# Testing of Natural Resources as Blessing or Curse to the Knowledge Economy in Arab Countries

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## Abstract

*This paper focuses on testing if natural resources constituted a blessing or a curse to the progress of knowledge economy in Arab countries. Some of these economies are based on natural resources and mainly oil and gas that are major sources of economic rents. The attained results from all the sample of Arab countries, show how knowledge variables are negatively related to the rents from natural resources. Natural resources appear thus as a curse to the expansion of knowledge economy in the overall set of countries. But, when taken country by country as in the literature, natural resources as blessing are shown over some economies. Transformation of curse to a sustainable blessings is the promising economic and social direction of change that could increase further inclusive growth in the Arab economies.*

Keywords: Rents, natural resources, curse, blessing, sovereign funds, inclusion.

## Introduction

The literature on natural resources rents looks at the effects of these resources as a curse or blessings to development, from different views. It refers to the existence of a curse in most oil abundant economies while it often indicates that these rents could be a blessing under specific managerial and policy frameworks. Arab countries and mainly those of Algeria, Libya and the Middle East as net exporters of oil and gas achieve important rents and revenues from these exhaustive natural resources. Outside these

activities, only few economic opportunities have been mobilized during the last years in these countries. As some of these economies are already facing the post-oil era in relation to the trends taking place in oil and gas industries, with future possibilities of exhaustion of reserves, diversification of economic activities has been emerging in some of these economies. But, the creation of new portfolios has not been expanded outside the traditional spectrum of activities. Besides that, public sovereign funds are still playing an important role both domestically and internationally implying that rents from natural resources are still promising sources of economic development.

This paper addresses questions that show how economic rents from natural resources in Arab countries are driving the development paths in relation to their access to knowledge economy. As such, it focuses on estimating the links between knowledge variables and rents from natural resources. This is to test if natural resources constitute a curse or a blessing factor to the expansion of the knowledge economy and economic development.

After a literature review on the major findings about the links between rents and development, a second section focuses on data and methods. The third section emphasizes the empirical analysis of data before estimating the relationships between subsets of knowledge variables and rents.

A preliminary version of this paper looked at the links between rents from natural resources and knowledge components. It addressed the major effects of economic rents on development. It did not clearly interpret the results in relation to the curse and blessing and their linkages to knowledge variables (Driouchi, 2014).

## I. Literature Review

In an early paper by Sachs and Warner (1997), natural resource abundance is related to economic growth. The authors observe that economies with a high ratio of natural resources to GDP in 1970 tend to grow slowly during the period 1970-1990. Additional evidence is then discussed to understand the negative relationship between resource abundance and economic growth. Gaitan and Roe (2012) remind the readers about the phenomenon of "natural resource curse" where countries with oil and other natural resources have grown less rapidly than those countries without. The authors also refer to the historical background about economics of exhaustible resources and the increased attention received, following Sachs and Warner's (1997) suggestion that countries with ample natural resources tend to grow less rapidly than natural resource-scarce countries. Gaitan and Roe (2012) develop an infinite-horizon, two-country model of trade with identical economies, except that one country is endowed with deposits of an exhaustible resource and the other is not. Within the context of the model, they show that this phenomenon can be explained in part by an inelastic demand for the exhaustible resource that increases growth in trade revenues and induces the resource-abundant country to invest relatively less than the country lacking exhaustible resources. Cotet and Tsui (2010) study the effects of oil rents on development based on a world panel dataset focusing on oil discoveries and extractions. They first test the hypothesis of the negative relationship between oil endowment and economic performance to find little robust evidence about that. Lange and Motinga (1997) already mentioned the specific status of both exhaustible and renewable resources in relation to the rents generated through these activities. To these authors, resources like minerals and fisheries generate "resource rents," or income above the normal return to capital invested in these activities. El

Anshary (2011) focuses on the "curse" outcome in oil based economies as related to market shocks such as those of 1970 and 2000s but the author considers that the magnitude also depends on the composition of public spending and the use of the generated oil rents. Carneiro (2007) looks at the development challenges facing resource-rich economies with focus on oil exporting countries. The author introduces the "paradox of plenty" to refer to the likely negative externalities that may be related to natural resources. Series of macroeconomic policies are suggested to overcome any negative effect related to the abundance of natural resources. Di John (2011) attempts a critical survey of theory and evidence about the resource curse. The author looks at the literature on Dutch disease, "rentier state" and rent seeking versions of the resource curse. Important shortcomings of these approaches are found. To the author, there is a threshold below which the risk of curse can be higher and above which better economic performance is achieved. Frankel (2010) also considers that it is striking how often countries with oil or other natural resource wealth have failed to grow faster than those without.

But, other publications have shown the role of good governance in transforming potential curse into a blessing. Cappelen and Mjoset (2009) describe the changes and the improvements in Norwegian economy from 1950-1970 to the current era. The authors noticed the attainment of higher per capita income and the high level of human development. They attribute that, to the petroleum sector but mainly to the policies and types of governance pursued in comparison with other natural resource abundant economies. Hartzok (2004) looks at the dividends from oil resource rents with focus on Alaska, Norway and Nigeria. According to the author, citizens of Alaska have been receiving payments from an oil rent trust fund since 1982. In Norway, the population is

provided with social services with investments in an oil rent fund. Nigeria has been in the process of setting similar fund. The paper focuses on the oil rent institutions and their optimal use to support the needs of the population. Ebeke and Ombga (2011) discuss oil rents and allocation of talents in relation to the quality of governance in a sample of 69 developing economies. The authors conclude that good governance leads to orient talents towards productive activities while lower quality governance may induce human resource allocation to rent-seeking. Paltseva and Roine (2011) deal with the issue of resource curse while indicating that key economic policies can transform resource rents into engine of development. Kurtz and Brooks (2011) discuss the oil curse within the framework of globalization and human capital growth. In this context, the resource curse becomes a developmental opportunity. This paper introduces the roles of domestic human capital in ensuring technological advancement, absorption and progress of new economies and sectors that can be linked or not to the oil economy. These trends are further amplified by globalization and international markets where major gains are captured by human capital and then by the virtuous spiral of economic growth and development. The findings of Davis and Tilton (2005) suggest series of various policies for different countries possessing rich mineral deposits. The positive relationship between natural resources and development has often been questioned on empirical evidence that is not all the time appropriate. Developing countries need more development and natural resources can be important assets in this process. In their paper, Busse and Gröning (2011) investigate the relationship between the natural resources and the governance indicators. This research uses a panel data and an instrumental variable method to explain the correlation between the variables and the error terms. The authors find evidence about an increase in the

corruption rate due to the export of the natural resources. Moreover, the results for other governance indicators are not significant (bureaucracy) or are not found (law and order).

Other sets of publications have emphasized the empirical nature of the problems related to natural resources. Fleming and Measham (2013) list ten assumptions related to resource curse in relation to policies. The authors focus on the local effect of the natural resources rather than their effects on the country as a whole. To the authors, a natural resource can be either a blessing or a curse to the area holding this activity. They explain that the difference in opinions over the blessing or curse of a natural resource resides in understanding the meaning of a resource curse and its impact on its area (regionally and nationally). Leonov and Volchkova (2013) test two hypotheses to study the Dutch disease over a period of twenty years. The results show that the openness and high revenues do not create a significant difference in the development of the industry whether the country has resources or not. The authors state that the government to remedy the decrease in industrialization uses the Dutch disease. They suggest loosening the policies in countries rich in resources because imposing policies to control for the Dutch disease when it does not exist may create more important and harmful problems. Konte (2012) studies the relationship between the economic growth pace of a country and the blessing or curse of the natural resources. This research shows that the level of democracy (democratic or autocratic) affects the types of effects of natural resources either as a blessing or a curse of having natural resource while accounting for education and the economic organizations involved. Ragnar (2009) studies the differences between the countries for which the natural resources are either a blessing or a curse. The author investigates theories of the resource curse. The author states that politics affect the blessing or curse of a natural resource. He added that the curse resides in relying on the natural resources

and not diversifying their activities. The author states that there is a relationship between economic development and the natural resources. He adds that resource-poor countries develop quicker than resource-rich countries because they rely on their natural resources economically. In his critical review Malik (2013) praises the research of Ragnar (2009), and considers it a good starting point to study the relationship between the natural resources abundance and the economic growth. Weber (2013) finds in the south-central U.S. an initial rise of symptoms of a curse in the 2000s. These effects are a reduction in the compensation and in workforce in other sectors. The author states that greater production does not result in less educated population. The results show that oil abundance in the south-central U.S. promotes a long-term economic development. Ross and Andersen (2012) claim that the resource curse exists and reexamined the data and previous models. Ross and Andersen show that the findings from previous are correct for the period before 1970. However, the "Resource Curse" was prominent after 1980. The research show that the oil resources constitute a barrier to the democratic development after 1970 where the oil rents start to go to the government. Elbadawi and Gelb (2010) suggest that the oil curse depends on the bad governance, high volatility rates and an overvaluation of the exchange rate. The export, manufacture, low product sophistication constitute the main areas where the resource curse show. This research investigates the means to escape the "resource curse" and the role that economic policies can do to promote the export diversification the sophistication and the density of product space.

Some publications have focused on Arab countries. Akarli (2007) studies the situation of six Arab countries in the Gulf Region (Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Oman and Bahrain) where it has been shown that their natural resources constitute a blessing for each country as it increases their economic revenues and

standards of living. Clement (2004) claims that the oil rent can be either a curse or a blessing for Algeria. This country can model best the effect of the misused oil rent. It suffered for a long time from the civil war and the economic adjustments. This research is concerned with the analysis that the natural resources in Algeria are not the cause of its actual crisis. It discusses that the deficiency in the Algerian system as well as its government is due to the French colonialism rather than the natural resources. All the difficulties and crises the country went through weakened it and conditioned the natural resources exploitation in hand with the rent. In fact, Algeria can use the rent to support its budget to finance its future projects. The author states that the natural resources can be a means to heal the country. El-Katiri, Fattouh and Segal (2011) analyze the oil rent distribution in Kuwait. They say that different countries have adopted strategies for using the oil rents to cover the needs of the population. To the author the best practice is provided by Norway where oil and gas represent 27 % of GDP (2008) and 50 % of exports. The receipts of the oil fund are distributed transparently to the current population while accounting also for future generations. Such a model is suggested for Kuwait by the authors. In their paper, the authors find that Kuwait considers its natural resources as a blessing. Elbadwi and Makdisi (2013) analyze the factors that underlie the transition taking place in the Arab economies. The authors find that rents from oil and other minerals do negatively to affect democracy when not managed appropriately. The results also suggest that home conflicts limit democratic transitions. The causal mechanisms that could explain that resource rents can constitute constraints to democratization are also discussed. Bricker and Foley (2013) attempt to link series of social and economic phenomena to the existence of rents from natural resources through using series of economic models. The authors find that in the context of Middle East, rents from natural

resources need to be used to further include the youth in labor markets. A very promising attempt made by Boucekkine, Prieur and Puzon (2013) has consisted in introducing a political game with two players that are the reformists and the conservative elite. Uncertainty is also introduced with high and low rents from natural resources. The results show that shifts to reforms and liberalization are not obvious in the case of Arab countries. The authors underline that the political liberalization at stake in the case of a typical oil exporter in the Arab region need also to ensure the coverage of the related risks. Haouas and Heshmati (2014) show that the Gulf Countries Council (GCC) as a set of oil exporting economies have failed to address the issue of oil curse. To the authors, GCC countries are in this sense lagging behind other groups of economies. The paper looks then in more details to the case of United Arab Emirates (UAE) as facing an oil curse. The authors recognize the progress made towards economic diversification but focus on the vulnerability of UAE economy to external shocks. Al-Irani (2012) proved that Yemen is also affected by the Natural Resource Curse. The research showed that the governmental policies worsen the resource curse effect on the country's development. The mismanagement of oil and the political economy of oil resulted in political instability and conflict. Kabbashi (2012) investigates the Resource Curse issue on Sudan. The research findings state that the Dutch disease and the fiscal linkages are responsible for the negative effect of the oil boom. The impact of the pursued distributive policies increase the impact of the resource curse. This latter is negatively affected by the fiscal policy and leads to an overestimation of the currency that weakens public institutions.

A natural resource as a curse or blessing to an economy is an empirical question that needs further investigation for each economy at each period of time. The enhancements of the managerial and governance processes are capable of transforming curses to blessings and thus benefitting to the knowledge economy and then to the overall development. But, further analyzes are needed given the complexity of different linkages between natural resources and development. This is pursued in the coming sections of the present paper with further analyzes on the relationship between economic rents and the components of the knowledge economy.

## II. Methods and Data

The major issue introduced here relates to the practical significance of rents without omitting the theories related to economics of rents as developed by different schools of economics. In this sense, a rent occurs when there is an excess profit that is generated under market imperfections. As well developed with the natural resource economics literature, mining exhaustible resources often leads to market imperfections thus to excess profits.

In the sense of World Bank data, rents are measured as percentages of GDP in each country. As such, the total rent from natural resources includes those from exhaustible resources (oil, gas and coal) and that from a renewable resource that is forestry. Rents account for the difference between valuations at world prices and domestic production costs (World Bank, 2011). For oil and gas, the related rents are consequently the difference between the value of crude oil at world prices and the total costs of its production. Similarly, the forestry rents are measured by the flow of forest products valued at both world prices and domestic costs of their production. The same definition

applies for coal rents and then for the total rents from natural resources. As reported above, the estimates of different types of rents are based on sources and methods described in "The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium" (World Bank, 2011).

Economic rents do exist with natural exhaustible and renewable resources. They can be collected by a government as royalties or extraction fees in the case of minerals and oil and gas. Series of economists have recognized that economic rents are "excess returns" above "normal levels" that take place in competitive markets. More specifically, it is a return in excess of the resource owner's opportunity cost.

Based on World Bank datasets (World Bank, 2011), rents are considered to be originating from oil and gas, coal extraction and forestry activities. As they are representing the excess returns between their valuation at international world prices and their domestic production costs, each value is composed of both quantity and price effects. In order to investigate the likely trends taking place in each economy, the quantity effect is first described through variables represented by the percent area of land covered by forests and the total energy produced in oil equivalent (World Bank, 2011). These preliminary investigations are introduced under the following descriptive analysis.

## III. Results of the Empirical Investigation

The results obtained below include those related to time trends in rents and knowledge besides the outcomes of regressions relating knowledge components to rents from natural resources.

### 1. Trends in total rents from natural resources

A decreasing trend might mean that the country is likely to be diversifying its economy while an increasing trend would show that more pressure is placed only on total natural resources. Algeria, Sudan, Syria, and Libya show increasing trends in total rents from natural resources. Oman, Qatar, Tunisia, the United Arab of Emirates, and Bahrain exhibit decreasing trends implying that diversification is likely to be pursued in these economies. Egypt, Jordan, Kuwait, Mauritania, Morocco, Saudi Arabia, and Yemen show stagnating trends in total rents from natural resources meaning that no major changes have been taking place in either in resource expansion or in diversification. The negative trends in total natural resource rents are though in favor of knowledge enhancement while positive trends show social costs paid to the knowledge economy. Any improvement in knowledge indices can be then related to other variables that are not included in this framework (table 1). More details about the yearly rents from oil and gas are in the appendices.

**Table 1: Trends in Total Rents as Percent of GDP (Source of Raw data: World Bank databases)**

| Country | Intercept | Trend | $R^2$ |
|---|---|---|---|
| Algeria | 13.7726<br>(4.8673) | 4.8673<br>(3.2122) | 0.2135 |
| Egypt | 13.6776<br>(4.8417) | 0.0359<br>(0.2882) | 0.0021 |
| Jordan | 0.5203<br>(1.0732) | 0.0115<br>(0.5378) | 0.0075 |
| Kuwait | 57.8131<br>(10.8939) | -0.3541<br>(-1.5120) | 0.0567 |
| Mauritania | 10.1469<br>(4.7114) | 0.1861<br>(1.9582) | 0.0916 |
| Morocco | 2.9534<br>(4.1912) | -0.0550<br>(-1.7710) | 0.0762 |
| Oman | 54.1377<br>(13.7739) | -0.4106<br>(-2.3673) | 0.1285 |

| | | | |
|---|---|---|---|
| Qatar | 63.7910<br>(14.8946) | -0.8039<br>(-4.2537) | 0.3225 |
| Saudi | 49.9980<br>(10.1233) | -0.2158<br>(-0.9904) | 0.0251 |
| Sudan | -3.7543<br>(-2.4859) | 0.4980<br>(7.4729) | 0.5950 |
| Syria | 5.6234<br>(3.4479) | 0.6001<br>(8.3382) | 0.6465 |
| Tunisia | 9.8502<br>(7.3406) | -0.1468<br>(-2.4798) | 0.1392 |
| UAE | 65.1689<br>(17.3926) | -1.1614<br>(-7.0242) | 0.5649 |
| Yemen | 26.9224<br>(8.4888) | 0.3756<br>(1.3161) | 0.0877 |
| Libya | 18.1439<br>(4.2292) | 2.3013<br>(5.9613) | 0.6637 |
| Bahrain | 47.9820<br>(10.0476) | -0.9852<br>(-3.4841) | 0.3024 |
| Lebanon | 0.0339<br>(8.7964) | -0.0017<br>(-5.6009) | 0.6106 |

When looking at the decomposition of total rents, the trends related to forestry rents appear to vary from one country to the other. Of course, countries without forest rents are not included in the analysis and only those exhibiting rents are considered. The trends in forestry rents in Algeria, Egypt, Mauritania, Morocco, Jordan, and Tunisia are all decreasing while they are stagnating in Sudan and Syria (table 2).

Table 2: Trends in Forestry Rents

| **Country** | **Intercept** | **Trend** | **$R^2$** |
|---|---|---|---|
| Algeria | 0.2068<br>(9.8728) | -0.0022<br>(-2.4128) | 0.1328 |
| Egypt | 0.6441<br>(27.6176) | -0.0127<br>(-12.3602) | 0.8008 |
| Mauritania | 1.0426<br>(25.6964) | -0.0059<br>(-3.3166) | 0.2244 |
| Morocco | 0.6666<br>(21.5089) | -0.0161<br>(-11.7903) | 0.7853 |
| Jordan | 0.0402<br>(12.6049) | -0.0004<br>(-2.9414) | 0.1854 |
| Sudan | 1.7591<br>(8.2443) | -0.0083<br>(-0.8901) | 0.0204 |
| Syria | 0.0148 | -2.19365E-05 | 0.0005 |

| | | | |
|---|---|---|---|
| | (4.3972) | (-0.1474) | |
| Tunisia | 0.3121<br>(21.1239) | -0.0044<br>(-6.8620) | 0.5534 |

## 2. Time trends in Oil Rents

All Arab countries are considered in the trend analysis of rents from gas and oil as they all have data on rents from oil and gas. While some countries appear to be lowering rents, others have had increasing trends with countries having stagnating rents. Iraq, Syria, Libya, and Sudan show increasing trends in oil rents. Oman, Qatar, Tunisia, the United Arab of Emirates, Bahrain, and Jordan exhibit decreasing trends. The trends in oil rents in Algeria, Egypt, Kuwait, Saudi and Yemen are all shown to be stagnating. These results indicate that the negative trends are consistent with either depletion of stocks or with the diversification strategy. Positive trends are mainly consistent with either new discoveries of oil and gas or with reduction of other activities (table 3).

Table 3: Time trends in Oil Rents for Exporting Countries

| **Country** | **Intercept** | **Trend** | **$R^2$** |
|---|---|---|---|
| Algeria | 14.8439<br>(6.3151) | -0.0429<br>(-0.4137) | 0.0044 |
| Egypt | 14.8406<br>(5.6044) | -0.1668<br>(-1.4280) | 0.0509 |
| Iraq | 23.5914<br>(3.7924) | 1.7572<br>(6.4011) | 0.5188 |
| Kuwait | 56.2508<br>(10.7815) | -0.3770<br>(-1.6374) | 0.0659 |
| Oman | 57.1422<br>(17.1008) | -0.7429<br>(-5.0380) | 0.4004 |
| Qatar | 64.6162<br>(17.3756) | -1.2955<br>(-7.8942) | 0.6212 |
| Saudi | 50.2773<br>(10.3215) | -0.3222<br>(-1.4990) | 0.0558 |
| Syria | 6.5554<br>(4.0856) | 0.4841<br>(6.8376) | 0.5516 |
| Tunisia | 8.8256 | -0.1505 | 0.1622 |

| | | | |
|---|---|---|---|
| | (7.0188) | (-2.7127) | |
| UAE | 59.4558<br>(15.6604) | -1.1291<br>(-6.7394) | 0.5444 |
| Libya | 19.5358<br>(4.8269) | 1.6504<br>(5.0027) | 0.5558 |
| Sudan | -5.3082<br>(-3.2105) | 1.2631<br>(9.3724) | 0.8145 |
| Bahrain | 41.7038<br>(10.1859) | -1.0763<br>(-4.4395) | 0.4131 |
| Jordan | 0.02182<br>(10.0773) | -0.0008<br>(-6.4938) | 0.6009 |
| Yemen | 26.8893<br>(8.4443) | 0.3730<br>(1.3018) | 0.0860 |

## 3. Outcomes of Regression Analyzes

The above concerns lead to attempting linking the rents with knowledge variables to test whether they facilitate or constrain access to knowledge and development. Regressions are pursued to test these hypotheses in the context of the overall world sample and for Arab countries. For that purpose, the components of Knowledge Economy are used. They are represented by education (EDU), innovation (INN), economic incentives regime (EIR) and information and communication (ICT) besides the indices knowledge index (KI) and KEI. The average rents are used as explanatory variables under different combinations but the AVG2000 as the average rents during the years 2000 (meaning from 2000 to 2010) appear to capture the variable needed in the regressions given below.

Table 4: Regression Analysis: Effects of rents on knowledge variables: Overall World Sample

| **Dependent Variable** | **Constant** | **AVG 2000** | **ICT** | **$R^2$** | **Observations** |
|---|---|---|---|---|---|
| EDU | 0.028<br>(.658) | -0.042<br>(-1.980) | 0.913<br>(15.492) | 0.761 | 95 |
| INN | 0.294<br>(10.314) | -0.043<br>(-3.019) | 0.620<br>(15.553) | 0.772 | 95 |
| EIR | 0.341<br>(5.098) | -0.106<br>(-3.196) | 0.483<br>(5.169) | 0.364 | 95 |
| KI | 0.149<br>(7.669) | -.028<br>(-2.942) | 0.796<br>(29.308) | 0.918 | 95 |
| KEI | .222<br>(10.179) | -0.043<br>(-3.932) | 0.697<br>(22.888) | 0.878 | 95 |

In the overall sample of 95 countries, the relationships between each knowledge variable selected as independent variable, a high level of linearity is established (as shown by $R^2$ between 0.364 and 0.918). The explanatory variables that show statistically significant (1% level) effects (except EDU that is significant at 5 % level) on each of the knowledge variables, are the average rate of total rents as percent of GDP over the period 2000-2009 (AVG 2000) and ICT that also exhibits statistically significant effects. The above results show that knowledge variables are highly sensitive to the average rate of rents and to ICT. While the effects of ICT are all positive and good drivers of the other knowledge variables, the effects of rents are all negative. This implies that any increase (decrease) in rents decreases (increases) the related knowledge variable.

As they are limited observations in the group of Arab countries (16), the explanatory variables used that appear to provide good responses are the average rents of 1970 (AVG70) (1970-1979), the average of 1990 (AVG90) (1990-1999) and the average of rents over 2000-2009 (AVG2000). Other variables such as AVG80 and ICT as shown in the overall model were tried and eliminated for reasons of multicollinearity. Under this framework that appears to be statistically relevant with $R^2$ between 0.207 and 0.833, the AVG 90 variable does not exhibit statistically significant effects. But, AVG2000 and AVG70 show statistically significant results for the variables EIR12, KI12, KEI12, EDU09, INN09, EIR09 and KI09 and KEI09. The level of significance is 5 % for KI12, EDU09 and KI09. It is 1 % for the other variables (EIR12, KEI12, INN09, EIR09 and KEI09. In some cases, both effects of AVG2000 and AVG70 are observed.

While the effects of the average rents for the period 2000-2009 are negative, the effects of the average rents over the period 1970-1979 are positive. This means that over the

period 2000-2009, the increase in rent decreases the related knowledge variables. But, the net effects: EIR12 (-0.835 and 0.806), for KEI12 (-0.494 and 0.439), for KI12 (-0.433 and 0.358), for INN09 (-0.347 and 0.316), for EIR09 (-.830 and 0.860), and for KEI09 (-0.412 and 0.371) could be negative. This implies that the net effect of average rents is negatively related to most knowledge variables as represented by the above components.

**Table 5:** Regression Analysis: Effects of rents on knowledge variables: **Arab Countries**

| Dependent Variable | Constant | AVG 90 | AVG2000 | AVG70 | $R^2$ | N° Observations |
|---|---|---|---|---|---|---|
| ICT 12 | 0.605<br>(6.705) | -0.011<br>(-0.045) | -0.269<br>(-1.204) | 0.337<br>(1.631) | 0.239 | 16 |
| EDU12 | 0.588<br>(5.658) | 0.211<br>(0.454) | -0.644<br>(.028) | 0.430<br>(0.096) | 0.364 | 16 |
| INN12 | 0.617<br>(10.782) | 0.143<br>(0.359) | -0.507<br>(.004) | 0.378<br>(.014) | 0.557 | 16 |
| EIR12 | 0.603<br>(10.914) | 0.063<br>(0.437) | -0.835<br>(-6.104) | 0.806<br>(6.373) | 0.821 | 16 |
| KI12 | 0.613<br>(8.252) | 0.097<br>(0.499) | -0.433<br>(-2.350) | 0.358<br>(2.102) | 0.372 | 16 |
| KEI12 | 0.615<br>(9.561) | 0.080<br>(0.473) | -0.494<br>(-3.105) | 0.439<br>(2.983) | 0.523 | 16 |
| ICT09 | 0.684<br>(9.618) | 0.065<br>(0.347) | -0.275<br>(-1.563) | 0.226<br>(1.385) | 0.207 | 16 |
| EDU09 | 0.586<br>(6.533) | 0.215<br>(0.912) | -0.496<br>(-2.234) | 0.292<br>(1.424) | 0.305 | 16 |
| INN09 | 0.625<br>(13.247) | 0.034<br>(0.273) | -0.347<br>(-2.965) | 0.316<br>(2.921) | 0.501 | 16 |
| EIR09 | 0.600<br>(11.015) | -0.009<br>(-0.061) | -0.820<br>(-6.073) | 0.860<br>(6.894) | 0.833 | 16 |
| KI09 | 0.639<br>(10.601) | 0.086<br>(0.547) | -0.346<br>(-2.318) | 0.269<br>(1.948) | 0.351 | 16 |
| KEI09 | 0.634<br>(11.846) | 0.055<br>(0.394) | -0.412<br>(-3.112) | 0.371<br>(3.031) | 0.525 | 16 |

Is there a change in rent structure and what are the likely effects on knowledge variables? This leads to considering the regressions of knowledge variables on differencing and then the squared differences of rents to capture the effects on knowledge variables (table 6).

**Table 6:** Regression Analysis: Effects of differential rents as shown below the table: **Arab Countries**

| Dependent Variable | Constant | Diff | DiffSqu | $R^2$ | Observations |
|---|---|---|---|---|---|
| KEI09 | 0.636<br>(16.845) | -.419<br>(-2.159) | 0.044<br>(0.185) | .517 | 16 |
| KI09 | 0.632<br>(16.997) | -0.302<br>(-2.652) | - | 0.334 | 16 |
| EIR09 | 0.657<br>(17.997) | -0.614<br>(-3.268) | -0.335<br>(-1.443) | .846 | 16 |
| INN09 | 0.622<br>(21.549) | -0.329<br>(-3.724) | - | 0.498 | 16 |
| EDU09 | 0.557<br>(9.856) | -0.380<br>(-2.196) | - | 0.256 | 16 |
| ICT09 | 0.659<br>(14.218) | -0.545<br>(-2.286) | 0.436<br>(1.483) | 0.312 | 16 |
| KEI12 | 0.620<br>(13.599) | -0.522<br>(-2.224) | 0.086<br>(0.296) | 0.510 | 16 |
| KI12 | 0.618<br>(13.454) | -0.390<br>(-2.773 | - | 0.354 | 16 |
| EIR12 | 0.647<br>(17.225) | -0.608<br>(-3.142) | -0.310<br>(-1.296) | 0.83 | 16 |
| INN12 | 0.601<br>(14.512) | -0.475<br>(-2.227) | 0.060<br>(0.228) | 0.525 | 16 |
| EDU12 | 0.546<br>(8.378) | -0.522<br>(-2.620) | - | 0.329 | 16 |
| ICT12 | 0.630<br>(10.314) | -0.675<br>(-2.150) | 0.538<br>(1.388) | 0.287 | 16 |

Note : *Diff=Difference between log (%Rent in GDP, Average 2000-2009) and log (% Rent in GDP, Average 1970-1997) and *DiffSqu=Diff squared.

The above regression results show that all indices and sub-indices related to knowledge economic index are negatively related to the explanatory variable representing the rate of rents in GDP per country. The indices used as independent variables in these regressions account for the difference between the average of the logarithmic values over the years 2000-2009 of the percent rent in GDP per country and the logarithmic values over the years 1970-1979 of the percent rate in GDP per country. It also includes the squared value of this index. But, in these regressions, the coefficients related to the squared values of the index appear to be statistically non significant.

These results show that the overall KEI of 2009 and of 2012 have respective coefficients of -0.419 and -0.522 while the related KI for the same years exhibit responses of -0.302 and -0.390 respectively for 2009 and 2012. Similarly, when INN09, INN12 are the dependent variables, the respective effects are -0.329 and -0.475. EDU09 and EDU12 exhibit also responses that are -0.380 and -0.522. The levels of responses of ICT09, ICT12, EIR09 and EIR12 are given as -0.545, -0.675, -0.674 and -0.608.

The results show how the rate of rent in GDP per country influences the level of knowledge attainment as this is measured by knowledge economy and knowledge indices besides the sub-components of the KEI. Otherwise, larger dependency on oil, gas and forestry rents as included in the World Bank data lowers the levels of knowledge attainment in case of positive values of the independent variable. Countries with lower rents might have higher levels in the knowledge attainment indices in case of positive values of the independent variable. These coefficients can be interpreted as effects of rents on knowledge gains or losses for countries. Those with higher levels of rents have higher costs in the knowledge sphere while lower costs are observed in countries with lower dependency on oil, gas and forests. Countries such as Lebanon, Morocco, Tunisia, Bahrain, UAE, Qatar, Kuwait, Oman and Saudi Arabia are having extra-benefits in the area of knowledge from the rent economy. Jordan, Egypt, Mauritania, Sudan, Syria, Yemen and Algeria are those countries that pay knowledge tribute to their rent based economy. In the sense of the selected index for rent representation, the 2000/1970 ratio is explained such that less than one implies a negative value in logarithms while positive values are ensured under the values of the ratio that are higher than one. This might mean that the concerned countries have lowered their dependency on rents in the economy when the original ratio representing the average rent in percent of GDP if the value for

the years 2000 is lower than the one that prevailed in 1970's. This is a sign of diversification and less dependency on oil, gas and forests. Newer discoveries of new natural resources may show figures where the 2000 rent is higher than that of 1970. The following table 8 shows how rents could be used to rank countries. Using AVG 2000 (rents that occurred in years 2000), Lebanon, Jordan and Morocco appear to have the lowest ranks with few oil resources. The Gulf countries have the highest ranks and appear at end of the list.

Table 7: Total Rents as percent of GDP (source WB) ranked by the average rents that occurred at different decades 2000 (2000-2011), 90 (1990-1999), 80 (1980-1989) and 70 (1970-1979)

**Ranked by AVG2000**

| | AVG2000 | AVG90 | AVG80 | AVG70 | Ratio2000 over 1970 |
|---|---|---|---|---|---|
| Lebanon | 0.006424 | 0.019681 | 0.007912 | 0.0079 | 0.813145 |
| Jordan | 1.323509 | 0.236457 | 0.356531 | 1.062412 | 1.245759 |
| Morocco | 1.549818 | 0.581404 | 2.230848 | 3.155989 | 0.491072 |
| Tunisia | 5.41763 | 3.566321 | 10.97922 | 7.983697 | 0.678587 |
| Egypt | 15.15793 | 10.34191 | 22.12079 | 9.893038 | 1.532182 |
| Sudan | 18.18588 | 2.831486 | 1.170472 | 1.641631 | 11.07793 |
| Mauritania | 21.41986 | 8.129692 | 10.70619 | 14.84876 | 1.442535 |
| Syria | 25.30291 | 23.52125 | 12.36641 | 8.11405 | 3.118407 |
| Bahrain | 30.41538 | 23.75888 | 46.91227 | 46.91 | 0.648377 |
| UAE | 31.52792 | 31.42353 | 40.59285 | 45.73739 | 0.689325 |
| Yemen | 33.34589 | 27.63558 | 27.63 | 27.63 | 1.206872 |
| Algeria | 33.65206 | 16.17218 | 16.34645 | 20.20645 | 1.665412 |
| Qatar | 44.76356 | 33.72777 | 47.888 | 66.07603 | 0.677455 |
| Kuwait | 47.78578 | 37.06023 | 47.31588 | 65.47057 | 0.729882 |
| Oman | 49.11157 | 32.6585 | 43.19188 | 59.5618 | 0.824548 |
| S.Arabia | 50.43384 | 34.48267 | 42.98475 | 55.25291 | 0.912782 |

Both the descriptive and regression analyzes pursued in this paper to show that rents from exhaustible natural resources are likely to be negatively affecting the knowledge economy indices. This is an empirical result based on rents as shares of GDP and

knowledge variables as provided by World Bank data. The regression results mainly for oil and gas show that all indices and sub-indices related to knowledge economic measurements are negatively related to the explanatory variable representing the rate of rents as a share of GDP per country. The indices used as independent variables in these regressions account for the difference between the average of the logarithmic values over the years 2000-2009 of the percent rent in GDP per country and the logarithmic values over the years 1970-1979 of the percent rate in GDP per country. It also includes the squared value of this index. But, in these regressions, the coefficients related to the squared values of the index appear to be statistically non significant. These results show that Arab countries need to investigate new financial mechanisms with the development of new knowledge based policies that could promote further development. The cases of developed economies and some developing countries provide examples that could be followed by oil and gas exporters.

## Discussion and Conclusion

Both the exhaustible and renewable resources available in Arab countries generate rents that are likely to be further mobilized for development and where the knowledge economy components could become important drivers for inclusive growth. Current and future levels of rents related to oil and gas are too important and need to be further directed to research, education, innovation, enterprise creation and creation of new technologies and institutions. The managerial and governance components are likely to play an important role in mobilizing these rents towards higher social efficiency.

There are countries that are successful in generating further access to knowledge economy through a better use of funds based on rents from natural resources. These economies could be used as starting models to improve the use of rents. Participation and

inclusion of all to these processes are means to ensure the improvement of the governance towards creating new enterprises and enlarging the market economies in the Arab world. The risks of exhaustion of rents and moves towards more diversification push also for a higher access to the knowledge economy through the efficient use of the current rents. This dynamic process is by itself knowledge based and needs to be continuously run to capture future opportunities for further inclusive growth in the Arab economies. But, the overall results attained in this paper show how natural resource rents constitute a curse for the future pursuit of knowledge economy development and adoption. But as discussed in the literature review, some Arab countries are shown with blessings from natural resources. This call for further analysis of the data for each individual Arab country. But, the transformation of curse to a sustainable blessings is the promising economic and social direction of change that could increase further inclusive growth in the Arab economies.

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