Bond 1998, using the moment's conditions in which the delayed differences are used as tools of the difference equation. System GMM estimator is better than Difference GMM estimator, in terms of showing results. (Blundell & Bond 1998) and (Bond, Hoeffler, & Temple 2001).

3- THE STUDY RESULTS

The descriptive data of the variables, for the two samples with the differences analysis, is shown in form of Arithmetic mean, Standard deviation, then we analyse the correlation coefficients, the correlation rate, and the multiple correlation .

3.1-The descriptive data

In the chart, there are the arithmetic mean rate, and the total standard deviation of each variable of each sample of countries between and inside the groups (appendix 1).

The descriptive statistics of the non-rentier and rentier countries shows that the arithmetic mean of the diversification index of the rentier countries, is bigger than the index of the rentier countries. The rate of GDP, the transfer of technology and creativity indexes are very high in the non-rentier countries, in comparison to the rentier ones. These differences are substantial, not ostensible (appendix 2).

3.2- The correlation analysis

The correlation rates between the study variables are in the range of medium and weak in the non-rentier and rentier countries. A contrary relation between the technological and creativity transfer and GDP, the relation is positive between the prices record index and the diversification index in the rentier countries, whereas in the non-rentier countries the correlation is different for the technological transfer and the diversification index ; positive(appendix 3).

The dual correlation rates results show that there are different relations between the variables; strong; weak; contrary; and positive. In the non-rentier countries, the relation is positive between the diversification, and the education quality and the technology transfer. Creativity, training, and partnership are strongly related to each other. On the other hand, in the rentier countries, there is just one positive relation that is between the prices record index and the diversification index, the others are contrary.

3.3-The multiple correlation analysis

It's used to remove the strong related variables, their coefficients can be biased according to the variance inflation coefficient. From the chart, there is a very high variance inflation coefficient (VIF>10)of creativity, partnership, and training then they mustn't be appeared in a model.

Chart 1. The variance inflation coefficient

var	INNG	Coll	Tra	Qtyedu	FDItech	GDPCo	CPI
Rent	25,75	14,78	13,23	1,92	1,77	1,21	1,10
N.Rent	23,79	16,62	14,58	2,05	1,9	1,42	1,17

Source: Prepared by the researcher based on the STATA 16 program.

3.4- The study results of the rentier countries

The regression coefficients rates of the study variables, considerably the years are unreal variables, with the model acceptance standards

In the chart, numbers show that the three models are statistically acceptable. When the significant rate of "F" s lesser than 1%, the insignificant auto-correlation of the 2nd grade, is negative. Hansen

test is insignificant that means there is not the definition problem, the auto-variables, in the model, are external variables.

Concerning the model plans which are related to the model variables, we have the following:

Model 11: For the plans of GDP, the technology transfer by the direct investments, training, and the educational system quality variables were significant at the level of significance 5% (10% for the education system quality) with a negative sign. Their change of 1% leads to change in the diversification index with rates of 0.0129%, 0.0420%, 0.0405%, and 0.0036% towards the contrary direction. The prices record index was insignificant at 5%, or 10%.

Model 12: For the plans of GDP, the technology transfer by the direct investments, creativity, and the educational system quality variables were significant at the level of significance 5%, with a negative sign. Their change of 1% leads to change in the diversification index with rates of 0.0136%, 0.0295%, 0.0422%, and 0.0048% respectively. The prices record index plan was insignificant at 5%, or 10%.

Model 13: For the plans of GDP, the technology transfer by the direct investments, the partnership between the universities and the research centers, and the educational system quality variables were significant at the level of significance 5%, with a negative sign. Their change of 1% leads to change in the diversification index with rates of 0.0118%, 0.0365%, 0.0571%, and 0.0039%. The long term impact is separately calculated, after the model preparation and according to the equation:

$$\beta'_{xi} = \beta_{xi}/(1 - \alpha_j)$$

- ** Is the coefficient of the long term variable.
- ** Is the delayed dependent variable
- ** Is the independent variables coefficient

The results, as following:

Chart 2. The long term coefficient of the rentier countries.

	Model11		Mode12		Model13	
	coef.	p>z	coef.	p>z	coef.	p>z
GDPCo	-0,020	0,000	-0,0215	0,0000	-0,0187	0,0000
Qtyedu	-0,064	0,015	-0,0468	0,1130	-0,0579	0,0460
CPI	0,004	0,240	0,0046	0,2400	0,0061	0,1390
FDItech	-0,062	0,067	-0,0669	0,0390	-0,0906	0,0140
Tra	-0,005	0,028				
INNG			-0,0076	0,0310		
Coll					-0,0063	0,0230

Source: Prepared by the researcher based on the STATA 16 program.

Model 11: The results show that there's an impact of significance at 5% of the variables of GDP, the educational system quality, training, their change of 1% leads to change in the rate of the diversification index with rates of 0.020%, 0.064%, 0.005% towards the negative direction. The index of technology is insignificant at the level of significance of 5%, acceptable at 10%. Its change of 1% leads to a change in the diversification index with rate of 0.062% towards the negative direction, whereas the change in the prices record index, is insignificant.

Model 12: The significant impact of the long term was kept by GDP, the technology transfer, and creativity. Their change of 1% leads to a change in the diversification index with rates of respectively 0.0215%, 0.0669%, 0.0076%, towards the negative direction. The educational system quality doesn't have any more significant impact, and the prices record index variable doesn't have any impact.

Model 13: the model shows a significant impact on the long term for the variables of GDP, the educational system quality (different from the precedent model), the technological transfer, and the business and university relation. Their change of 1% leads to changes in the diversification with rates of 0.0187%, 0.0597%, 0.0906%, and 0.0063%, but the prices record index variable is insignificant. The years coefficients, the unreal inserted variables, are to measure the change of the delayed dependent variable L1.D1 from one year to another, the change is calculated, as following:

$$\beta_{yr} = (e^{\widehat{\beta}} - 1) * 100$$

β_{yr} Is the explanatory coefficient during the time, e is the constant natural foundation =2.71, $\hat{\beta}$the year coefficient as shown in the model. The application of the previous equation on the model results we got the rates, as following:

Chart 3. The explanatory of Time in the rentier countries.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Model11	3,97	4,34	3,56	3,61	3,92	4,13	5,26	5,21	5,21	4,48
Model12	4,04	4,41	3,40	3,47	3,87	4,11	5,22	5,15	5,18	4,37
Model13	3,78	4,49	3,47	3,29	3,79	4,04	5,09	4,95	4,89	3,93

Source: Prepared by the researcher based on the STATA 16 program.

With model 11, the rate 3.97 of 2009 means that the regression coefficient change of the diversification index in 2009, will increase more than in 2008, with rate of 3.97%, and significant rate less than 10%, for 2010 the diversification index coefficient will increase more than in 2009, with a rate of 4.34%, and so on.

3.5-The results of the non-rentier countries

The charts show the rates of the study variables regression coefficients with taking in consideration the years, as unreal variables, in addition to the model acceptance standards (appendix 5).

According to the chart number, the three models are statistically acceptable, the insignificant rate "F" is less than 1%, and because the 2nd grade auto-correlation is positive and insignificant, we relied on the calculation of the 3rd grade, negative auto-correlation. In addition, there is not the definition problem as long as Hansen test is negative. About the regression coefficients, the three models show that there is not any significant impact of education and technology transfer, the rest is, as following:

Model 21: For the GDP, and training planes are negative and significant at the significance level of 5%, the change of 1% in the two variables leads to change in the diversification with rates of 0.0271%, and 0.0082% towards the negative direction, but for the rate of the prices record variable coefficient was positive and significant at the level of 5%, that means change of 1% causes change of 0.1670 in the diversification index.

Model 22: GDP and creativity have positive significant impact, their change of 1% leads to the diversification change with rates of 0.0216%, and 0.0093% towards the negative direction. The prices record index has positive impact, 1% of change results 0.1418% change in the diversification.

Model23: the coefficients of GDP, and the relation between business and universities are negative and insignificant. Their change of 1% mean change in the diversification with rates of 0.0252%,and 0.0073% in the negative direction. Because the prices record index coefficient is positive and significant, then its change of 1% means change of 0.1940% in the diversification, in the same direction. The results of the long term are shown in the following chart:

Chart 04. The long term coefficients of the non-rentier countries.

	Model21		**Mode22**		**Model23**	
	Coef.	P>z	Coef.	P>z	Coef.	P>z
GDPCo	-0,0824	0.000	-0,0643	0,0000	-0,0679	0,0000
Qtyedu	0,0186	0,821	0,0918	0,2830	-0,0094	0,8950
CPI	0,5084	0,010	0,4222	0,0220	0,5228	0,0100
FDItech	-0,0438	0,768	-0,0280	0,8550	0,0157	0,9100
Tra	-0,0245	0,005				
INNG			-0,0278	0,0220		
Coll					-0,0196	0,0100

Source: Prepared by the researcher based on the STATA 16 program.

This chart shows the variables that don't have long term , significant impact and short term impact, with the variables significant impact that had impact before. Then, we find each model, as following:

Model 21: Change of 1% within GDP and training causes change in the diversification with rates of, respectively, 0.0824% and 0.0245%, towards the negative direction. The change of the prices record index with a rare of 1% leads to a change with rate of 0.5084% in the same direction.

Model 22: GDP and creativity with rate of %1 leads to change in the diversification index with rate of respectively, 0.0643% and 0.0278% but towards the negative direction, and the prices record

index change, with rate of 1, causes a change with rate of 0.4222% in the same direction.

Model 23: GDP, and creativity change with rate of 1% causes a change in the diversification index with rates of respectively, 0.0697%, and 0.0196%, but towards the negative direction. The change in the prices record index with rate of 1% leads to change with rate of 0.5228% in the same direction. The years coefficients, unreal, are shown in the chart (appendix 6).

From the chart, we find the regression coefficient change of the diversification index in 2009 gets back with rate 22.43% in comparison to 2008, and for 2010 the diversification index coefficient gets back with rate of 22.35% in comparison to 2009 and so on.

The last idea to discuss is related to the coefficients rates between the rentier and non-rentier countries; they vary greatly from each other, can we say the difference is substantial, or ostensible ?!. To answer the question, we rely on Hausman test, that helps us to compare between the two models coefficients. Based on zero hypothesis saying that the difference between the two models coefficients is unorganized, there is a model better that the other:

The alternative hypothesis saying the coefficients model of the rentier countries is weak in comparison to the non-rentier ones. It was confirmed in the test results.The rates were as follow: chi2:5295.49, chi2=16387.29 and chi2=3670.17 with significant grade prob>chi2=0.0000, that there is difference between the coefficients, and we confirm that we doing compare the two models, just emphasize the substantial difference between them.

4- THE RESULTS ANALYSIS

Results show that there is a contrary relation between GDP and the exportations diversification, in the two samples, the increasing GDP causes decreasing in the exportations diversification. This result reflects correct logic for the non-rentier countries, depending on the resources curse logic. This result is incompatible for the non-rentier countries. However, accepting the resources curse hitting the rentier countries, as a presupposition, is real fallacy. Some countries were

able to overcome this curse promote some sectors, such as Oman by using its incomes to develop other sectors, UAE by decreasing the hydrocarbon exportations and increasing the other exportations , and Norway, as an example to follow, they are all included in this study. (Busch, 2011; Love, 1986).

The coefficient of the prices record index is noticeably, in the rentier countries, insignificant and without impact at the significance level of 10%, then it is considerable that the demand is inflexible in relation to the study results, and the reason of the diversification decreasing in the rentier countries because of the demand inflexibility decreasing. The raw materials exportations has the big portion of the exportations, the rest, that can be derived substances of the raw materials, in contrast to the non-rentier countries, whose positive and significant coefficient showing the prices flexibility of the foreign demand for their exportations. (Sannassee et al 2014).

For the knowledge variables, the rentier countries rely on the educational system quality and the technology transfer to diversify their exportations, not like the non-rentier ones. This diversification is focused on the simple notions, and imitated products. With advantage to the non-rentier countries, they are both dependent on training, creativity, and partnership. The Southeastern Asian countries experience was an economic miracle because of increasing exportations of products, never exported before, by practical learning. (Lucas, 1988). Creativity, in better way, participates to diversify, in comparison to imitation by technology transfer, but it's recommended to not give imitation away until being able to rely on creativity. (Klinger & Lederman 2006). Another explanation, that is most likely, relies on the method the countries follow to diversify, there are differences between:

1. The quantity diversification (the most common one),
2. The quality diversification; the concentration on the products quality related to the economic structure change,
3. The diversification of the outputs nature depending on the materials change in the economic production, regardless of its structure. (Lashitew et al, 2020).

On the previous division, we say that the rentier countries rely on the first input diversification that is classic and which depends on the products availability, regardless of their quality, this kind of diversification needs simple knowledge provided by the basic technology of the multinational companies and the educational system outputs . In the non-rentier countries, diversification rely on the 2nd type of creativity and training, through which renewable knowledge is regenerated and ongoing structural changes occur in the distinctive technology products.For more explanation, we mention:

1. The direct foreign investments role to transfer knowledge; there are a lot of studies, in the literature review, confirming the investments role (Saggi, 2002), the knowledge nature poses questions, according to researches (Blomstrom & Sjoholm, 1999), the technological transfer throughout the foreign investments of the multinational companies, is an element of the knowledge level promotion, but its learning is not as it must be.
2. The technological gap (Posner, 1961).

In the study of Mariotti, Piscitello & Elia 2009 of the active companies in the local production system, there is a weak desire, from the multinational companies, to deal with the local companies and transfer knowledge because the external knowledge flow is bigger than the internal one, but they are ready to work with their opponents to establish a positive balance between the flows.

The companies that want to transfer knowledge, don't find it necessary, for reaching the maturity or getting back to the point, because they don't transfer the distinctive technology and will make the local companies imitate the transferred technology (the basic one). So, the multinational companies linger on transferring knowledge to the hosting countries.

According to the resources theory RBV, knowledge is devided into two types: Inclusive technology Outward technology.

Knowledge changes between them in the spiral theory. (Nonaka, Takeutchi & Ingham 2005). As a source of being competitive, inclusive knowledge transfer is a challenge for the two parts when outward

knowledge transfer is easy by training and reaching the researches, articles and books. Then, the companies will work to stop the others gaining knowledge, this unseamless transfer of knowledge is due to the knowledge isolation, and the strategies of forbidding its transfer applied by the multinational companies. (Peteraf, 1993). These notions has some features, as classified by Barney 1991, valuable, inimitable, seldom, and insubstituable. Open innovation, is a solution to this problem, instead of relying on the multinational companies technological transfer, the rentier countries companies have to develop and promote technology, by partnerships and strategic alliances with multinational companies in mutual research projects with the usage of their knowledge. It is a model in which the external and internal ideas, and channels are used for marketing, they work hard for developing their own technology. (Chesbrough), in Open Innovation there are three choices for the companies:

1. Marketing of ideas invented by other companies ,
2. By other external operators , their own ideas can be in the market,
3. Mutual research projects.

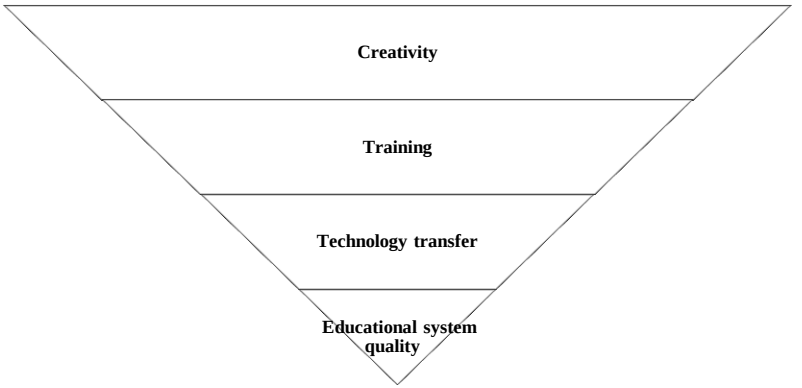
The first type makes the companies followers of technology inventors, the second is not preferred by the multinational companies, and the third that is dependent on the partnership between the two parts to realise projects, in which each company participate with its own knowledge, and resources for the projects success. The markets shares, the benefits division, and the patents registration are posed problem in Open Innovation. Despite of its problems, it's the method that many countries apply, such as France which works with the competitive poles policy, after the local production policy, by concentrating on the involvement of Start Up companies, small and midsize businesses, the research and development laboratories, universities, the multinational companies, and the regional and governmental institutions, to promote the mutual development and research projects.

Depending on the previous explanation, knowledge was introduced with five variables, whereas the educational system quality and technological transfer have significant impact on the diversification in

the rentier countries, and insignificant impact in the non-rentier ones, so hypotheses 01and 02 are not correct. The hypotheses 3, 4 and 5 are correct because training, creativity, and partnership have positive impact on the two samples diversification, with the advantage of the rentier countries, knowledge is better and helps to diversify the exportations. The refusal of H1, with which we accept that education quality doesn't have positive impact on the diversification, urges us to confirm that education is a component of the human capital that is a foundation of the intellectual capital, creativity and training are parts of its structure. Refusal of H2, technology transfer, is due to the harmony between the technology exporter countries and its recipients (technology importer countries).

The main hypothesis of the study, knowledge leads to better exportations diversification in the non-rentier countries than in the rentier countries, is correct because the measurements model of the non-rentier countries is better than that of the rentier ones. H4 and H5, related to creativity, are correct depending on the previous studies (Mania & Rieber, 2019), (Klinger & Lederman, 2006), imitation cripples the exportations diversification,and the new exportations discovery, the high technology products exportation, by creativity, is very important. (Krugman, 1979). Then, it's possible to design a form of the knowledge importance for diversifying exportations. An inversed pyramid, according to the knowledge component importance, is like, as following:

Diagram 01. The knowledge components importance of the exportations diversification.



Source: Prepared by the researcher

From the bottom to the top, the knowledge indexes importance gets high in achieving the exportations diversification; the educational system quality has the weakest impact, technology transfer, training, finally creativity. (Partnership between search laboratories and business sectors is a part of creativity). These four coefficients are neither contradictory, nor independent of each other; none of them can be put aside . Each element has a role; the lower one pushes the higher with ongoing improvement. It's possible to reach creativity without passing through technology transfer. They simultaneously occur in continuity, the generation that does development and research activities, was well-educated in the past. Knowledge transfer is done through generations, in the time dimension that is complementary to the place dimension; the direct foreign investments.

CONCLUSION

The study deals with the knowledge impact on the exportations diversification in the non-rentier and rentier countries, from 2008 to 2018. There are differences between the variables averages the exportations diversification, educational system quality, technology transfer, training, creativity, and the relation between business and

universities.These differences were positive for the non-rentier countries. Panel dynamic models show that the knowledge promotion causes the exportations diversification. Throughout our analysis, we notice that the non-rentier countries have depended on training and creativity, partnership between the universities and businesses, more than the rentier countries have done. For that reason, the non-rentier countries concentration is on the high level products exportation, diversify in quality, not like the rentier countries diversify in quantity.

These results allow us to give some recommendations:

1. Establishing mechanisms of attracting direct foreign investments for partnership with the local companies, in long term, that ensure knowledge transfer from the foreign operator to the local one.
2. Encouraging companies for ongoing training of workers and employees.
3. Promoting the creativity environment, by providing the researchers and improving the local companies' capacities to do more efforts to research and development.

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Appendix

Appendix 1. The descriptive data of the studyvariables

Variable		Rent		N.Rent	
		Mean	**Std.Err**	**Mean**	**Std.Err**
DI	overall	0,770	0,078	0,448	0,102
	between		0,074		0,101
	within		0,027		0,020
GDPCo	overall	132919,800	272381,800	1599316,000	2907025,000
	between		274248,000		2917909,000
	within		23174,870		355835,700
Qtyedu	overall	3,561	0,852	4,382	0,955
	between		0,796		0,938
	within		0,308		0,226
CPI	overall	115,410	21,637	107,740	11,921
	between		9,484		6,342
	within		19,493		10,164
FDITech	overall	4,320	0,683	5,007	0,504
	between		0,612		0,458
	within		0,305		0,222
Tra	overall	3,803	0,655	4,837	0,634
	between		0,597		0,619
	within		0,268		0,168
INNG	overall	3,100	0,585	4,324	0,822
	between		0,541		0,816
	within		0,219		0,160
Coll	overall	3,276	0,705	4,528	0,786
	between		0,614		0,753
	within		0,347		0,250

Source: Prepared by the researcher based on the STATA 16 program.

Appendix 2. The analysis of the descriptive data of the study variables.

Variables	Test	Levene's test on equal variances		T test for means equality		
		F	Sig.	t	ddl	Sig.
DI	equal variances assumption	27,918	,000	53,787	899	,000
	Unequal variance assumption			52,724	768,909	,000
GDPCo	equal variances assumption	181,487	,000	-11,042	899	,000
	Unequal variance assumption			-10,262	422,296	,000
Qtyedu	equal variances assumption	12,726	,000	-13,536	886	,000
	Unequal variance assumption			-13,442	839,600	,000
CPI	equal variances assumption	104,763	,000	6,498	872	,000
	Unequal variance assumption			6,685	672,461	,000
FDITech	equal variances assumption	50,588	,000	-16,869	886	,000
	Unequal variance assumption			-17,174	858,905	,000
Tra	equal variances assumption	3,923	,048	-23,849	886	,000
	Unequal variance assumption			-23,895	878,836	,000
INNG	equal variances assumption	137,997	,000	-25,786	886	,000
	Unequal variance assumption			-25,276	740,637	,000
Coll	equal variances assumption	18,203	,000	-25,026	886	,000
	Unequal variance assumption			-24,863	841,947	,000

Source: Prepared by the researcher based on the STATA 16 program.

Appendix 3. The correlation rates matrix

Country	Variables	DI	GDPCo	Qtyedu~s	CPI	FDITech	Tra	INNG	Coll
Rent	DI	1.0000							
	GDPCo	-0.3931	1.0000						
	Qtyedu	-0.3103	0.1214	1.0000					
	CPI	0.0271	0.0177	-0.0541[1]	1.0000				
	FDITech	-0.3632	0.0578[1]	0.6025	-0.1330	1.0000			
	Tra	-0.4113	0.2261	0.8141	-0.0008[1]	0.5925	1.0000		
	INNG	-0.3263	0.2505	0.8338	-0.0430[1]	0.5876	0.8770	1.0000	
	Uniindcoll	-0.3103	0.2651	0.7617	-0.0173[1]	0.5261	0.8097	0.9010	1.0000
N.Rent	DI	1.0000							
	GDPCo	-0,3867	1.0000						
	Qtyedu	0,0531[1]	0,0461[1]	1.0000					
	CPI	0,0659[1]	0,0347[1]	-0,2336	1.0000				
	FDITech	0,1628	-0,1127	0,3572	-0,2016	1.0000			
	Tra	-0,0858	0,1504	0,8241	-0,213	0,3361	1.0000		
	INNG	-0,1664	0,2951	0,8021	-0,1807	0,2007	0,9091	1.0000	
	Coll	-0,0774[1]	0,2372	0,7874	-0,1004	0,3378	0,8629	0,8884	1.0000

Source: Prepared by the researcher based on the STATA 16 program.

Appendix 4. GMM model of the rentier countries.

Variables	Model11		Mode12		Model13	
	Coef.	P>t	Coef.	P>t	Coef.	P>t
L1.DI	0,3445	0,0000	0,3686	0,0000	0,3696	0,0000
GDPCo	-0,0129	0,0010	-0,0136	0,0000	-0,0118	0,0010
Qtyedu	-0,0420	0,0130	-0,0295	0,0980	-0,0365	0,0350
CPI	0,0028	0,2670	0,0029	0,2630	0,0039	0,1650
FDItech	-0,0405	0,0480	-0,0422	0,0290	-0,0571	0,0100
Tra	-0,0036	0,0440				
INNG			-0,0048	0,0430		
Coll					-0,0039	0,0440
year						
2008	0,0000		0,0000		0,0000	
2009	0,0389	0,0750	0,0396	0,0560	0,0371	0,0600
2010	0,0425	0,0540	0,0431	0,0380	0,0439	0,0320
2011	0,0350	0,1100	0,0334	0,1020	0,0341	0,0880
2012	0,0354	0,1070	0,0341	0,1010	0,0324	0,1040
2013	0,0385	0,0760	0,0380	0,0610	0,0372	0,0570
2014	0,0404	0,0670	0,0403	0,0510	0,0396	0,0470
2015	0,0513	0,0210	0,0509	0,0150	0,0497	0,0140
2016	0,0508	0,0190	0,0502	0,0150	0,0483	0,0140
2017	0,0508	0,0170	0,0505	0,0120	0,0477	0,0130
2018	0,0438	0,0420	0,0427	0,0360	0,0386	0,0410
N/instruments = 41 N/groups = 44						
F(17, 44)	469.64		2451.44		1017.39	
Prob > F	0.000		0.000		0.000	
AR(1)	z = -3.33 Pr > z = 0.001		z = -3.49 Pr > z =0.000		z = -3.62 Pr > z = 0.000	
AR(2)	z = -0.09 Pr > z = 0.926		z = -0.06 Pr > z = 0.953		z = -0.11 Pr > z = 0.912	
Hansen p-value	Prob 0.340		Prob 0.219		Prob 0.256	

Source: Prepared by the researcher based on the STATA 16 program.

Appendix 5. GMM model of the non-rentier countries.

	Model21		**Mode22**		**Model23**	
DI	Coef.	P>t	Coef.	P>t	Coef.	P>t
L1.	0,6716	0,0000	0,6642	0,000	0,6289	0,0000
GDPCo	-0,0271	0,0000	-0,0216	0,002	-0,0252	0,0000
Qtyedu	0,0061	0,8210	0,0308	0,282	-0,0035	0,8950
CPI	0,1670	0,0010	0,1418	0,000	0,1940	0,0000
FDItech	-0,0144	0,7700	-0,0094	0,857	0,0058	0,9100
Tra	-0,0082	0,0020				
INNG			-0,0093	0,007		
Coll					-0,0073	0,0020
Year						
2008	0,0000		0,0000		0,0000	
2009	-0,2540	0,0400	-0,2607	0,0230	-0,3535	0,0030
2010	-0,2530	0,0410	-0,2580	0,0240	-0,3493	0,0040
2011	-0,2536	0,0420	-0,2585	0,0240	-0,3492	0,0040
2012	-0,2592	0,0390	-0,2620	0,0240	-0,3529	0,0040
2013	-0,2549	0,0430	-0,2592	0,0260	-0,3520	0,0040
2014	-0,2649	0,0360	-0,2692	0,0210	-0,3605	0,0030
2015	-0,2696	0,0320	-0,2720	0,0190	-0,3657	0,0030
2016	-0,2702	0,0320	-0,2729	0,0190	-0,3668	0,0030
2017	-0,2626	0,0380	-0,2656	0,0230	-0,3617	0,0030
2018	-0,2624	0,0390	-0,2659	0,0230	-0,3625	0,0030
N/instruments = 37 N/groups = 38						
F(17, 38)	1491,93				4496.22	
Prob > F	0.000				0.000	
AR(1)	z =-3.07 Pr > z = 0.002		z =-3.07 Pr > z = 0.002		z =-3.04 Pr > z = 0.002	
AR(2)	z = 1.74 Pr > z = 0.083		z =1.77 Pr > z = 0.077		z =1.73 Pr > z = 0.084	
AR(3)	z = -1.61 Pr > z = 0.108		z =-1.59 Pr > z = 0.112		z =-1.53 Pr > z = 0.126	
Hansen	Prob = 0.321		Prob = 0.223		Prob = 0.288	

Source: Prepared by the researcher based on the STATA 16 program.

Appendix 6. The explanatory time coefficient of the non-rentier countries

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Model21	-22,43	-22,35	-22,40	-22,84	-22,50	-23,27	-23,63	-23,68	-23,09	-23,08
Model22	-22,95	-22,74	-22,78	-23,05	-22,83	-23,60	-23,82	-23,88	-23,32	-23,35
Model23	-29,78	-29,48	-29,47	-29,74	-29,67	-30,27	-30,63	-30,70	-30,35	-30,41

Source: Prepared by the researcher based on the STATA 16 program.