Oil Resource Abundance, Economic Growth and Income Distribution in Iran

Mohammad Ali Moradi (Ph. D.)[1]

Abstract

Since the first oil shock in 1973, almost the economic performance of Iran has been related to its natural resource wealth. The economy has experienced relatively lower per capita GDP growth and higher income inequality. This may support this hypothesis that natural resources seem to have been more of a curse than a blessing for Iran.

This paper aims to analyze the effects of oil resource abundance on two major macroeconomic variables, economic growth and income distribution, in Iran using the data over the period 1968 - 2005. I take a time series perspective and focus on major forces of economic growth including oil resource. Moreover, the main determinants of income distribution are theoretically specified to examine the effects of oil resource. Due to the problem of data availability, and ARDL approach is employed to estimate the empirical models.

Using the production function approach, the results of the study confirm that the overall long run effect of oil abundance on GDP is positive and significant but the value of the estimated coefficient is too small. The findings show that physical capital and human capital have positive and significant effects on GDP in the long run. Moreover, this study finds that oil abundance have negative and significant effect on income distribution. It means that oil revenue improves income equality in Iran. It should be point out that while the Gini coefficient is relatively higher compared to most countries, poverty level are substantially lower because of the distinguished social welfare system in the country and cohesive system of private social responsibility through a religious charitable system. However, income and human capital have a negative and significant effect on income distribution. The overall findings appeared to support this hypothesis that oil abundance is not a blessing for Iran.

Keywords: Oil Abundance, Economic Growth, Income Distribution, Time Series Analysis, Iran
JEL Classification: O15, Q43, Q33, C32, O53

[1] Corresponding author:
E-mail address: mamoradi@yahoo.com, Tel.: 0098 21 44807568
Fax: 0098 21 66926326

1 Introduction

Since the first oil shock in 1973, almost the economic performance of Iran has been related to its natural resource wealth. The economy has experienced relatively lower per capita GDP growth and higher income inequality. This may support this hypothesis that natural resources seem to have been more of a curse than a blessing for Iran. Numerous researchers have supported the view that resource poor countries often outperform resource-rich countries (Sachs and Warner, 1995a). This hypothesis has been tested statistically largely with data from a cross-section of countries and to a limited extent with time series data for individual countries.

The sharp swings in its economic performance and oil prices in the recent decades make Iran a natural laboratory for investigating the relationship among oil abundance and macroeconomic variables such as economic growth and income distribution. This paper aims to examine the effects of oil resource abundance on two major macroeconomic variables, economic growth and income distribution, in Iran using the data over the period 1968 - 2005. It investigates the evidence for the presence of a curse versus that of a blessing. I take a time series perspective and focus on major forces of economic growth including oil resource. Moreover, the main determinants of income distribution are theoretically specified to examine the effects of oil resource. Due to the problem of data availability, and ARDL approach is employed to estimate the empirical models.

Natural resources have formally played little role in the growth literature mainly in the models formulated in the mid-twentieth century. In the neoclassical model, output is a function of capital and labor, constrained by the prevailing level of technology (Solow, 1956). There are some criticisms of the neoclassical model in the literature. A significant part of the economic growth is unexplained by the contributions of capital and labor. Recently, growth theory is developed to include natural capital which plays a significant role in differentiating economic performance (Sachs and Warner, 1995, 1997a, b, 2001). They show that countries with great natural resources tend to grow slower than countries that have fewer natural resources. A reasonable conclusion to be drawn from this review is that there are strong theoretical grounds to posit a correspondence between resource wealth and economic growth.

The oil windfall could aid poverty alleviation and should contribute to improve living standards for the majority of the population. So, another dimension of the presence of resource curse, apart from a possible negative growth impact, is the prevalence of poverty and the observation that oil abundance economies have a poor record in poverty alleviation and unequal income distribution. This is a central theme of much of the literature, most vehemently the Oxfam America Report (Ross, 2001). Much of the emphasis is also on the observation that resource abundance tends to worsen income inequality (Auty, 1994b; Fields, 1989; Sarraf and Jiwanji, 2001), Bourguignon and Morrisson (1998) made a strong case for the inclusion of resource endowments as arguments in income distribution equations. Tanninen (1999) tests the effect of government expenditure on income distribution. Giving the awakening of interest on the need to reduce income inequality as a way of fighting poverty in Iran, the Gini coefficient is used as a proxy for income distribution to examine the effects of oil abundance on income distribution.

A better understanding of the mechanisms is essential for developing policy measures. It requires an understanding of the mechanisms through which oil resource affects the economy. In the literature, several transmission channels such as Dutch disease, uncertainty, investment in education, general decision-making of governments and efficiency have recognized to explain the resource curse. This study assessed to capture these most important transmission channels.

The rest of the paper is organized into five sections. Section two examines the stylized facts of the economy concerning the oil revenue spending and macroeconomic variables. Section three analyzes the various explanations of the transmission mechanism from large-scale natural resource revenues to a poor economic performance. Section four provides a survey of the growing academic literature on the subject and based on the findings of literature review and stylised facts of the economy, empirical models are specified. Section five introduces methodology and analyses the results of estimates. Finally, section six presents the results and policy implications.

2 Macroeconomic Stylized Facts

Based on the data prepared, this section presents an overview on macroeconomic indicators of the Iranian economy for giving a concrete historical perspective on paper's hypotheses. More specifically, it examines the evolution of main macroeconomic variables over the period 1968 – 2005. They comprise economic growth rate, Investment, oil revenue, inflation and Gini coefficient.

Natural resource such as oil may be regarded as a gift from the God, because in theory it can be taxed away by governments without impairing incentives to produce. A high ratio of natural resource over GDP can facilitate economic development if the rent is used to boost levels of investment and the foreign exchange from resource exports is deployed to enhance the capacity to import the capital goods required to build a modern economy.

Since the 1970s, changes in the price of oil have been important source of economic fluctuations, as well as a paradigm of a global shock, likely to affect many macroeconomic indicators in Iran. More specifically, this process has resulted in the lower productivity, lower growth, higher income inequality, higher unemployment, and higher inflation characterized every resource based economy after the mid 1970s.

First, the growth performance of the economy is considered, since it gives a better picture of the welfare in the society.

Figure **1** plots the stylized picture of the per capital economic growth in Iran. The aggregate average annual rate of GDP and per capita GDP growth rate are 3.8 and 1.3 percent, respectively, over the period 1968 – 2005 which shows a lower growth performance. Moreover, as can be seen from the Figure, the growth rate of real per capita GDP is characterized by wild fluctuations. However, while over the war period, 1978 – 1988, the growth rate was mainly negative with the exception of the mini-boom of 1982-1983. A more normal pattern is observed after the war.

The time series graph in the figure appears to reveal two distinct facts in Iran's economic growth history. The first fact is related to the lower growth rate and the second is characterized by the higher volatility in the economic growth rate. So, this can be considered as a paradoxical picture of plenty in Iran.

Figure 1 The Growth Rate of GDP Per Capita: 1968 - 2005

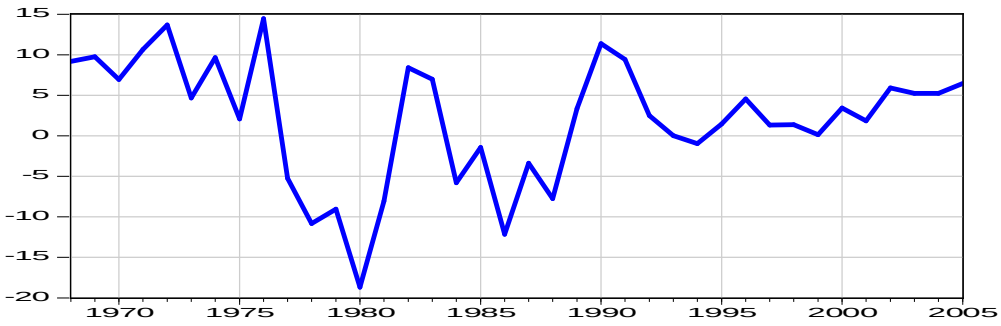
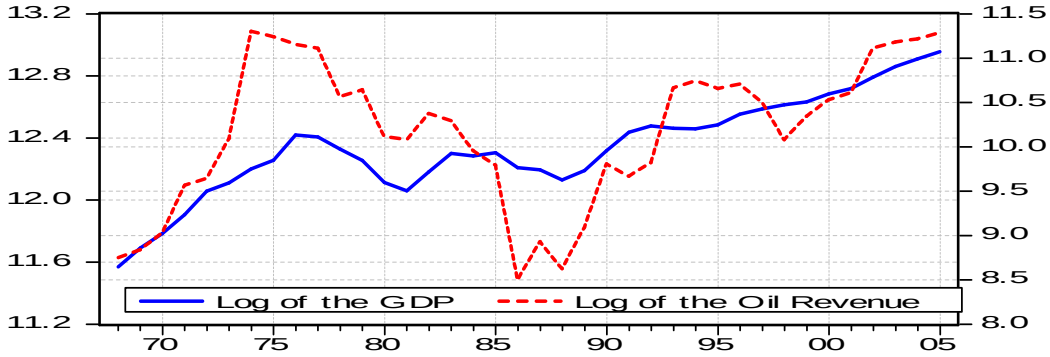


Figure 2 presents the trend of the log of real GDP and the log of real oil revenue in the economy. There appears to be a relatively positive relationship between oil revenue and economic growth. The correlation coefficient between these variables is 0.69 over the period of the study.

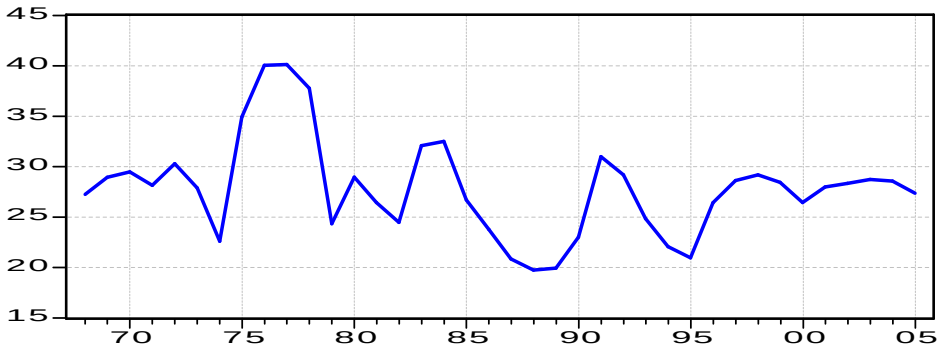
Figure 2 The Log of Real GDP and The Log of Real Oil Revenue[2]: 1968 - 2005



Another major indicator is total investment as a percentage of GDP. Figure 3 shows the ratio of total investment over GDP in Iran over the period 1968 – 2005. The average ratio over the period of the study is 27.9 percent which is relatively a higher ratio compared to other countries. The Figure shows that following the first oil shock in 1972, this ratio was increasing. Moreover, following the other major oil shock occurred in 2000, this ratio was also increasing. Nevertheless, while the investment ratio as a percentage of GDP is higher, the economy has experienced a lower economic growth. This means there is a resource allocation problem in the country.

[2] The Iranian consumer price index is used to deflate the oil revenue series.

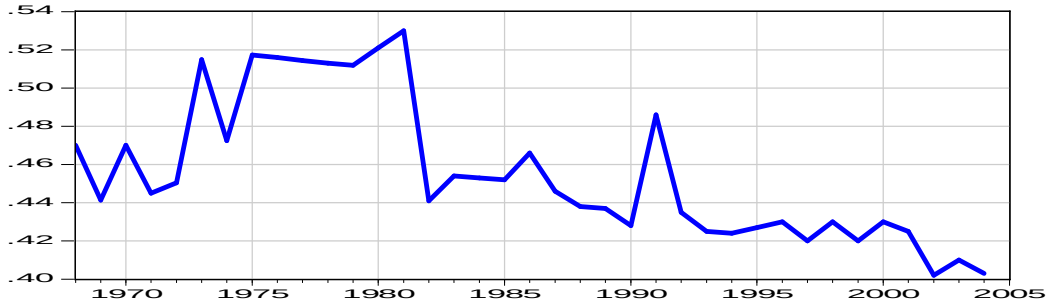
Figure 3 Total Investment as a Percentage of GDP: 1968 - 2005



The measurement of inequality is a well-developed area that has provided a wide variety of indexes with properties for every taste and research interest. In this paper, I use Lorenz consistent index for Iran. There is a general agreement that the income distribution of Iran is somewhat more inequitable. Figure 4 shows the evolution of Gini coefficient index[3] over the period 1968 to 2005. The average annual of the coefficient is 0.45 percent over the whole period.

According to the Figure, the time series appears to reveal two distinct periods. In the first period, before revolution in 1979, the coefficient was steadily increasing. In the second period, after revolution, with the exception of 1991, the coefficient was steadily declining. The average annual of the coefficient in the first period (1968 – 1979) is 48.6 while this coefficient is 44.1 percent over the period 1980 – 2005. However, the coefficient is characterized with higher fluctuation over the whole period. Moreover, there is a general agreement that the income distribution of Iran is somewhat more inequitable.

Figure 4 Gini Coefficient: 1968 - 2005



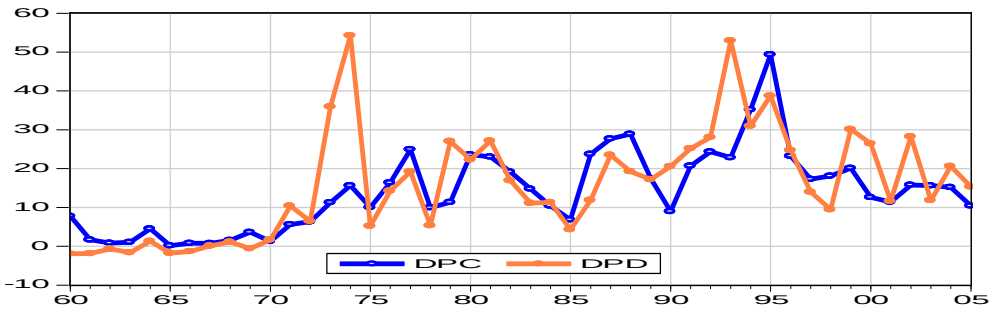
Inflation rate is another indicator is affected by oil revenue sending. There are several measures to examine domestic inflation. Two measures are used to examine the evolution of inflation in the economy. They comprise consumer price index (CPI) inflation and GDP implicit price inflation. Figure 5 represents the CPI and GDP inflation rate. From the plots of these inflation measures in the Figure, it appears that the measures move in a similar direction. Moreover, the sample period may be split into two inflationary regimes as follows:

[3] Gini coefficient ranges from zero to one. Zero indicates that all individuals have equal things while 1 demonstrates that one person has all things.

- 1960 – 1972: relatively low and stable inflation; a single - digit inflation rate
- 1973 – 2005: higher and more variable inflation; double - digit inflation rate

Both inflation measures represents that following the first oil shock, inflation rate in Iran has been higher and volatile. Such volatility in a key price index can make it difficult for policymakers to accurately judge the underlying state of, and prospects for, inflation.

Figure 5 CPI (DPC) and GDP Deflator (DPD) Inflation Rates: 1968 – 2005
(percentage)



The above analysis constitutes an initial set of stylized facts around which I organize in the following sections my discussion of oil revenue, economic growth and income distribution in this paper.

3 Transmission Mechanism

There exists a huge literature on why countries might suffer resource curse. This paper considers major transmission mechanisms which comprise Dutch disease, volatility, investment in education and efficiency in resource allocation.

First, the transmission mechanism of Dutch disease is analyzed.[4] The experience of the Netherlands in the 1970s following the discovery of the gas field gave rise to concern over Dutch disease. This is defined explicitly as the contraction in the non-hydrocarbon traded sector following an real appreciation of the exchange rate. Generally, Dutch disease effects of natural resource exports can inhibit growth in manufacturing, a sector whose expansion is commonly believed to generate positive productivity externalities, giving rise to increasing returns. Slower growth in manufacturing, due to competition for labor and capital from resource sectors and secondary growth in non-traded, would then reduce the economy's potential for dynamic growth.

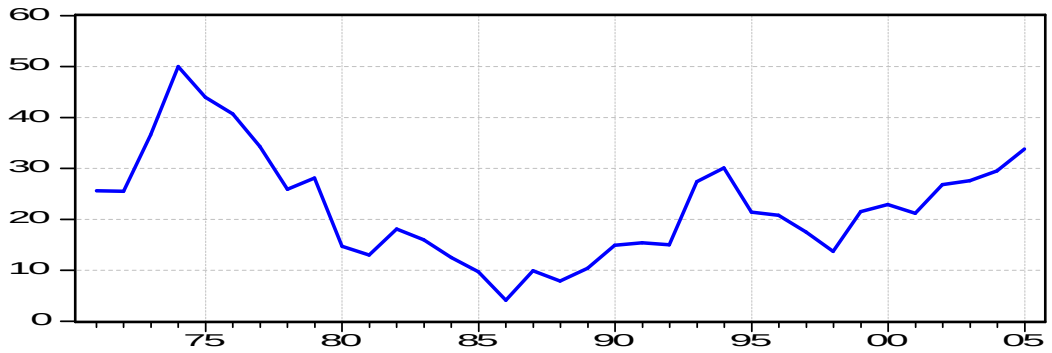
In the case of natural resource exports, large scale revenue inflows from exports put upward pressure on the exchange rate. They also lead to a significant

[4] The theory Dutch disease is described by an increase in revenues from natural resources where it reindustrializes a nation's economy by raising the exchange rate. It makes the manufacturing sector less competitive and public services entangled with business interests.

expansion in domestic demand relative to the country's ability to supply that demand. The demand expansion comes from the budget and public sector and, where the revenues get into the domestic banking sector, from credit expansion. The demand expansion in turn increases the price of non-traded goods, causing a further appreciation of the real exchange rate. The combination of these impacts results in an often dramatic decline in the competitiveness of non-oil exports, a shift in domestic resources away from those sectors to the non-traded goods sector, and erosion of diversity and balance in the domestic economy. Evidence of Dutch disease has been identified in almost all countries where petroleum exports play a major role in their economy.

Now, the Dutch disease effects are considered in Iran using time series data. Figure 6 represents total exports as a Percentage of GDP. Following the first oil shock in 1972, this ratio immediately increased but after 1974, it was steadily decreasing. Therefore, this could cause a contraction of the traded sector and could be considered as a Dutch disease effect. The other major oil shock occurred in 2000. As can be seen from the Figure, there is no any evidence of Dutch disease over this period using total exports as a Percentage of GDP.

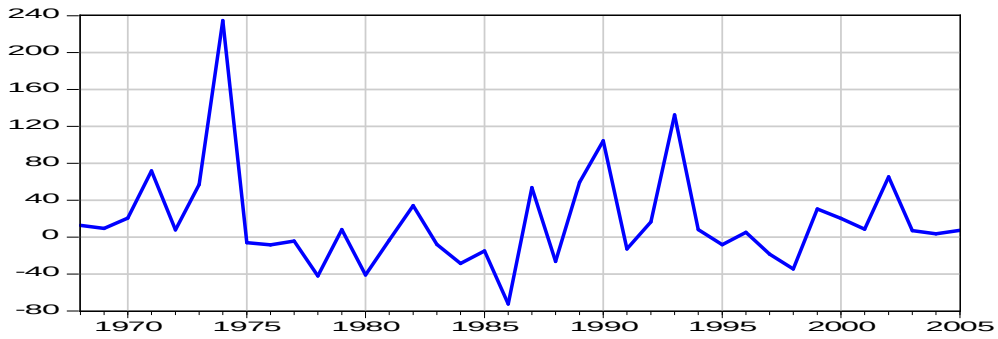
Figure 6 Total Exports as a Percentage of GDP: 1968 - 2005



Second, in the literature, revenue volatility is considered as a possible explanation for resource curse (see, for example, Auty, 1998 and Mikesell, 1997). The basic argument is that resource revenues are very volatile, especially driven by violent fluctuations in prices over relatively short periods of time. Mikesell (1997) found that between 1972 and 1992, countries with high primary export share experienced terms of trade volatility two to three times greater than industrial countries in the same period. Potentially, this volatility could cause a variety of problems. Fluctuating revenue profiles make it very difficult to pursue a prudent fiscal policy. There is also concern that windfall revenues from fluctuating export prices would be consumed rather than invested (see, for example, Sachs and Warner, 1998). However, some empirical evidence does throw doubt on this view (see, for example, Macbean, 1966 and Behrman, 1987). The permanent income hypothesis would argue that windfall gains would be more likely to be saved and invested than consumed. Figure 7 shows the growth rate of real oil revenue. As can be seen from the Graph, the growth rate of oil revenue is very volatile causing a variety of problems through external sector. Volatility in revenues, associated with volatility in aggregate expenditure, public and private, creates real exchange rate volatility. This volatility will make the tradable sector very unstable and risky,

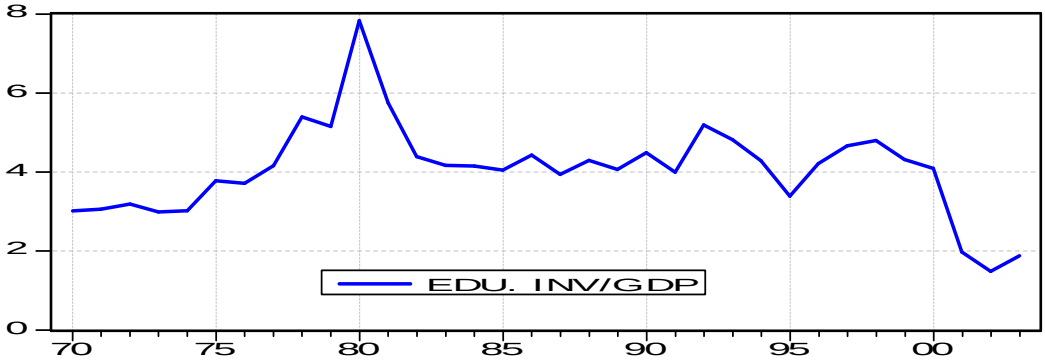
creating further disincentives towards investment in these sectors. Consequently, oil exports could cause higher volatility as a whole on all measures followed by lower growth.

Figure 7 The Growth Rate of Real Oil Revenue: 1968 - 2005



Third, there has been extensive study of the relationship between resource abundance and investment in education in the literature.[5] Gylfason (2001b) provides theoretical justification for why countries rich in natural resources might neglect education. He points out that exploitation of natural resource wealth may reduce returns to human capital investments, and thus diminish incentives for educational attainment. Despite the theoretical strength of these arguments, the empirical base for the resource curse hypothesis is not robust. It could be argued that what may appear to be slow growth caused by natural resource wealth is instead produced by other phenomena not directly related to resources. Gylfason (2001b) tests and finds that natural resource intensity is negatively and significantly related to public spending on schooling as a percentage of income and the gross enrollment in secondary schools in a sample of 85 countries from 1965 to 1998. In the case of Iran, Figure 8 plots total investment in education as a percentage of GDP. As it can be seen form the Figure, following the first oil shock in 1972, this ratio was steadily increasing while following the major oil shock in 2000, this ratio was steadily declining.

Figure 8 Total Education Investment as a Percentage of GDP : 1968 - 2005



[5] Maloney (2002) and Bravo-Ortega and de Gregorio (2006)

Fourth, the first strand in the literature argues that large windfall revenues lead to poor general decision-making by governments. Several factors explain this process. First, the development of oil raises expectations among the population. Therefore, this pressures government to do something which encourages speedy responses. Often quick, ill coordinated decisions are bad decisions. Also, spending revenues too quickly is more likely to introduce distortions into the way the economy works, if only because there is less chance for the economy to adjust naturally (Auty 2001b), Second, having more money to play with tends to weaken prudence and normal procedures of due diligence. Thus, the importance of making the right choices seems somehow less important. Particular importance is when governments decide on capital spending without thought to the recurrent spending implications (Sarraf and Jiwanji, 2001), Third, because, in the first instance, the revenues accrue to government, decision making is then concentrated in fewer hands compared to say peasant cash crops where a much greater number of economic agents are involved in the decision how to spend any windfalls (Auty 2001b), Gylfason et al. (1999) argues that the level of domestic investment is inversely related to dependence on primary product exports. However, intuitively it is attractive to imagine fluctuating revenues, in the absence of effective stabilizing measures, creating problems for government fiscal and monetary policy and macroeconomic management more generally.

One major reason is that the savings are not properly channelled by financial sector to productive projects in Iran. Banking system is almost completely in the financial sector and other financial systems are underdeveloped. Banking system is not efficient enough to play the crucial role that they must in the process of economic growth and development. Moreover, the government allocate its development budget to various projects and there is no sufficient budget to complete those projects on time and a project lasts more than two or even three times compared with actual time planned. This could explain the resource allocation problem in Iran and this is the reason why the ratio of total expenditure to GDP is higher and the growth rate of the economy is lower.

Fifth, another source of lower economic growth is the reduction of economic efficiency. One of the main measures of inefficiency is TFP. The TFP growth rate for a sample of between 1960 and 2005 has been roughly zero in Iran while the growth rate of capital productivity is negative over the period. This means the efficiency of the economy has markedly deteriorated. Resource allocation is one of the important channels resulting in zero TFP growth rate.[6]

Sixth, a number of studies have also shown that resource abundance frequently leads to increased income inequality (Stevens, 2003; Gylfason and Zoega, 2003 and Auty, 2004). Two reasons why this might occur are as follows: First, oil, gas and mining industries are often characterized by their enclave nature, with few forward and backward linkages into the economy. During production, such industries employ only a relatively small number of highly-skilled, well-paid workers, and generally import the majority of inputs. Second, public expenditure may exacerbate inequality. This can result where expenditure is concentrated in the

[6] See Sala-I-Martin; Arab countries (2000)

formal sector in towns and cities, skewing distribution against rural households, or where it is orientated towards the interests of the wealthier classes. However, resource abundance can lead to decrease income inequality. This negative contribution of oil revenue to income inequality may occur through two mechanisms. The first is that part of social expenditure consists of direct transfers to the poor, increasing their income and redistributing income from rich to poor. The second is that social expenditure may promote access for the poor to education and other human-capital enhancing activities, such as healthcare, thereby contributing to future income equality.

4 The Resource Course: Theory and Evidence

This section reviews the literature to develop an empirical model on which I will base my analysis. This review is organized into two parts. First, a number of theoretical and empirical studies are analyzed to describe the relationship between resource abundance and growth in the framework of production function and economic growth model. Second, the literature related to resource abundance and income distribution is reviewed.

2.1 Economic Growth

Concern over the impact of great wealth on a society goes back at least as far as the writing of the 14th century philosopher Ibn Khaldun (1332–1406)[7] in which he identifies the fifth stage of the "state" as one of waste and squandering (Ibn Khaldun, 1967), More recently, concern about the potential negative impacts of being a natural resource producer emerged among development economists in the 1950's and 1960's. Initially, Nurkse (1953) and Rostow (1960), accentuate the positive role of natural resources in economic development. Moreover, this concern is associated with Prebisch (1964) and Singer (1950). They argue that primary product exporters would find themselves disadvantaged in trading with the industrialized countries (the centre) because of deteriorating terms of trade. Hirschman (1958), Seers (1964) and Baldwin (1966) reinforce this negative consequence by arguing that linkages from primary product exports would be limited compared to manufacturing, although by contrast some tried to argue that primary products could promote economic growth (Roemer, 1970; Lewis 1989). The major theoretical literature on the resource curse focuses on the structural mechanisms of the so-called Dutch disease (see, for example, Matsuyama, 1992; Sachs and Warner, 1999 and Torvik, 2001).

There is a very large body of work that tries to establish a negative relationship between abundance of natural resources and poor GDP performance (Auty, 1986; 1993, 2001a, b; Bulmer-Thomas, 1994; Lal and Myint, 1996; Ranis, 1991; Sachs

[7] One of his famous books titled " Muqaddimah of Ibn Khaldun" is written in 1377

and Warner, 1995b, 1997, 1998 and Auty, 2001a) found that between 1960 and 1990, the per capita incomes of resource poor countries grew between two to three times faster than those of the resource abundant countries.

To many economists the tendency of natural resource-rich countries to experience low economic growth is a conceptual puzzle. Economists consider natural resources to be a potential source of income, some of which is saved and converted into capital to support increases in future output levels. For example, resource rents may be used for the construction of roads, the ICT systems, health care and educational programs. Several countries did benefit from their natural wealth. For example, the nineteenth century resource booms in Latin America stimulated economic progress. More specifically, Ecuador experienced a significantly higher income per capita level after its boom (Sachs and Warner, 1999a). Similarly, Sachs and Warner (1995) point out that the industrial revolution in the UK and Germany was possible only because of the vast deposits of ore and coal. As a more recent example, Norway manages its natural resource abundance well and converts it into economic prosperity (Sachs and Warner, 1995 and Gylfason, 2000, 2001a). Moreover, they point out that natural resource discovery, the resulting sudden increase in income may lead to sloth and less need for sound economic management and for institutional quality.

Natural resource abundant economies benefit less from the technology spillovers that are typical in manufacturing industries because the exports of these industries are harmed by an appreciation of the local currency, for example through the inflationary pressure resulting from increased domestic demand (Sachs and Warner, 1995, 1999a; Gillis et al., 1996 and Gylfason, 2000, 2001b). Finally, as the natural resource sector expands relative to other sectors, the returns to human capital decrease and investments in education decline (Gylfason, 2001a).

The literature has emphasized the importance of human capital in the process of economic growth. Moreover, human capital can be considered as a complementary input to physical capital. Hence, based on the literature and more specifically considering the extension of Solow (1956) model, human capital and physical capital could be included in the empirical model. The model assumes that GDP is produced according to an aggregate production function technology based on the well-known Cobb-Douglas production function. The econometric model specification is given by the following equation.

$$Y_t = \beta_0 + \beta_1 K_t + \beta_2 E_t + \beta_3 OR_t + \vartheta D_t + \varepsilon_t \qquad (1)$$

where Y, K, E and OR represent real GDP, real physical capital, human capital and real oil revenue, respectively. These variables are converted to a logarithm scale and also defined in per worker. D is a set of dummy variables to capture the effects of external and internal shocks in the economy. In the equation, it is expected that $\beta_1 \succ 0$ and $\beta_2 \succ 0$, while β_3 may be either positive or negative.

There are many sources of human capital. Becker identifies four main sources: schooling, on-the-job training, health and information. All of which are said to improve the physical and mental abilities of the individuals, thereby raising their productivity and wages. Of these, empirical researches have focused mostly on schooling. In this study, the measure of the level of schooling is constructed employing the Barro and Lee (1996) education attainment approach using ten-year intervals of census data.

This model leads to three testable hypotheses, which can be summarized as follows: in the first hypothesis, physical capital has a positive effect on GDP. In the second hypothesis, average schooling as a proxy for the stock of education has a positive effect on GDP and finally, in the third hypothesis, oil revenue has a positive effect on GDP. These hypotheses are tested by applying the cointegration and error correction regression approach described in the next section.

2.2 Income Distribution

Another dimension of the presence of resource curse, apart from a negative growth impact, is the prevalence of poverty and the observation that resource rich economies have a poor record in poverty alleviation and unequal income distribution. This is a central theme of much of the literature, most vehemently the Oxfam America Report (Ross, 2001). Much of the emphasis is on the observation that resource abundance tends to worsen income inequality (Auty, 1994b; Fields, 1989 and Sarraf and Jiwanji, 2001), Bourguignon and Morrisson (1998) made a strong case for the inclusion of resource endowments as arguments in income distribution equation. Their empirical tests show that the availability of resources exerts significant income equalizing effects.

A number of empirical studies have tried to explain income distribution or inequality from various standpoints. Some studies, and mainly those based on time series data, are often pre-occupied with determining the effects of selected macroeconomic variables (such as inflation and unemployment level) on income distribution (Mocan, 1999 and Blejer and Guererro, 1990), while some other time series studies examine the effects of fiscal policy, especially tax rate, on inequality (Auten and Carroll, 1999 and Feenberg and Poterba, 1993). Tanninen (1999) tests the effect of government expenditure on income distribution and he presents mixed findings on the matter. As such studies have been reported mainly for developed countries with adequate time series on income distribution.

In addition of resource abundance measures, human capital is included in the income distribution model. Theoretical studies suggest that the relation between education and income inequality is not always clear. For instance, the human capital model of income distribution, stemming from the works of Schultz, Becker and Mincer[8] implies that the distribution of earnings (or income) is determined by the level and distribution of schooling across the population. The effect of increased average schooling on income distribution may be either positive or negative. Knight and Sabot (1983) also emphasize the complicated effect of human capital accumulation on income distribution.

Becker and Chiswick (1966) show that in the United States, income inequality is positively correlated with inequality in schooling and negatively correlated with the average level of schooling. Moreover, Chiswick (1971) suggests that earnings inequality increases with educational inequality. Subsequent studies[9] are based on a

[8] See, for example, Becker (1960), Mincer (1963) and Schultz (1981)

[9] See, for example, Adelman and Morris (1973), Chenery and Syrquin (1975), Ahluwalia (1975), Marin and Psacharopoulos (1974), Psacharopoulos (1977) and Winegarden (1987).

slightly larger sample of countries. Most of them find that a higher level of schooling reduces income inequality, while inequality of educational attainment increases it. On the other hand, Ram (1984 and 1989) using slightly different specifications and data finds that mean schooling and schooling inequality do not have any statistically significant effects on income inequality.

Considering the ambiguous theoretical predictions on the relation between resource abundance and education and income distribution, I look for empirical evidence using time series data. Based on the literature review mentioned above and attempts made to derive some basic stylized facts, the determinants of the income distribution in Iran comprise GDP per capita, human capital and oil revenue. The following is the linear regression model corresponding to literature, on which this analysis is based:

$$GINI_t = \gamma_0 + \gamma_1 Y_t + \gamma_2 E_t + \gamma_3 OR_t + \delta D_t + \varepsilon_t \qquad (2)$$

where *GINI* is the Gini coefficient as a proxy for income distribution. The Gini coefficient is considered because it is a useful summary indicator of inequality. *E* is the average years of school attainment for the population aged 15 and over, *Y* is the level of the GDP per capita, *OR* represent per capita real oil revenue, The variables included in the model are on the logarithmic scale. Finally, *D* is a set of dummy variables. In the equation, it is expected that γ_1, γ_2 and γ_3 may be either positive or negative.

5 Methodology and Empirical Results

Cointegration and error correction econometric approach is employed to estimate the models specified. This paper considers cointegration analysis within an autoregressive distributed lag (ARDL) framework, since this approach is a more statistically significant approach for determining cointegrating relationships in small sample. ARDL is the major workhorse in dynamic single equation regressions.

An advantage of the ARDL approach is that, while other cointegration techniques require all of the regressors to be integrated of the same order, it can be applied irrespective of their order of integration.[10] It, therefore, avoids the pretesting problems associated with standard cointegration test. The ARDL model takes sufficient numbers of lags to capture the data generating process in a general to specific modeling framework. Moreover, its popularity in applied time series econometrics has even increased, since it turned out for nonstationary variables that cointegration is equivalent to an error-correction mechanism (see Granger's representation theorem in Engle and Granger, 1987). By differencing and forming a linear combination of the nonstationary data, all variables are transformed equivalently into an EC model with stationary time series only. Finally, in order to determine the optimal lag length incorporated into the model and selects the ARDL

[10] Pesaran et al. (2001)

model to be estimated, this study employs the Akaike Information Criterion (AIC). The general form of a linear ARDL model is as follows:

$$Y_t = \sum_{i=0}^{P} \beta_i X_{t-i} + D_t + \varepsilon_t \qquad (3)$$

where Y_t is dependent variable and X_t is a vector of explanatory variables and ε_t is the error term. A vector of dummy variables is included to capture the effects of shocks effected the relevant variables. Time series data for Iran collected from central bank are used in this study with annual data covering the period 1968 - 2005. Since this study utilizes annual data only 38 numbers of observations, the possible optimal lag length to be considered is two in both models. The results of estimates for both models are summarized as follows:

Economic Growth:

Using the model presented in equation (1), the following short run results are obtained:

$$Y_t = -1.50 + 0.58Y_{t-1} - 0.21Y_{t-2} + 1.28K_t - 1.35K_{t-1} + 0.49K_{t-2} + \qquad (4)$$

(-4.57) (3.86) (-1.90) (5.64) (-3.81) (2.40)

$$1.97E_t - 3.20E_{t-1} + 1.29E_{t-2} + 0.008OR_t + 0.04OR_{t-1} - 0.08TB81 - 0.07TB88$$

(4.76) (-4.59) (2.63) (0.46) (2.48) (-3.15) (-2.75)

$n = 38$ $\quad \overline{R}^2 = 0.989$ $\quad S = 0.0229$

$\chi^2_{SC}(1) = 1.56\,[0.21]$ $\quad \chi^2_{FF}(1) = 1.79\,[0.18]$

$\chi^2_{N}(2) = 2.11\,[0.35]$ $\quad \chi^2_{ARCH}(1) = 0.40\,[0.52]$

A set of the diagnostic tests is conducted to ascertain the goodness of fit of the ARDL model. The diagnostic test examines the serial correlation, functional form, normality and heteroscedasticity associated with the model. The short-run diagnostic test results are very satisfactory with an absence of first order serial correlation. Error term is normally distributed along-with no autoregressive conditional heteroscedisticity. Ramsey's Reset test for functional form confirms that there is no specification problem in the short run model. Since there are outliers, two outliers are identified and included in the model. TB81 = 1 if t = 1981 and 0 otherwise and TB88 = 1 if t = 1988 and 0 otherwise. The long run relationship is estimated as follows:

$$Y_t = -2.40 + 0.66K_t + 0.10E_t + 0.08OR_t - 0.13TB81 - 0.11TB88 \qquad (5)$$

(-10.77) (10.97) (2.34) (2.74) (-2.62) (-2.47)

The cointegration result shows that the variables are cointegrated and significant at the 5 level. Thus, these results suggest that a long run and stable relationship between the variables exists. Further, the results indicate that the coefficients of oil revenue, human capital and physical capital variables have positive and significant long run

impact on the GDP at the 5 percent level. However, although oil revenue has positive effect on GDP, the magnitude of the coefficient is too small confirming the effect is minor. This may support this hypothesis that oil abundance is not a blessing for Iran.

According to Engle and Granger (1987) a system of cointegrated variables can be represented by a dynamic error correction model. Thus, we proceed to test for error correction by using the above results.

$$\Delta Y_t = -1.50 + 0.21\Delta Y_{t-1} + 1.28\Delta K_t - 0.49\Delta K_{t-1} + 1.97\Delta E_t - 1.29\Delta E_{t-1} + 0.007\Delta OR_t - \quad (6)$$

(-4.57) (5.64) (-2.40) (4.76) (-2.63) (0.46)

$$0.08TB81 - 0.07TB88 - 0.63ECM_{t-1}$$

(-3.15) (-2.75) (-4.80)

$n = 38$ $\quad \bar{R}^2 = 0.872$ $\quad S = 0.0229$

Empirical findings show that model passes all diagnostic tests and supports the overall validity of the short run model. The error correction term indicates the speed of adjustment to restoring equilibrium in the dynamic model. The ECM coefficient confirms how quickly or slowly variables return to equilibrium and it should have a statistically significant coefficient with a negative sign. The estimated equation shows that the coefficient of ECM_{t-1} is equal 0.626 and highly significant. It suggests that deviation from the long run GDP path is corrected by around 0.63 percent over the following year. This means the adjustment takes place quickly.

Income Distribution

Based on the literature, the evolution of the distribution of income is determined by the level of per capita income, human capital and per capita real oil revenue as specified in equation (2). The following is the short run results are estimated:

$$GINI_t = 1.27 + 0.12GINI_{t-1} + 0.23GINI_{t-1} + 0.14Y_t + 0.20E_t - 0.04OR_t - 0.15D82 + 0.10TB91 \quad (7)$$

(2.09) (1.06) (2.15) (2.24) (3.37) (-3.30) (-4.85) (2.91)

$n = 37$ $\quad \bar{R}^2 = 0.847$ $\quad S = 0.032$

$\chi^2_{SC}(1) = 0.65\,[0.42]$ $\quad \chi^2_{FF}(1) = 0.61\,[0.43]$

$\chi^2_{N}(2) = 0.78\,[0.68]$ $\quad \chi^2_{ARCH}(1) = 0.68\,[0.41]$

The short-run diagnostic test results are very satisfactory with an absence of first order serial correlation. Error term is normally distributed along-with no

autoregressive conditional heteroscedisticity. Ramsey's Reset test for functional form confirms that there is no specification problem in the short run model. D82 is dummy variable, which takes 1 if t > 1982 and 0 otherwise; TB91 = 1 if t = 1991 and 0 otherwise. The long run relationship is estimated as follows:

$$GINI_t = 1.96 + 0.21Y_t + 0.30E_t - 0.06OR_t - 0.22D82 + 0.15TB91 \quad (8)$$

(2.39) (2.27) (3.47) (-3.68) (-4.84) (2.43)

The results reveal that there is a long run relationship among the variables included in the model. Oil revenue spending decreases inequality in Iran. In empirical setting, results reveal that increased real oil revenue improve income distribution because part of it is distributed to the poor directly of indirectly. The estimated coefficient of oil revenue implies that a one percentage point increase in the oil revenue, the Gini coefficient declines by 0.06 percentage point. This negative contribution of oil revenue to income inequality may occur through two mechanisms.

- The first is that part of social expenditure consists of direct transfers to the poor, increasing their income and redistributing income from rich to poor.
- The second is that social expenditure may promote access for the poor to education and other human-capital enhancing activities, such as healthcare, thereby contributing to future income equality, especially when financial markets are imperfect and underdeveloped.

It should be point out that while the Gini coefficient is relatively higher compared to most countries, poverty level are substantially lower. One reason is that social welfare system in the country has relatively effective safety nets because the government has justice goal and try to maintain social cohesion. Another reason is that the country are marked by an important and cohesive system of private social responsibility in which families provide help to their members during hard times and income is redistributed through a religious charitable system.

However, it should be noted that although oil revenue spending improves the equality of the income in Iran, the magnitude of the coefficient is too small suggesting the effect is minor.

Education is an important determinant of income inequality. The results confirm the negative role of education in income distribution. The higher educational attainment results in more unequal income distribution. The findings show that a one percentage point increase in the average years of school attainment increases the Gini coefficient by 0.30 percentage point.

Increased income pushes income inequality upwards with high significance. So, income and inequality are having same direction indicating positive and significant relationship, meaning that income per capital causes to raise inequality by 0.21 percent, if there is 1 percent increase in income.

$$\Delta GINI_t = 1.27 - 0.22\Delta GINI_{t-1} + 0.14\Delta Y_t + 0.20\Delta E_t - 0.04OR_t - 0.15D82 + 0.09TB91 - 0.66ECM_{t-1} \quad (9)$$

(2 .09) (-2.15) (2.23) (3.37) (-3.30) (-4.85) (2.91)

$n = 37$ $\quad \bar{R}^2 = 0.683$ $\quad S = 0.0320$

The estimated model confirms that the ECM_{t-1} coefficient is highly significant suggesting the existence of long run relationship among the variables as defined in the ARDL model of income distribution. More specifically, deviation from the long run Gini path is corrected by 0.66 percent over the following year. This implies that a high speed of adjustment to equilibrium level after a shock.

6 Conclusion

Since theories provide different predictions about the impact of natural resource abundance on economic growth and income inequality, more empirical analysis is necessary to shed light on their relationship. Resource abundance is considered a vibrant tool for the growth of income and improving income distribution or poverty reduction. This paper examined the determinants of the economic growth and Gini coefficient in an autoregressive distributed lag framework, paying particular attention to testing the effect of natural resource abundance reforms. Employing the ECM cointegration test and the ARDL bounds technique, the empirical evidence showed a significant steady-state relationship between economic growth and its determinants. Moreover, there is a significant steady-state relationship between Gini coefficient and its determinants. After documenting these basic cointegration results, the long-run estimates were derived using the underlying ARDL model.

The results therefore highlight the importance of natural resource abundance in order to improve economic growth and alleviate income inequality. However, the results of both model confirms that although oil revenue has positive effect on GDP and negative effects on Gini coefficent, the magnitude of the coefficients in both models are too small confirming the effect is minor. So, the effect of oil revenue on economic growth and income distribution is not very strong. This may support this hypothesis that oil abundance is not a blessing for Iran.

Moreover, the findings of growth model show that physical capital and human capital have positive and significant effects on GDP in both the shot run and the long-run. Gini coefficient model confirmed that GDP have positive and significant effect on income distribution. However, human capital has a negative and significant effect on income distribution.

By understanding the major determinants of economic growth and income distribution, we may discover policy implications that would help to increase economic growth and reduce inequality. Policy recommendation reveals that there is a need to revise macroeconomic policies to improve the efficiency and productivity of resource allocation in the economy. Country can get more benefits from oil revenue if it is converted towards efficient activities. This means that there is a huge need to revise budgeting systems.

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