

**Estimation and analysis of economic factors
affecting migration using multiple regression
analysis
(Case Study: Sudanese university professors in
Saudi Universities)
(The time period 2011 – 2016)**

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Abstract:

In this study, the regression model was estimated according to the economic factors affecting the migration of professors of Sudanese universities. The problem of the study was that the expelling migration of the scientific minds represented by university professors through the lack of tools for academic studies and scientific research and the lack of suitable job opportunities for scientific competencies and their scientific and professional level Which led to emigration to Saudi Arabia and was important in the importance of the migration of scientific minds themselves and identify the economic factors affecting the migration of professors, and aimed to know the economic reasons that push the Sudanese university professors to migrate and from The study results that the lack of appropriate employment opportunities for scientific competencies and professional Amstwahlm of the most important reasons that led to immigration by 75.6% and that the low level of income (lack of income) of the most factors cause For migration by 94.8% and that it was 73.9%. The migration of distinguished minds is a global phenomenon, not a case limited to the Sudanese university professors. The estimated model fits the data and

weakly complies with the data 14.8%. The study recommended continuing studies on the causes of migration of Sudanese university professors to Saudi Arabia .

Key words: Migration, multiple regression, variance analysis, scientific competencies.

INTRODUCTION :

Migration refers to the movement of people from one region to another, whether within the borders of the state, so-called internal migration, or the movement outside the borders of the state, which is called external migration. Immigration may lawfully be, or may be through a migrant leak to the intended state through illegal ways, such as the claim entry for the purpose of the visit and then continue to stay within the State in order to work ⁽¹⁾.

Internal migration is mainly from areas with low demand for employment to areas where employment opportunities are available or where there are better opportunities for living. Thus, the predominant pattern of internal migration is from rural to urban areas, and internal migration is driven by economic in the first class.

In the case of external migration, the motives may be economic, or may be scientifically motivated, the migration of Soviet scientists after the collapse of the Soviet Union as well as some immigrants from developing countries such as the migration of university professors. Therefore, this study focuses on explaining the analysis and interpretation of the economic factors that affect the migration of professors of Sudanese universities, which is the migration of scientific minds distinguished and low income and low standard of living and the lack of employment opportunities using the method of multiple regression and review the problem and the importance and objectives and assumptions of this study as follows:

THE STUDY PROBLEM:

The theory of attractions and expulsion factors is one of the most widely used theories in analyzing the reasons why individuals migrate. The theory simply states that people migrate because there are repugnant factors from their home country, or that there are attractive factors in the host region ⁽²⁾. Therefore, the study problem was as follows:

1. Lack of physical income led to the migration of university professors .
2. The low standard of living is one of the reasons for the migration of university professors.
3. Lack of tools for academic studies and lack of possibilities and tools of scientific research led to the migration of professors.
4. Lack of suitable job opportunities for scientific competencies and scientific and professional qualifications caused by the migration of university professors.

THE IMPORTANCE OF THE STUDY:

The importance of the study stems from the importance of the issue of brain drain itself, because it is the professors who have the responsibility to graduate present and future generations from universities in different disciplines. Therefore, it was necessary to study this subject in view of its great importance, ⁽³⁾ by identifying the economic factors affecting the migration of teachers and discovering the factors Which is significantly correlated with the outcome variable (migration) using multiple regression analysis technique and determining the most important factor between these factors and the importance of the results that will end the study.

OBJECTIVES OF THE STUDY:

1. Study of the economic factors affecting the migration of Sudanese university professors.
2. Identify important economic factors and how they affect migration.

3. Find out the economic reasons that push the university professor to migrate.
4. Create a multiple regression model.

STUDY HYPOTHESES:

The study hypotheses are:

1. Is there a statistically significant relationship between the economic factors and the migration of university professors?
2. Is there a significant effect of economic factors on the migration of university professors?
3. How accurate is the estimation of the multiple regression model of economic factors?

METHODOLOGY OF THE STUDY:

Data on the study were collected by means of the questionnaire along with the secondary sources, such as periodicals, government official statistics and others.

The study is based on descriptive analytical methodology for the purpose of producing results that contribute to the achievement of the research objectives .The analytical method uses some such correlation and multiple regression in order to know all the details related to these data.

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Model : The Moodle

In Applied Statistical Questions we interpret values Y By averages of other variables x_1, x_2, \dots, x_p . The relationship between the dependent variable Y And independent variables x_1, x_2, \dots, x_p Often represented in the view matrix observations As follows :

$$\begin{matrix} X_{11} & X_{21} & \dots & X_{q1} & Y_1 \\ X_{12} & X_{22} & \dots & X_{q2} & Y_2 \\ \cdot & \cdot & & \cdot & \cdot \\ \cdot & \cdot & & \cdot & \cdot \\ \cdot & \cdot & & \cdot & \cdot \\ X_{1n} & X_{2n} & \dots & X_{qn} & Y_n \end{matrix}$$

Each row is called an information point data point . And using n From the information points we see we want to establish a relationship between the dependent variable dependent And independent variables independent variables The relationship is often indicated as linear :

$$\begin{aligned} qX_q \dots \dots \dots (1) \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_q X_q &= Y_R \\ \dots \dots \dots (2) \sum_{j=1}^q \beta_j X_j + \beta_0 &= Y_R \end{aligned}$$

whereas $\beta_0, \beta_1, \dots, \beta_q$ Are constants called gradient parameters regression parameter Other names are regression coefficients Regression Coefficient And partial regression coefficients Partial Regression coefficient A linear relationship is a common or general choice for three reasons :

1. Easy to work with .
2. Often the approximation of the first order of the nonlinear relationship .
3. often used as an argument that there is no reason to assume that the relationship is nonlinear.

And we get the geometric shape of Y_R if it was $q = 1$ Represents a straight line . If they are $q = 2$ The Y_R It will be a surface in the space consisting of three coordinates Three-dimensional space And when they are Y_{x2} And for three or more independent variables Y_R he claims hyper plane (Hyperline).

Unfortunately Y_R Can not explain the data set form a line Line Or surface Plane Meaning that it is not calculated to deviate points from the line or surface .

This difficulty can be avoided by creating a random variable error limit error term In the form .

$$\dots\dots\dots (3) \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_q X_q + \epsilon_i$$

And any single value Y_i Explained by

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_q X_{qi} + \epsilon_i \quad (4)$$

If any point of data does not fall on the line or surface, there is no longer any problem, because we will blame or blame the differences $(Y_i - Y_{Ri})$ On ϵ_i .

In order to facilitate statistical analysis, we have made the following assumption about error : ϵ Distributed naturally in the center 0 And a standard deviation fixed σ (They are naturally distributed and symbolized $N(0, \sigma)$ ⁽⁵⁾ .

Estimating the parameters of the model :

Estimating The Parameter of model Cannot find (Y_R) Exactly, so as to our lack of knowledge of those values for ϵ Which occurred . Anyway we can appreciate (Y_R) As a pointer .

$$b_0 + b_1 X_1 + \dots + b_q X_q \dots\dots\dots (5) = Y \tilde{y}$$

We use Greek characters to denote the parameters to be estimated, and the English characters we use to denote the estimate, Van b_0 Is an estimate for β_0 . b_1 Is an estimate for β_1 And so on . These estimates are called regression coefficients for sample or partial regression coefficients of the sample .

Choose an appropriate function for the sample values for each unbiased linear estimation that has the smallest possible variations . Is the choice of font, surface or multiple surface which gives the smallest sum of squares of differences between real and estimated values (ie, differences between Y_i And $R_i \tilde{y}$).

Find estimates b_0, b_1, \dots, b_q Equal to the mathematical issue that is smaller minimize

$$\dots\dots\dots (6) \quad \sum_{j=1}^n e^2 = \sum_{j=1}^n (Y_i - \tilde{y}_{Ri})^2$$

The difference $R_i \tilde{y} - Y_i = e_i$ Called the rest Residual Which represents the differences between the observed value of the dependent variable and the estimated value by the linear relationship can be written

$$\sum_{j=1}^n [Y_i - (b_0 + b_1 X_{1i} + b_2 X_{2i} + \dots + b_q X_{qi})]^2 \dots (7) = \sum_{j=1}^n e^2$$

Note that the values of x_{ji} Values are constants as long as the issue is minimized minimize Quantity e_i Since these values represent the real values observed for the data we are studying when $q = 1$ A linear relationship can be found by trial and error trial and error So make sure that the value is lower for e_i^2 (5) .

Segmentation of squares : Partitioning Sum of Squares

The concept of lower squares does not mean that it equips us with a way of estimating the parameters of the presumed linear relationship, but it is the basis for many other tests and interpretations .

We can count the sum of squares of deviations as a measure of how much the variable differs from a given value, for example the sum of squares of deviations from the mean value of values Y The view is a measure of the amount of variance of the variable values adopted by the center its own mean We now want to know how much these deviations are and how much they are . By a successful linear relationship fitted Linear relationship If it is a large part of the differences Variation at Y Annotated by the form model .

$$\dots\dots\dots (8) \sum_{j=1}^n (Y_i - \hat{y}_{Ri})^2 = \sum_{j=1}^n (\hat{y}_{Ri} - \bar{y})^2 + \sum_{j=1}^n (Y_i - \bar{y})^2$$

The limit $(Y_i - \bar{y})^2$ It is a measure of the changes of the adopted variable . The difference is attributed to two reasons : - For the deviations of the linear relationship from the middle $(\bar{y} - \hat{y}_{Ri})^2$, And to attend the residences Residuals $(Y_i - \hat{y}_{Ri})^2$ Total squares of residues or unexplained variation by \hat{y}_{Ri} .

(Sum of squares around the mean = Sum of squares due to regression + Sum of squares around the regression)

Table of variance analysis and mean squares :

Analysis of Variance Table And Mean Squares

The degrees of freedom indicate the number of independent parts of the information including the dependent variable that we need to rank the sum of squares .

$(Y_i - \bar{y})^2$ to her (n-1) Of degrees of freedom . This result can be obtained or justified by one function per Y_i , s Or meaning y Were used to calculate the sum of squares, so only one degree of freedom was lost . This logical justification is practical to find the degrees of freedom to the sum of the squares around the regression in $(\hat{y}_{Ri} - Y_i)^2$ Function \hat{y}_{Ri} Fully determined by m Of values to b_0 , b_1 ,

..., b_q This means that the total will be lost m Of degrees of freedom which degrees of freedom are $(n - m)$. To find the degrees of freedom of the total squares of the slope we will follow some of the twisted paths, noting that the degrees of freedom on the left must equal the degrees of freedom on the right .

$$n - 1 = \text{degrees of freedom for } (\hat{y}_{Ri} - \bar{y})^2 + n - m$$

In order to solve the equation, we will find the total squares of the regression Sum of square due to regression Her degrees of freedom . The sum of squares and their degrees of freedom can be summed up by a table traditionally called the variance analysis table Analysis of variance table ⁽⁵⁾ , ⁽⁶⁾ .

Analysis of variance

Source of variation	Sum of squares	Degrees of freedom	Mean square
Due to regression	$\sum(\hat{y}_{Ri} - \bar{y})^2$	$m - 1$	$\frac{\sum(\hat{y}_{Ri} - \bar{y})^2}{m - 1}$
About regression	$\sum (Y_i - \hat{y}_{Ri})^2$	$n - m$	$\frac{\sum(Y_i - \hat{y}_{Ri})^2}{n - m}$
Total sum of squares	$\sum (Y_i - \bar{y})^2$	$n - 1$	$\frac{\sum(Y_i - \bar{y})^2}{n - 1}$

The average squares are calculated by dividing the number of squares by the number of degrees of freedom associated with that total, and the average of the three squares are statistics statistics Are of high value since any of them can be used to estimate σ^2 Which is the opposite of sin ⁽⁶⁾ . ⁽⁷⁾ .

Analysis, interpretation and discussion of results :

Economic factors were analyzed on the migration of Sudanese university students using the statistical program spss These factors are represented in the following :

- X_1 : Brain drain .
- X_2 : Lack of job opportunities .
- X_3 : Low income level
- X_4 : Low standard of living
- X_5 : Lack of tools academy

X_6 : The global capitalist system

The results of the analysis were as follows:

The Chi- Square test was used to test the null hypothesis, which states that there is no statistically significant relationship between the economic factors and the migration of Sudanese university professors against the alternative hypothesis. There is a statistically significant relationship between economic factors and the migration of Sudanese university professors, (Sig) Below the moral level 0.05 We reject the null hypothesis and accept the alternative hypothesis as follows:

Table (1) Chi- Square test

	Economic factors					
	X_1	X_2	X_3	X_4	X_5	X_6
The value of the Chi-Square	71.043	82.174	127.539	100.696	38.913	37.652
Degree of freedom	4	4	4	4	3	4
Values Sig	0.000	0.000	0.000	0.000	0.000	0.000

Source: The Researcher By SPSS

From Table (1) we find that all the values of the Chi- Square test are significant and significant because they are values Sig Below the level of morale 0.05 for all economic factors so we reject the hypothesis of nothingness and accept the alternative hypothesis, and this means that there is a significant statistical relationship between the economic factors and the migration of professors of Sudanese universities .

Table (2)

What are the reasons Which Your payment Migration to me The kingdom Arabic Saudi

the reasons	Frequency	percent
Economic	104	90.4
Others	11	9.6
Total	115	100.0

Source: The Researcher By SPSS

Table (2) shows that the reason for the migration of Sudanese university professors to the Kingdom of Saudi Arabia is an economic factor by 90.4% while only 9.6% for other factors. See the chart of columns shown in figure (1).

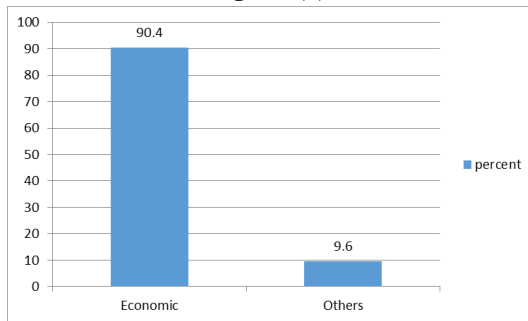


Figure (1) Reasons of A migration to The kingdom Arabic Saudi

Table (3) Experience And reasons of Migration

			reasons of Migration to The Arabic Saudi		Total
			Economical	Others	
Number Years Experience Universities Sudanese	Less than 5	the number	44	5	49
		Experience %	89.8%	10.2%	
	5And Less than10	the number	25	3	28
		Experience %	89.3%	10.7%	100%
	10And Less than15	The number	22	2	24
		Experience %	91.7%	8.3%	100%
	More than 15	the number	13	1	14
		Experience %	92.9%	7.1%	100%
	Total	the number	104	11	115
		Experience %	90.4%	9.6%	100%

Source: the researcher By spss

From During the table 3 We note that 92.9% of the years of experience in Sudanese universities more than 15 years see the reasons for the migration of Sudanese university professors to The kingdom Arabic Saudi Arabia is the economic reasons, while only 7.1% believe that it is another, and that 91.7% of the years of experience in Sudanese universities ranging between 10 and 15 years, they said that the reasons for the migration of Sudanese university professors to The kingdom Arabic Saudi Arabia is economic, while 8.3% said it is.

In view of the graphs shown in Figure (2), we find that the majority of respondents with years of experience in Sudanese universities between 10 and 15 years, and more than 15 years. More

common when economic reasons. This shows that the economic factors affected the migration of Sudanese university professors to The kingdom Arabic Saudi Arabia .

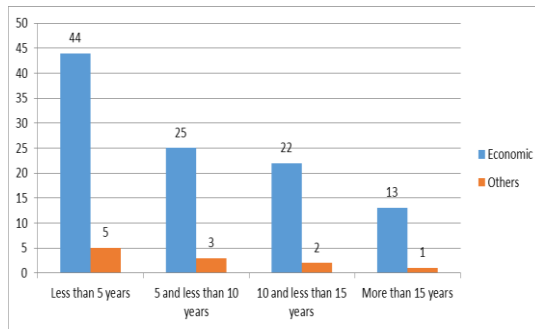


Figure (2) Experience and reasons of Migration

Table (4) migration Minds Distinguished From Countries The original to me Countries The Diaspora phenomenon International And not status compartment On Masters Universities Sudanese Just

the answer	frequency	percent
strongly agree	30	26.1
agree	55	47.8
neutral	7	6.1
disagree	16	13.9
strongly disagree	7	6.1
Total	115	100.0

Source: The Researcher By SPSS

Table (4) shows that 47.8% of the respondents agree that migration Minds Distinguished From Countries The original to me Countries The Diaspora phenomenon International And not status compartment On Masters Universities Sudanese Just 26.1 % strongly agree while 6.1% are neutral, 13.9% disagree, and 6.1% strongly disagree. These percentages are lower than those approved and strongly approved.

We conclude by 73.9% that the economic factor is migration Minds Distinctive **phenomenon International And not status compartment On Masters Universities Sudanese** . See graph shown in figure (3).

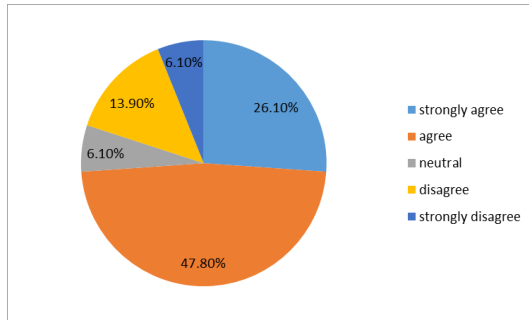


Figure 3: Brain drain

Table (5) Brain drain reasons Scientific studies Migration

the answer	frequency	percent
strongly agree	58	50.4
agree	29	25.2
neutral	7	6.1
disagree	16	13.9
strongly disagree	5	4.3
Total	115	100.0

Source: The Researcher By SPSS

Table (5) shows that 50.4% of the sample strongly agree the reasons Which Paid Competencies Scientific studies Migration From Sudan Non Availability Opportunities the work Occasion for them And to their level Scientific research Vocational and 25.2% agree that while 6.1% neutral, 13.9% disagree, 4.3% disagree strongly. The total of these percentages is lower than those strongly approved and approved.

We conclude by 75.6% that the economic factor is not Availability Opportunities the work Suitable for competencies Scientific studies Scientific research And professional reasons of migration from Sudan. See the graph in figure 4).

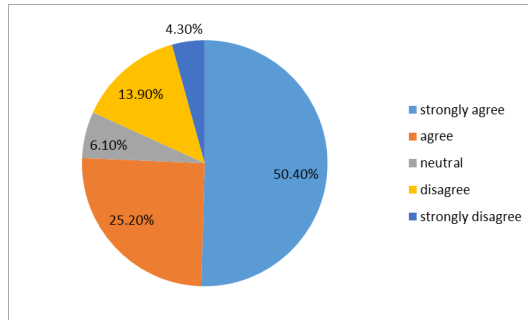


Figure (4) No Availability Opportunities the work

Table(6) Decrease level Income High Rates Inflation at Opposite Height level Income at Saudi

the answer	frequency	percent
strongly agree	77	67
agree	32	27.8
neutral	4	3.5
disagree	0	0
strongly disagree	2	1.7
Total	115	100.0

Source: The Researcher By SPSS

Table (6) shows that 67.0% of the sample strongly agree with a decrease level Income High Rates Inflation at Opposite Height level Income at Saudi Arabia and 27.8% agree while only 3.4% are neutral, only 1.7% strongly disagree. The total of these percentages is lower than those strongly approved and approved.

We conclude by 94.8% that the economic factor is decreasing level Income in Sudan versus its rise in Saudi Arabia is one reason for the migration of Sudanese university professors. See graph shown in figure (5).

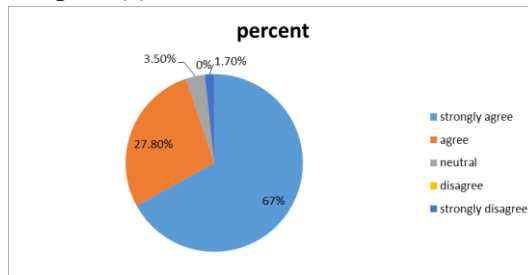


Figure (5) decreases level Income

Table (7) Low level the living at Sudan

the answer	frequency	percent
strongly agree	54	47.0
agree	44	38.3
neutral	8	7.0
disagree	6	5.2
strongly disagree	3	2.6
Total	115	100.0

Source: The Researcher By SPSS

In Table (7), 47.0% of the sample strongly agree that it is low level the living at Sudan , at Opposite Providing Life Good at Saudi 38.3% agree while 7.0% are neutral, 5.2% disagree, and 2.6% strongly disagree. The total of these percentages is lower than those strongly approved and approved.

And conclude by 85.3% factor that the low level of economy 's the living at Sudan Is the reason for the migration of Sudanese university professors to me The kingdomArabic Saudi Arabia . See graph shown in figure (6).

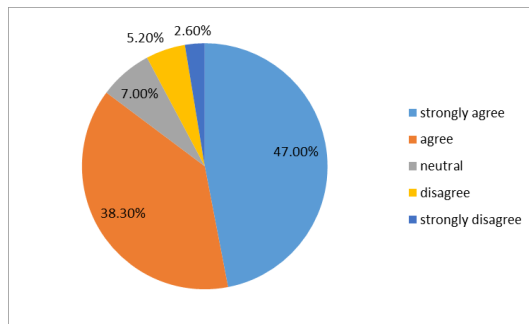


Figure (6) is low level the living

Table (8) Shortfall Clear at Tools Studies academy at Sudan

the answer	frequency	percent
strongly agree	52	45.2
agree	36	31.3
neutral	19	16.5
disagree	8	7.0
strongly disagree	0	0.0
Total	115	100.0

Source: The Researcher By SPSS

From Table (8), 45.2% of the research sample strongly agree that it led Shortfall Clear at Tools Studies academy at Sudan For researchers to me Frustration Scientific research And professional Because Non Availability Potential And tools search Scientific research 31.3% agree while only 16.5% are neutral, only 7.0% disagree. The total of these percentages is lower than those strongly approved and approved.

We conclude by 76.5% that the economic factor is a lack of **tools Studies academy And scientific research in Sudan** is a reason for the migration of Sudanese university professors .

See graph (Figure7).

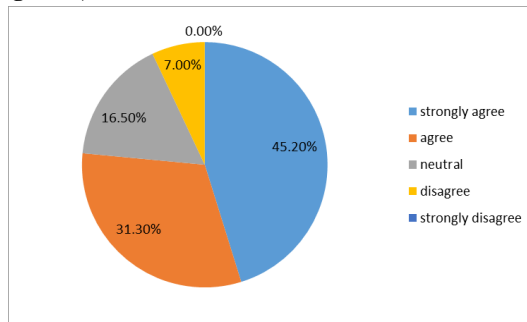


Figure (7) Lack The Tools academy

Table (9) Link Saudi Center the system VC Global

the answer	frequency	percent
strongly agree	27	23.5
agree	43	37.4
neutral	23	20
disagree	20	17.4
strongly disagree	2	1.7
Total	115	100.0

Source: the researcher By spss

Table (9) shows that 23.5% of the sample strongly agree that the correlation Saudi Center the system VC Global Which Led to me Development at the field Academic And research Scientific research And became Attractive and 37.4% disagree, while 20.0% neutral, 17.4% disagree, 1.7% strongly disagreed. The total of these percentages is lower than those strongly approved and approved.

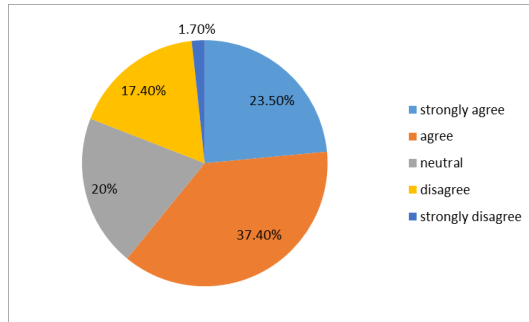


Figure (8) System VC Global

Table (10) Test of Chi-Square

the test	the value	Degree of freedom	Significances.
Chi-Square	17.661	9	0.039
Number of cases	115		

Source: the researcher By spss

Table (10) shows that the value of significance Sig. Which is 0.039 less than the level of morale 0.05 and therefore reject the hypothesis of nothingness and accept the alternative hypothesis , and from the table we find that the value of the test box Ka is 4.949 and this value has significant significance, which indicates that the economic factors have a significant impact on the migration of Sudanese university professors .

And Llt n burden this effect , the researcher estimates the multiple regression model of economic variables (independent) , which has four levels and strongly OK , OK , neutral and is OK so there will be three independent variables number (j-1) Where j The number of levels is encoded by 0 and 1 and the group that takes 0 at all levels is called the comparison group as in the following table :

the level	X ₁	X ₂	X ₃	X ₄
Agree	0	0	0	0
Strongly Agree	1	0	0	0
neutral	0	1	0	0
Disagree	0	0	1	0
Strongly Disagree	0	0	0	1

Numbers of the researcher

The dependent variable (migration) is the number of years of migration. The estimated model is as follows :

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \dots \dots \dots \dots (9)$$

Where :

Y : Years A for Migration

X₁ : Number of Years Experience Universities Sudanese

X₂ Factors : Economic development (Strongly agree)

X₃ : Factors Economic development (Neutral)

X₄ : Factors Economic development (disagree), where the factors are Economic development (agree) is the comparison group .

Table (11) Summary of the Multiple Regression Model of Economic Factors

Sample	R value	R ² value
1	0.385	0.148

Source: The Researcher By SPSS

Table (11) shows that the value of the coefficient of selection R² Which equals 0.148 . This means that 14.8% of the changes in the dependent variable result (migration) are caused by the independent variables explained (the influencing variables). This indicates that the model weakens the data . And that the suitability of the model to the data look at the value F In the variance analysis table .

Table (12) Analysis of variance

Sources of variation	Total squares	Degree of freedom Df	Average boxes	Values F	Values Sig.
Regression	365.548	4	91.387	4.773	0.001
Residual	2106.226	110	19.148		
Total	2471.774	114			

Source: The Researcher By SPSS

Through Table (12) we find that value F Significant because the value of Sig (0.001) less than the moral level (0.05) . This means that the model fits the data .

Table (13) Transactions Economic Factors Model

sample	Variable coefficients		T values	Values Sig.
	β	Standard error		
constant	7.944	.832	9.548	0.000
X 1	-0.2 82	.083	-3.374	0.001
X 2	2.108	.875	2.410	0. 018
X 3	2.921	1.493	1. 180	0.053
X 4	-0.128	4.416	-0.029	0.977

Source: The Researcher By SPSS

And compensation of transactions β of Table (13) in Equation (9)
 We get the following form :

$$Y = 7.944 - 0.282X_1 + 2.108X_2 + 2.921X_3 - 0.128X_4 \dots \dots \dots (10)$$

That value -0.282 Means that when the number of years of migration increases in years, the number of years of experience for the Sudanese universities professor will be reduced by headquarters 0.28 With the stability of the remaining independent variables. And that the statistics t This value has significant significance and this means that the variable can be predicted X_1 .

And that the value of the coefficient of the second variable is 2.108 The difference between Agree strongly indicates that economic factors have a significant effect on emigration Masters Universities Sudanese and statistical t This value has significant significance and this means that the variable can be predicted X_2 If the person is strongly agreeable compared with that it is OK. And the value of the third variable coefficient 2.921 The difference is that neutral people agree that economic factors have a significant effect on emigration Masters Universities Sudanese Statistical t This value has significant significance and this indicates that the variable X_3 Predictable, for the fourth variable X_4 , We compared the group of people who disagree with the group of people who agree with that value -0.128 This comparison represents any discrepancy between disagreeing and agreeing that economic factors have a significant effect on migration Masters Universities Sudanese and this difference is negative and means less answer than OK to disagree

and the statistics t This value is not significant and this means that the variable can not be predicted X_4 That is, it does not contribute to the predictive power of the model.

Conclusions and recommendations

Economic factors affect migration Masters Universities Sudanese relationship with migration.

That low level Income in Sudan compared with its rise in Saudi Arabia is one of the reasons for the migration of Sudanese university professors by 94.8%.

Lack of job opportunities in scientific competencies and their professional level led to the migration of Sudanese university professors by 75.6%.

That lack of **tools Studies academy And scientific research in Sudan** is one of the reasons for the migration of Sudanese university professors by 76.5%.

Recommendations:

Conduct continuous studies on the causes of migration of university professors

Raising wages and salaries for scientific competencies

Attention to graduate studies and scientific research.

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