Czech
Journal of Multidisciplinary Innovations
Volume 11, November, 2022. ISSN (E): 2788-0389
Website: www.peerianjournal.com Email: editor@peerianjournal.com

Measuring the effect of happiness on GDP in Iraq for the period (1990-2019)

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Abstract
Happiness is a goal that everyone wants to achieve, as the researchers believe it is possible to calculate happiness in Iraqi society through three variables (human capital, economic well-being, and technological progress) Where the variables were described in a way that may be the first according to our knowledge, and after that the relationship between the variables and the gross domestic product **(GDP)** , was measured as an indicator of economic activity in Iraq ,And it turns out that the model is meaningful in the sense that the variables represent happiness in Iraq, as well as the existence of joint Cointegration between the variables in the long term.

Key words
1-Happiness 2- Human Capital 3- Economic Well-Being 4- technological progress

Introduction
Its considered human capital component, technological progress and economic well-being are among the most important elements that can contribute to achieving happiness for individuals and society, as education contributes to the accumulation of human capital, and theories of economic growth indicate that technological progress increases the rate of long-term economic growth, and technological progress increases. Quickly when the work force is better educated, from here the accumulation of human capital helps in technological progress and is a source of sustainable growth and happiness for individuals and society**(Streeten , 1994 , 233)**

That the relationship between happiness and economic growth can be calculated in light of the behavioral school propositions **(Blaug , 1976 ,315)**

As individuals who are educated and have a high income can be happy, as well as societies in which the national income is high and the level of education is low, they are societies that achieve a high score in the well-being index and then happiness, and that is a reason for achieving sustainable growth . The researchers believe that happiness focuses on well-being through average

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Journal of Multidisciplinary Innovations
Volume 11, November, 2022. ISSN (E): 2788-0389
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income and the Gini coefficient on the one hand, and education through human capital and technological progress on the other hand, and both factors contribute to achieving it jointly.

Purpose of the study : The research seeks to demonstrate the nature of the relationship between happiness, represented by economic well-being, in terms of average per capita income, Gini coefficient, human capital, and technological progress in Iraq.

The importance of studying

The research gains its importance from the importance of happiness, which has taken over a large part of the interest of economic researchers, where the skills and competence of the human element, in addition to technological progress, play a fundamental role in achieving happiness, because the lack of happiness represents a clear imbalance in the structure of society, which is negatively reflected in the achievement of development. Economic**.**

The study Problem : Huge financial resources flow annually into the Iraqi economy. These resources were supposed to contribute to the accumulation of human capital, technological advancement, and economic prosperity ,And then the latter enhances economic development. Hence, the study problem is the following question :

1- Is there a reciprocal relationship between economic welfare and human capital in the Iraqi economy?

2-Is there a correlation between economic welfare and technological progress ?

3-Is there a reciprocal relationship between economic prosperity and gross domestic product ?

The hypothesis of the study

The study attempts to test the following hypotheses

The first: that human capital will cause happiness

The second: that technological progress will cause happiness

The third: that economic well-being will cause happiness

The concept of human capital

In many development literature, the interest in economics and human capital can be traced back to the early writings of Adam Smith and Alfred Marshall at the end of the 18th century, However, this interest has gained intense momentum since the beginning of the sixties of the twentieth century **(Papalia , 2004 , 9)**

As Simon Kuznets explained that nearly 90% of the economic growth achieved by industrialized countries during the 1950s was mainly due to improving human capabilities, knowledge and organization, which led to the distinction between quantitative and qualitative aspects and talk about human capital and investment. In the human resource.

Thus the concept of human capital appeared as an integral part of economic growth strategies, and in this he (Heodore Schultz) says that human capital has grown in Western societies at a faster rate than traditional capital, and that this growth was one of the most important features that characterized the economic system in Schultz concluded that his basic idea of human capital led

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him to the idea of investing in human capital, meaning investing in their education, health, training, and development of their organizational and managerial skills **(Schultz , 1961 , 51)**

Technological Improvement

The theory of economic growth has witnessed a tremendous development, by a group of economists with different orientations and ideologies, starting from the classical school represented by Adam Smith, Ricardo and Malthus, followed by some other bold attempts, in which mathematical models were used on a large scale and the first of these models were presented by each From Ramsey (1928)) and Young (1928)) and (Schumpeter (1943)) as well as (Harold (1939)) and Dommar (1947) In light of the criticisms directed, especially the last two models, a more analytical model appeared, presented by the Neoclassical researcher Robert Solow, whose aim was to search for the reasons for the differences between countries in the degree of wealth and poverty **(Solow , 1988 , 45)**

However, the reality is otherwise, as many developing countries have not achieved the required development, and technical development is not a gift from heaven, as Solow claims. The modern theory of growth provides us with the analytical framework for internal growth, which is determined by the system that governs the production process and not by forces outside the production system **.(Peters, 2001 ,9)**

That the internal growth model was found to deal with the problem in the neoclassical growth model, i.e. the problem of diminishing marginal productivity of capital and then diminishing economic growth, and in order to avoid this problem, the model assumes the abolition of the hypothesis of diminishing marginal productivity, i.e. that (a = 1), and the production function adopted in the model takes The following simple linear figure **(Houghton ,2000 , 2)**

$$\mathbf{NI} = \boldsymbol{TK} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (\mathbf{1})$$

As equation (1) shows that the national income (NI) depends on (T) technological progress as an internal variable, in addition to the physical and human capital expressed in (C) So (C) as in equation (2) consists of two parts: the first is human capital, which is (Ht), and the second part represents fixed physical capital (kt).

$$\mathbf{K} = \boldsymbol{f}(\boldsymbol{Ht}\,, \boldsymbol{kt}\,) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (\mathbf{2})$$

According to the model, (Ht) represents the total human capital included in the production of commodities, which is the human capital per capita (ht) multiplied by the number of workers who have education in different stages (Lt) as in equation (3)

$$\mathbf{Ht} = \boldsymbol{ht}\,.\,\boldsymbol{Lt} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

That the human capital of the individual (ht) is formed after any individual allocates a certain time (S) for the purpose of study or training to acquire skill and experience, and that this training and qualification will lead to a certain material return (r), that is, that the human capital of the individual grows at an exponential rate. Fixed as in the equation (4)

$$\boldsymbol{ht} = \boldsymbol{e}^{\boldsymbol{r}\,.\boldsymbol{s}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (\mathbf{4})$$

Based on one of the previous studies, which obtained the material return at a rate of (4.8%), and that the quality and quality of the qualification depends on the time allocated to education as

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an average in Iraq is (4.5) years, for the same year in which the rate of return on education was calculated as previously, according to the study that was conducted And (Lt) is the educated labor force in Iraq, as in equation (5) **(Corsi , 2010 , 2)**

$$\mathbf{Lt} = f(St + Wt + Ct + Ut) \dots\dots\dots\dots\dots\dots\dots\dots (5)$$

Whereas

(**St**): represents those with secondary education from (15) or more

(Wt): represents those with vocational education from (15) or more

(Ct): Represented those with education in institutes from (18) or more

(Ut): represents those with a university education (primary and higher studies) from (18) or more

.

Data were obtained from (statistical totals) issued by the Ministry of Planning and Development Cooperation in various numbers during the years of study (1990-2019) . As for (Ct), it represents physical capital (fixed capital formation), and it was also obtained from (statistical totals) issued by the Ministry of Planning and Development Cooperation in various numbers during the years of study (1990-2019) . Equation (6) represents technological progress as an endogenous variable

$$\mathbf{T} = \frac{NI}{C} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

Table (1) represents the outcome of the mathematical operations of the previous equations

Table (1) GDP, physical and human capital, and technological progress in Iraq for the years (1990-2019) million dinars

T=GDP/K*	C*=Kt+Ht	Ht =ht * Lt	er * sht =	Lt	Kt	GDP	السنوات
4.794	7545.275	1325.275	1.0218	1297	6220	36197.7	1990
9.0233	3609.948	1309.948	1.0218	1282	2300	32566.9	1991
4.0818	12116.77	1334.471	1.0218	1306	10782.3	49459.2	1992
7.0558	17631.96	1371.256	1.0218	1342	16260.7	124479.1	1993
12.434	49397.26	1352.863	1.0218	1324	48044.4	616198.4	1994
16.588	117239	1371.256	1.0218	1342	115867.7	1940994	1995
45.137	49163.21	1416.215	1.0218	1386	47747	2219295	1996
73.712	45626.8	1443.803	1.0218	1413	44183	3363572	1997
27.115	174296.6	1412.128	1.0218	1382	172884.5	4731483	1998
27.024	236993.1	1445.847	1.0218	1415	235547.3	6411433	1999
13.982	540782.2	1460.152	1.0218	1429	539322	7523807	2000
16.302	2532924	1482.632	1.0218	1451	2531441	41314569	2001
18.638	2200638	1561.31	1.0218	1528	2199077	41022927	2002
15.082	1968997	1484.675	1.0218	1453	1967512	29585789	2003
16.771	2858128	320.8452	1.0218	314	2857807	47958546	2004
0.9991	10184490	2128.409	1.0218	2083	10182362	10182364	2005
0.9981	16913177	2022.142	1.0218	1979	16911155	16911157	2006
0.9936	7532397	1992.51	1.0218	1950	7530404	7530406	2007

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0.9912	23242577	2038.491	1.0218	1995	23240539	23240541	2008
0.9956	14952394	2151.911	1.0218	2106	14950242	14950244	2009
0.9915	26255013	2235.698	1.0218	2188	26252777	26252779	2010
0.9994	37257489	2220.371	1.0218	2173	37255269	37255272	2011
0.9936	35448444	2266.352	1.0218	2218	35446178	35446181	2012
0.1052	38580055	2242.851	1.0218	2195	38577812	3859996	2013
0.5306	37014250	2254.602	1.0218	2206.5	37011995	19653088	2014
0.5389	37075060	2246.044	1.0218	2198.15	37072814	19653088	2015
0.675	35271718	2244.32	1.0218	2196.48	35269474	23686734	2016
0.697	32731818	2248.322	1.0218	2200.34	32729570	22594673	2017
0.739	31782882	2214.896	1.0218	2167.62	31780667	22659259	2018
0.645	32257357	2238.396	1.0218	2190.64	32255119	21649368	2019

Source

-GDP, Kt, Lt: Ministry of Planning and Development Cooperation, Annual Statistical Abstract, - Central Statistical Organization, various years

- ht, Ht, K *, A: calculated by the researchers

Measuring happiness in Iraq

Happiness is an ancient idea whose origins extend to a number of roots of knowledge and it refers to the satisfaction that results through economic dealings. The term happiness includes many things, including personal comfort, contentment, contentment and loveBut these qualitative variables are difficult to measure and convert into quantitative variables, so the researchers believe that depending on the definition of the United Nations Development Program and the Human Development Report, happiness can be dependent on average per capita income, level of education (human capital) and technological progress. On the **Kakwani** index, and Table (2) shows economic well-being based on the Gini coefficient and the average per capita income during the research period.

Calculation of luxury according to (**Kakwani**) Standard

(**Kakawni**) provided an explanation and calculation of the level of economic well-being through the form below.**(C.Kakwani , 1980 , 80)**

$$WS = M(1 - G) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 7$$

Whereas : **(Dervis , 1982 , 427)**

(**WS**) represents the level of well-being and has three possibilities

First: That the value of WS is less than **500** is a low level

Second: The value of WS should be between **500** and **800**, which is an average level

The third: that the value of WS is more than **800**, which is a high level

M : represents the average per capita income during the study period

G : represents the **Gini** coefficient and has a value of **(1> G> 0)**

Table (2) shows the Gini coefficient, average per capita income and economic well-being in Iraq during the period (1990-2019)

Economic well-being	Average Income	Gini coefficient	year

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477	763.5	0 .374	1990
190	313.2	0 .391	1991
233	395.3	0 .409	1992
336	589.8	0 .429	1993
303	556.4	0 .454	1994
231	446.5	0 .481	1995
313	638.9	0 .509	1996
483	1047.8	0 .539	1997
631	1371.8	0 .540	1998
731	1626.2	0 .550	1999
702	1633.3	0 .570	2000
652	1552.5	0 .580	2001
546	1334	0 .590	2002
544	891	0 .389	2003
797	1351.2	0 .410	2004
806	1390	0 .420	2005
906	1484.4	0 .389	2006
1029	1450	0 .290	2007
839	1731.2	0 .515	2008
683	1427.5	0 .521	2009
807	1706.6	0 .527	2010
953	2041.4	0 .533	2011
593	1398.6	0.576	2012
324.9	750.4	0.567	2013
263.6	635.2	0.585	2014
257	634.2	0.594	2015
327	824.1	0.603	2016
489	1290.7	0.621	2017
588	1423.7	0.587	2018
619	1458.8	0.576	2019

The table was prepared by the researcher, depending on:

1-Data of the Ministry of Planning for various years

2-Statistical group for different years

Building a model of happiness in Iraq and measuring its reliability

After describing the variables of the happiness model in the Iraqi economy consisting of quantitative indicators represented in (human capital, technological progress and economic well-being)

In general, the literature of the behavioral economic school related to the concept of happiness did not provide a justification regarding the selection of a specific group of indicators of happiness However, most of the various theoretical and applied studies related to the study of the subject

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included some macroeconomic variables that the researchers expect to represent happiness, as the proposed variables are human capital Technological progress, and economic well-being. The growth in this case will be expressed by a dependent variable represented in the gross domestic product (GDP) and the aforementioned variables are independent explanatory variables during the period (1990-2019)

The happiness function can be expressed by the following formula:

$$GDPt = f(WSt, Ht\ , T) \dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

Where the variables denote :

GDPt: growth in gross domestic product dependent variable

WSt : economic well-being is an independent variable

Ht: human capital is an independent variable

Tt: technological progress is an independent variable.

The mathematical construction assumes that happiness consists of the three explanatory variables mentioned above. The study model used takes the following form **(Charemza , 1992 , 18)**

$$GDP_t = B_0 + B_1 WS_t + B_2 H_t + + B_3 T_t + \varepsilon_t \dots\dots\dots\dots (9)$$

In order to obtain a standard model of happiness in Iraq, we used a time series of (29) observations spanning from (1990) to the year (2019), and below we will analyze the variables according to standard statistical tests with a focus on the significance of the model

Analysis of simple correlation coefficients between indicators

In order to enrich the study and arrive at indicators that can be adopted to measure happiness, time series will be used , And analyze the simple correlation coefficient between the model variables and find out the degree of correlation for each variable with another variable Assuming the rest of the other factors are fixed, so that variables can be arranged according to the degree of correlation. **(Yule , 2015 , 64)**

As the results of (Correlation) came as in Table (3), the highest degree of correlation for the variable of economic well-being was (41%), followed by technological progress by (22%) and human capital by (3%). This is in addition to the correlation between the indicators among them. It gives great importance and is an indication of the researcher that the model has achieved the desired goal.

Table (3) shows the simple correlation coefficient between the dependent variable and the independent variable in Iraq

	GDP	H	T	WS
GDP	1.000000	0.139786	-0.225202	0.419146
H	0.139786	1.000000	-0.517390	0.152565
T	-0.225202	-0.517390	1.000000	-0.138150
WS	0.419146	0.152565	-0.138150	1.000000

The table was prepared by the researchers based on the results of the E-Views 9 statistical program

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Volume 11, November, 2022. ISSN (E): 2788-0389
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United Root Tests

We use these tests because the time series of variables are often considered unstable time series because they generally go in a general direction, and therefore they must be converted into stable time series in order to obtain estimates that do not suffer from false regression using unit root tests, and despite the multiplicity of these tests, we are We will use one test, the Augmented Dickey - Fuller test, to test the following hypotheses. **(Dickey , 1979 , 431)**

The null hypothesis: with the existence of the unit root (time series instability)
Alternative hypothesis: the absence of a unit root (time series stability)
For example, the **(ADF)** test in the(**Xt**) series stability study is based on estimating the models by the following OLS .**(Granger , 2011 , 120**)

From Table (4) it can be seen that the time series are integrated of degree I (1) during the time period (1990-2019), this means that the model can be predicted in the future because it does not include Spurious Regression and that all time series are stable with the first difference.

Table (4) Results of the Extended Dicke-Fuller ADF test (1st difference test) & (Level Test).

Var	sign	(Level Test)			(1st difference test)		
		con	trend	none	con	trend	none
GDP	Test statistic	-2.842511	-3.251382	-1.513319	-7.633970	-7.523209	-7.736544
	Critical values	-2.967767	-3.574244	-1.952910	-2.971853	-3.580623	-1.953381
Prob	5%	0.064	0.094	0.111	0.000	0.000	0.000
WSt	Test statistic	-2.692371	-2.515539	-0.480682	-4.500404	-4.467599	-4.569585
	Critical values	-2.971853	-3.580623	-1.952910	-2.976263	-3.587527	-1.953858
Prob	5%	0.087	0.318	0.498	0.001	0.007	0.000
Ht	Test statistic	-2.423158	-4.657647	0.323544	-8.591921	-8.425002	-8.649317
	Critical values	-2.967767	-3.574244	-1.953381	-2.971853	-3.580623	-1.953381
Prob	5%	0.144	0.004	0.772	0.000	0.000	0.000
Tt	Test statistic	-11.206	-2.9120	-1.957	-0.8082	-15.94	-2.6797

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		39	59	204	22	769	35
	Critical values	-3.004861	-3.632896	-2.674290	-3.012363	-3.632896	-1.607830
Prob	5%	0.000	0.177	0.0563	0.798	0.000	0.0321

The table was prepared by the researchers based on the results of the E-Views 9 statistical program

The sample significance test based on (F-statistic)

The linear formula was chosen as the best formula that represented the function, and the calculated value (t) reflected the significance of both human capital (Ht) and economic well-being (ws t), based on the results obtained from the (F-statistic) test, which is a significant pattern according to Intrinsic test (F) where the value of **(Prob 0.009)**.

It became clear that the model is a semantic and that the independent variables that represent happiness affect the dependent variable that represents economic activity in the country, as shown in Table (5).

The three independent variables represent quantitative indicators that help in measuring and calculating happiness in Iraqi society, regardless of the amount of influence of each variable in the dependent variable. We are in the process of determining quantitative indicators to calculate a qualitative behavioral variable, as this experiment can be transferred with the addition of a variable according to the nature of society and the circumstances affecting it .

The value of (R^2) was estimated at (61%), which is the ratio of what was explained by the explanatory variables represented (**human capital, economic well-being, and technological progress**) in the dependent variable in the Iraqi economy during the study period, while the other variables that were not included in the model It affects by (39%), as for the value of **(D.W)**, which is (1.9), which is in the region of acceptance, and the problem of Autocorrelation did not appear

Table (5) shows the estimation of the regression equation and the model significance test

Dependent Variable: GDP				
Method: Least Squares				
Date: 04/19/21 Time: 14:46				
Sample: 1990 2019				
Included observations: 30				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(H(-1))	**-4651.124**	**1967.509**	**-2.363965**	**0.0478**
D(T(-1))	**-**	**121890.**	**-1.300645**	**0.2048**

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	158536.8	9		
D(WS(-1))	23790.35	11164.95	2.130807	0.0427
C	5540971.	1606117	3. 449917	0.0329
R-squared	0.704323		Mean dependent var	16415215
Adjusted R-squared	0.612514		S.D. dependent var	14391750
S.E. of regression	13557958		Akaike info criterion	35.80641
Sum squared resid	4.78E+15		Schwarz criterion	35.99324
Log likelihood	-533.0962		Hannan-Quinn criter.	35.86618
F-statistic	6.225527		Durbin-Watson stat	1.962126
Prob (F-statistic)	0.009063		Wald F-statistic	3.738880
Prob(Wald F-statistic)	0.023371			

The table was prepared by the researchers based on the results of the E-Views 9 statistical program

Cointegration test

It is the association between two or more series, so that the fluctuations in one of them cancel out the fluctuations in the other series so that the ratio between their two values is constant over time, meaning that some time series deal with structural imbalances of the other series . When testing for the model variables, the researchers found that the time series are not significant if taken separately and were significant and influential when they were tested as a group over the long term Where the researcher can predict the future and reduce the residuals to the least possible. Table (6) below shows the common complementarity between the variables of the model , where the model achieved two complementarities according to the impact test and the maximum value test. **(Mackinnon , 2008 , 542)**

Table (6) shows the co-integration between the dependent variable and the independent explanatory variables

Date: 04/20/21 Time: 21:42
Sample (adjusted): 2006 2018
Included observations: 29 after adjustments
Trend assumption: Linear deterministic trend

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Series: GDP WS H T				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.993926	108.5950	47.85613	0.0000
At most 1 *	0.875411	42.24709	29.79707	0.0011
At most 2	0.620320	15.17150	15.49471	0.0559
At most 3	0.180133	2.581973	3.841466	0.1081
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.993926	66.34790	27.58434	0.0000
At most 1 *	0.875411	27.07559	21.13162	0.0065
At most 2	0.620320	12.58953	14.26460	0.0904
At most 3	0.180133	2.581973	3.841466	0.1081
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

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Conclusions and Recommendations

Conclusions

1-The unit root tests showed the stability of the time series for all variables after taking their first differences, that is, they are integrated in degree (I (1)) and for the residual series of estimation, they are not stable in level and stabilize after taking their first differences.
2-The stability of the estimated residues at the level is evidence of a common complementarity between the study variables, although they are of the same degree.
3-The essence of the Fisher test means that the model is meaningful, as it can be said that happiness in Iraqi society can be measured through the three variables (economic well-being, human capital, and technological progress) and can be predicted in the future through its estimation at the present time
4-The Johansen-Josselius test indicates the existence of long-term common complementarity between the study variables.
5-The explanatory variables are variables that reflect the amount of happiness in Iraqi society, and that the weakness of their influence in the model is due to the characteristics of the Iraqi economy and not to the substance of the variables.

Recommendations: In light of the aforementioned conclusions, we present the following recommendations

1-Adopting the three variables as quantitative indicators to calculate and measure happiness in the Iraqi economy.
2-The need to keep abreast of global and regional developments and the shift from a primary rentier economy to one based on knowledge and accumulation of human capital.
3-The necessity to diversify the Iraqi economy and develop the productive sectors (agricultural - industrial - service), using modern technological methods and methods.
4-Developing a long-term strategy for accumulating human capital through investment in education on the one hand, and linking education in the labor market on the other hand.

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Czech
Journal of Multidisciplinary Innovations
Volume 11, November, 2022. ISSN (E): 2788-0389
Website: www.peerianjournal.com Email: editor@peerianjournal.com

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