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# MEASURING TAX EFFORT IN ARAB COUNTRIES

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**Abstract**

Many Arab countries face difficulties in generating sufficient revenues for public expenditure and may face a budget deficit. This study makes use of pooled time-series and cross-sectional country data for the 1994-2000 time period for 16 Arab countries to examine the determinants of the tax effort. The results suggest that in the Arab countries, the main determinants of the tax revenue share in GDP are the per capita income, the share of agriculture in GDP and the share of mining in GDP. Other variables that are also important are the share of exports, imports and the outstanding foreign debts. Furthermore, country-specific factors appear to be important determinants of tax share, e.g., the political system; attitudes toward government; the quality of tax administration and other institutions of the government. The results for the tax effort index showed that for Arab countries that are facing a budget deficit, especially those of the GCC, there is room to increase their tax revenues by reforming their tax systems.

## 1. Introduction

Many developing countries face difficulties in generating sufficient revenues for public expenditure. In some Arab countries, budget deficits and the unproductive use of public expenditures have limited the critical investments in both human resources and basic infrastructure that are necessary for providing a foundation for sustainable economic growth. In the last two decades, many Arab countries have embarked on economic and financial reform programs some of which are supported by the International Monetary Fund. These reform programs have usually included measures to raise tax revenues and to restructure tax systems.

The purpose of this study is to examine the determinants of tax revenue shares and to construct an index of tax effort for the Arab countries. This study makes use of pooled time-series and cross-sectional country data for the 1994-2000 time period for 16 Arab countries. The index of tax effort is constructed as the ratio of actual tax share to the predicted (or potential) tax share, as in previous work on this topic, Stotsky and WoldeMariam (1997), Tanzi (1981, 1987, 1992), Leuthold (1991) and Tait and Eichengreen (1978) among others.

It should be emphasized here that the main purpose of pan Arab comparisons of tax effort is to reveal whether an Arab country is limited in its revenue collections by a low capacity to generate tax revenues or by an unwillingness to use the available tax capacity to fund public expenditures. Another reason is to give guidance as to the proper mix of fiscal policy to undertake in the event of a budget deficit. If an Arab country facing a budget deficit imbalance were already making the maximum use of its taxable capacity, this would suggest that regaining budget balance would require expenditure rationing rather than tax increases. Moreover, in many Arab countries, the informal sector is important yet hardly contributes to tax revenues. To account for the informal sector when examining the tax effort, essential data is required. Unfortunately, these data are not consistently available among Arab countries.

The next section summarizes tax revenue performance in Arab countries. Section three presents the model and reviews the literature on previous studies and discusses the different approaches that have been used to examine the determinants of tax effort. Section four discusses the empirical results while section 5 gives the conclusions and some policy implications.

## 2. Tax Revenue Performance in Arab Countries

Tax Revenue performance varies across Arab countries. In the 16 Arab countries for which we managed to obtain complete and reliable data, the share of tax revenue in GDP was on average about 12.6 percent in 1994 (see Table 1). In these countries, in 1994, the share of tax revenue in GDP was above 25 percent in only one country, Algeria; between 15 and 25 percent in 6 countries, Egypt, Jordan, Mauritania, Morocco, Tunisia and Syria; between 5 and 15 percent in 4 countries, Bahrain, Lebanon, Yemen and Oman; and below 5 percent in the remaining countries, Saudi Arabia, Kuwait, Sudan, Qatar and UAE.

Tax revenue trends are not uniform across these Arab countries. Some countries have enjoyed sustained increases in tax revenue shares in recent years while others have seen tax revenue shares weaken. The most recent evidence suggests that tax revenue shares are, on average, beginning to strengthen. In the year 2000, the share of tax revenues in GDP was on average about 14.9 percent, up by about 20 percent from its level in 1994.

In general, tax shares in developing countries tend to be lower than in industrialized countries, (Tanzi, 1992). In fact, the tax shares in some Arab countries such as Tunisia, Algeria and Morocco were higher on the average than in Asia and African countries in recent years (Eltony, 2000). In OECD countries, the share of tax revenue in GDP was on average about 38 percent (28 percent without social security taxes) in 1999, though there is considerable variation, with the share of tax revenue ranging from 29 percent in Australia to 51 percent in Sweden (OECD, 2000).

On the other hand, Arab countries use a limited number of taxes. Taxes on goods and services comprised the largest share of taxes in 2000, accounting for about 5.1 percent of GDP. International trade taxes accounted for 5.0 percent of GDP and taxes on personal income and profits accounted for about 4.6 percent (IMF, 2001).

Furthermore, there are several reasons for the relatively low share of tax revenue in GDP in Arab countries, though any generalization is difficult given the differences in the political and economic structures across these countries. Some of the Arab countries such as Lebanon, Sudan Algeria, and Yemen have experienced repeated and severe internal unrest, including civil wars, which has impaired revenue collections. In addition, the presence of large inefficient state-owned enterprises, few large private sector taxpayers, and hesitation to collect taxes from elites may also have limited revenue collections.

Apart from general economic and political weaknesses, the tax structure in many Arab countries has impaired the efficiency of resource allocation in the economy and incentives for growth, and has limited the ability to raise tax revenues (El-Erian & Tareq, 1993); Gillis, 1989). Furthermore, international trade taxes are typically characterized by an excessive number of nominal tariff rates, high rates, and numerous exemptions, resulting in significant dispersion in the rate of effective protection. Customs structures protect industries, leading to lower incentives to produce efficiently, and limiting economic growth. Export taxes and misaligned or multiple exchange rates also distorted domestic incentives for production. Corporate income taxes are often limited to the formal sector and are often characterized by high marginal tax rates and narrow tax bases.

Multinational businesses often pay a disproportionate share of income taxes compared to local businesses For example, in Kuwait it is set at 50 percent of profits. Personal income taxes are almost exclusively applied to wage income in the formal sector (typically government employment) and are often unwieldy, with high marginal tax rates and a small tax base, leading to tax evasion.

In addition to poor tax structures, many Arab countries are characterized by weak tax and customs administrations, which impair efforts to raise tax revenues (Eltony, 2000). Tax and customs administrations in these countries typically have excessive numbers of poorly trained and supervised staff, weak management practices, low salaries, and inadequate equipment and supplies. Discretion in the application of the tax and customs law, owing to weak domestic legal and institutional structures, creates opportunities for corruption and tax and customs fraud in many Arab countries.

Nevertheless, in recent years, some Arab countries have made progress in improving their tax systems. An IMF study by WoldeMariam (1995) found that several Arab countries were able to increase their tax revenue shares in the context of the IMF reform programs. For instance, Morocco, Tunisia, Lebanon, Jordan, Egypt, Sudan, Mauritania and Yemen have all undertaken a comprehensive program of reform of both tax policy and tax administration, resulting in a significant improvement in the structure of their tax system and an increase in the tax share to GDP ratio in the year 2000.

## 3. The Model

Previous studies measured taxable capacity by regressing for a sample of countries the tax revenue to GDP ratio on explanatory variables that serve as proxies for possible tax bases and other factors that might affect a country's ability to raise tax revenues. This regression approach has been applied to samples of developing and industrialized countries (see for example Tanzi (1981; 1987; & 1992); Leuthold (1991); Tait and Eichengreen (1978); Chelliah et al. (1975) and Bahl (1971)). The predicted tax ratio from such a regression is considered as a measure of taxable capacity while the regression coefficients can be interpreted as average effective rates on those bases. The ratio of the actual to the predicted tax ratios is then computed and used as an index of tax effort. For the most part, in this approach, tax effort is defined as a ratio of tax revenues to some measure of taxable capacity, for example GDP, thus assuming that the tax bases and other explanatory variables reflect only differences in taxable capacity (Tanzi, 1992).

Moreover, in these previous studies, the main determinants of the tax share in GDP are presumed to include the sectoral composition of value added, the overall level of industrial development, and the importance of international trade in the economy. The sectoral composition of value added is likely to be an important influence on the tax share because some sectors of the economy are more suitable to taxation and generate taxable revenues. For some Arab countries, the share of agriculture in the economy may be an important determinant of taxable capacity because small farmers are known to be difficult to tax and the agriculture sector, in general, does not generate large tax revenues.

On the other hand, the mining share may be important as a sector that can generate large taxable income. However, in Arab countries, oil extraction by state owned enterprises is common, thus limiting potential revenue collections from this source.

Furthermore, the share of manufacturing may also be important as manufacturing enterprises are typically easier to tax than agriculture since business owners typically keep better books and follow better accounting practices and manufacturing can generate large taxable incomes if production is efficient.

Moreover, per capita income is typically considered the best proxy for the overall level of development and economic structure sophistication. This factor may have explanatory power beyond sectoral shares, though these factors are usually linked to each other, since the share of services and industry increases with the level of development and per capita income. One problem with using nominal magnitudes in a cross-country analysis is that they must be converted into a common currency, such as the U. S. dollar. If exchange rates do not reflect purchasing power parities, then comparisons based on a common currency may be skewed, though if there is some systematic skewing across the countries then this may not bias the results. One possibility, however, is to convert the nominal magnitudes into a common currency using purchasing power corrected exchange rates.

Furthermore, the share of international trade in the economy is a measure of openness. Certain features of international trade make it more suitable for taxation than domestic activities. In most Arab countries, the international trade sector is typically the most monetized sector of the economy and has gained increasing importance in recent years. Thus import and export shares could be an important determinant of tax share.

A number of studies have attempted to assess the importance of these structural features. Chelliah et al. (1975) related the tax share in GDP to various combinations of explanatory variables, using a sample of 47 countries averaged over the 1969-71 period. They obtained the best fit using the agricultural share, the mining share, and the export ratio in GDP as explanatory variables. They found that mining is positively related to the tax share while agriculture is negatively related and the export ratio is insignificant.

Updating an earlier work, Tait and Gratz (1979) used the same sample of 47 developing countries with data averaged over the 1972-76 period. Their results suggest that the Chelliah et al. specifications are appropriate, using either non-export income per capita, the share of mining, or the share of non-oil exports in GDP as explanatory variables or non-export income per capita and the share of exports in GDP as explanatory variables. They did not find the share of agriculture to be significant. Their measure of the tax effort indices also produces similar results to the earlier study.

Tanzi (1987) examined, for a sample of 86 developing countries, how the share of tax revenue in GDP is related to the logarithm of per capita income. He found a positive and significant relationship between these two. In a subsequent study, Tanzi (1992) extended his analysis to incorporate a sample of 83 developing countries over the period 1978-88. He found that the relationship between tax share and per capita income is weakened. That is to say, the hypotheses that other factors, such as macroeconomic instability, the need to service debt and the changing structure of the economy, have become more important determinants. He estimated an alternative specification that related the tax share in GDP to the agriculture share in GDP, the share of imports in GDP, the foreign debt share in GDP, and per capita income. His results showed that the share of agriculture in GDP is strongly inversely related to the tax share and its explanatory power is greater than per capita income. He also finds that import share and debt share are important determinants of tax share.

This study uses regression analysis to investigate the determinants of tax effort in Arab countries. It employs pooled time series and cross-sectional country data for 16 Arab countries for the 1994-2000 time period. One benefit of using a wide scope of Arab countries is that the sample is composed of countries that tend to have few economic characteristics in common, though among these Arab countries, there are many political, economic, and social similarities. The choice of sample is partly motivated by the need to obtain a data set where the variables can be measured in a relatively accurate, reliable and consistent manner. In addition, this study only uses ratios to GDP. GDP includes income earned locally that accumulates to non-residents and excludes income received from abroad by residents, since local income accruing to non-residents typically is taxed while remittances from abroad typically are not. Moreover, this study uses a cross-country, time-series data set, thereby taking advantage of explanatory variables that vary both by unit of observation (the country) and time.

An error component model, which allows separate country intercepts, is estimated using pooled time-series and cross-country data. This model is also known as the fixed effect model. The reason for choosing the fixed effect model is that we are interested in making inferences conditional on the effects that are in the sample (Hsiao, 1986); Greene, 1993; and Baltagi; 1996). That is to say, we are focusing on the set of Arab countries and our inference is restricted to the behavior of these Arab countries. Furthermore, following the previous empirical studies, the specification of the tax effort function is as follows:

$$Tax_{it} = A_i + B_1\, YP_{it} + B_2\, Import_{it} + B_3\, Export_{it} + B_3\, Mining_{it} + B_4\, Manu_{it} + B_5\, Agri_{it} + B_6\, Odebt_{it} + u_{it} \quad (1)$$

Where (u) is the error term, (i) denotes the country and (t) denotes the time.

The variables that presumed to determine the tax share in GDP, (Tax), are the share of agriculture, (Agri), the share of mining, (Mining), the share of manufacturing, (Manu), per capita income, (YP), converted into constant 1995 U. S. dollars, using both market exchange rates and purchasing power corrected exchange rates, the share of exports in GDP, (Export), the share of imports in GDP, (Import) and the share of outstanding foreign debts (Odebt).

## 4. The Empirical Results

The least squares estimation was used with all the variables expressed in logarithm form and serial correlation correction when necessary. The empirical model of Equation (1) was estimated for two sub-samples of the Gulf Cooperation Council (GCC) countries and non-oil Arab countries respectively and the sample of all Arab countries. However, in each case, the model was first estimated treating time and country effects as fixed and then tested for correlation of group-specific effects using the Hausman Test (1978). The Hausman test rejected the random effect specification. In this paper, only the fixed effect estimates are reported. The discussion of the findings will begin with the GCC countries sample results.

### *4-1. Results for the GCC Countries*

In this section, the result of regression equation for the six GCC countries is presented. These countries are mainly oil-based economies with very similar economic structure and a primitive tax system. They also rely heavily on oil revenues, not taxes, to finance their expenditures. The results are presented in equation (2) and Table 2.

$$Tax = A_i^* + 0.444\ YP - 0.198\ Mining \quad (2)$$

(1.67) (-1.96)

R-Square Adj.= 0.497 D.W. = 1.928 S.E.R.= 0.12 F= 240.5

* (t-Statistics are reported in the parentheses)

The results indicate that the mining share is negative and significantly related to the tax ratio while the per capita income is positive and also significant at the 10% level, in particular, the mining sector share is found to be the most

statistically significant among all the variables. All the other variables were found to be statistically insignificant and in some cases possess the wrong signs and therefore have been dropped from the estimated equation. These results are consistent with intuition for this group of countries as their economies are heavily dependent on oil revenues for national income and on public spending for economic activities and thus they lack the economic and sectoral sophistication needed for an advanced tax system. Furthermore, all the country-specific dummy variables are found to be statistically significant suggesting that factors specific to these countries (e.g., the political system; attitudes toward government; the quality of tax, customs, and other institutions of government; and commodity price shocks, etc.) are important determinants of variations in the tax share in GDP (see the detailed results in the Appendix).

For the most part, Table 2 indicates that the gap between actual tax and potential tax is wide and there is some room for increasing tax revenues via tax reform programs. The results suggest that almost all the GCC countries experienced an upward trend in their tax effort index, and all the GCC countries showed that the actual tax is lower than the potential tax, especially in UAE, Kuwait, Qatar and Saudi Arabia. These results are not uniform across the GCC as Oman and Bahrain's tax effort indices are relatively stable over the 1994-2000 period and close or slightly above unity especially in the year 2000. However, for the GCC countries that are facing a budget deficit there appears to be a need for tax reform to increase tax revenues.

### *4-2. Results for the Non-oil Arab Countries*

This group of countries includes the most diversified Arab economies such as Tunisia, Egypt, Morocco, Lebanon and Syria but also includes the poorest Arab countries such as Mauritania, Sudan and Yemen. Moreover, it includes Arab countries with sophisticated and advanced tax systems. This group also includes the three Arab countries with the highest tax ratios; namely, Tunisia, Algeria and Morocco and almost all of these countries are undertaking economic and financial reforms with the help of the IMF.

$$\begin{aligned} Tax = A_i &+ \underset{(4.61)}{0.177\ YP} + \underset{(1.68)}{0.072\ Import} + \underset{(1.72)}{0.107\ Export} \\ &+ \underset{(1.87)}{0.062\ Mining} - \underset{(-1.62)}{0.087\ Agri} + \underset{(1.76)}{0.090\ Odebt} \end{aligned} \qquad (3)$$

R-Square Adj. = 0.775 D.W. = 2.022 S.E.R.= 0.097 F= 103.0

Equation (3) and Table 3 give the result of the regression for this group of countries. The results indicate that the agricultural share is significant and inversely related to the tax ratio while the share of mining, the import share, the export share and per capita income are all positively related to the tax ratio and also statistically significant. In particular, per capita income is once more the most statistically significant among all the variables. These results are consistent with intuition, especially with regard to mining, which we expected to have a positive relation with the tax ratio. Moreover, contrary to the previously estimated equation (2), the outstanding foreign debt was found to be statistically significant and possessed a positive sign, indicating that the share of outstanding foreign debt has a positive impact on the tax ratio in the non-oil Arab countries. This result is also intuitive and may point to the impact of IMF-aided economic and financial reform programs. Moreover, the share of the manufacturing sector in the GDP was found to be statistically insignificant and was dropped from the estimated equation.

Furthermore, all the country-specific dummy variables are found to be statistically significant suggesting that factors specific to these countries are also important determinants of variations in the tax share in GDP for these countries (see the detailed results in the Appendix).

Table 3 shows that for the majority of non-oil Arab countries, the actual tax is less than the potential tax, indicating that there is room to increase actual tax revenues in line with their taxable capacity, especially in some countries such as Yemen, Egypt, Syria, Mauritania and Jordan.

These results also suggest that non-oil Arab countries with a relatively high tax share tend to have a relatively high tax index (as for example Tunisia, Algeria, Morocco and Sudan), and their tax effort indices have experienced an upward trend. Although these results are not uniform across the Arab countries (as for example, Egypt, Jordan, Syria, Mauritania and Lebanon), the tax effort indices are relatively stable over the 1994-2000 period but in some cases weakened towards the year 2000.

### *4-3. Results for all the Arab Countries*

Equation (4) gives the result of the estimation using the sample of all 16 countries, resulting in a panel data set of 112 observations.

$$\begin{aligned} Tax = Ai &+ \underset{(2.68)}{0.214\ YP} + \underset{(1.66)}{0.068\ Import} - \underset{(-1.71)}{0.089\ Export} \\ &- \underset{(-1.82)}{0.044\ Mining} - \underset{(-1.79)}{0.007\ Agri} \end{aligned} \qquad (4)$$

R-Square Adj. = 0.795 D.W. = 1.911 S.E.R.= 0.11 F= 527.4

The results indicate that the agricultural share in GDP, the mining share and the export share are negative and significantly related to the tax ratio while the

import share and per capita income are positive and also significant at the 10% level of significance. In particular, per capita income is the most statistically significant among all the variables; it is significant at the 5% level. These results are consistent with intuition with the exception of the export share, which we might have expected to have a positive relation with the tax ratio. Surprisingly, the manufacturing share in the GDP and the share of outstanding foreign debts were found to be consistently insignificant and thus were dropped from the estimated equation. Furthermore, all the country-specific dummy variables are found to be statistically significant suggesting that factors specific to the countries are important determinants of variations in the tax share in GDP (see the detailed results in the Appendix).

Table 4 shows that for the Arab countries that face a budget deficit there are needs for tax reforms and increased tax since they are not making the maximum use of their taxable capacity. With the exception of Tunisia, Algeria, and Morocco and to some extent Sudan, Lebanon and Bahrain, all other Arab countries could embark on tax reforms. The results also suggest that Arab countries with a relatively high tax share tend to have a relatively high tax index, though these results are not uniform across the Arab countries. The tax effort indices are generally unstable over the 1994-2000 period, though almost all the Arab countries have an upward trend.

**5. Conclusions**

The results of this study should be taken on the context of the main purpose of the study, namely, the comparison of tax effort across Arab countries in order to reveal whether an Arab country is limited in its revenue collections by a low capacity to generate revenues or by an unwillingness to use the available tax capacity to finance public expenditures. Therefore, we should be careful in interpreting these results and their policy implications, as the model does not take a full account of the country specific factors such as the political system; attitudes toward government; the quality of tax administration, customs, and other institutions of government; and commodity price shocks, etc. The estimation results showed that these factors are highly significant in all the estimated equations and this may partially explain the Hausman test rejection of the random effect specification.

Moreover, the results suggest that the main determinants of the tax share in the GDP for the Arab countries are the per capita income, the share of agriculture in GDP and the share of mining in GDP. These variables are statistically significant and possessed the expected signs. Other variables that are also important determinants are the share of exports and imports and only in the non-oil Arab countries, the outstanding foreign debt was found significant and positively related to the tax share.

Finally, some Arab countries have substantially increased their tax effort in recent years while others have experienced marked declines. The measures of tax effort do, however, have implications for fiscal policies in the event of a budgetary imbalance. Arab countries with relatively low indices of tax effort, especially those of the GCC, are not limited in their tax revenue coefficients by a low capacity to generate revenues and may wish to place greater emphasis on increasing tax revenues rather than on rationing expenditures. With the exception of Tunisia, Algeria and Morocco and to some extent Sudan and Lebanon, all other Arab countries could undertake a tax reform program in order to increase their tax revenues.

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**Table 1: Arab Countries: Tax Revenue (% of GDP)**

| Country | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Ave. |
|---|---|---|---|---|---|---|---|---|
| Algeria | 27.1 | 29.0 | 30.7 | 31.7 | 32.2 | 32.8 | 33.3 | 31.0 |
| Bahrain | 7.4 | 7.7 | 7.8 | 6.5 | 8.8 | 8.7 | 8.9 | 8.0 |
| Egypt | 22.6 | 21.1 | 17.5 | 16.5 | 17.6 | 18.6 | 19.4 | 19.1 |
| Jordan | 20.7 | 20.5 | 21.4 | 18.9 | 19.6 | 20.2 | 22.6 | 20.5 |
| Kuwait | 1.2 | 1.1 | 1.1 | 1.2 | 1.4 | 1.0 | 1.1 | 1.1 |
| Lebanon | 10.8 | 11.6 | 14.1 | 12.6 | 13.5 | 14.3 | 15.1 | 13.1 |
| Sudan | 4.8 | 6.5 | 5.9 | 5.8 | 6.5 | 6.8 | 6.8 | 6.2 |
| Mauritania | 17.9 | 17.0 | 17.5 | 18.3 | 16.6 | 16.5 | 19.1 | 17.6 |
| Morocco | 23.8 | 23.3 | 23.8 | 27.4 | 29.1 | 30.7 | 31.5 | 27.1 |
| Oman | 7.1 | 7.4 | 7.5 | 8.8 | 6.8 | 7.50 | 10.1 | 7.9 |
| Qatar | 0.97 | 0.98 | 0.98 | 0.98 | 1.0 | 1.1 | 1.1 | 1.0 |
| Saudi Arabia | 4.2 | 3.4 | 3.4 | 3.7 | 3.6 | 3.7 | 3.7 | 3.8 |
| Syria | 17.5 | 18.6 | 15.6 | 16.3 | 16.7 | 17.0 | 18.0 | 17.1 |
| Tunisia | 25.0 | 25.0 | 24.8 | 27.6 | 30.8 | 33.7 | 36.4 | 29.1 |
| UAE | 1.2 | 1.3 | 1.5 | 1.7 | 1.8 | 2.0 | 2.1 | 1.7 |
| Yemen | 9.4 | 8.7 | 10.8 | 10.9 | 13.2 | 9.7 | 9.7 | 10.3 |
| Average | 12.6 | 12.7 | 12.8 | 13.1 | 13.7 | 14.1 | 14.9 | - |

**Table 2. GCC Countries: Tax Effort Index**

| Country | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|
| Bahrain | 0.900 | 0.919 | 1.003 | 0.811 | 1.006 | 1.016 | 1.017 |
| Kuwait | 0.889 | 0.883 | 0.917 | 0.921 | 0.929 | 0.928 | 0.919 |
| Oman | 0.915 | 0.955 | 0.964 | 0.934 | 0.863 | 0.947 | 1.012 |
| Qatar | 0.905 | 0.914 | 0.915 | 0.936 | 0.960 | 0.915 | 0.928 |
| Saudi Arabia | 0.820 | 0.888 | 0.897 | 0.972 | 0.942 | 0.970 | 0.977 |
| UAE | 0.754 | 0.866 | 0.965 | 0.937 | 0.919 | 0.925 | 0.950 |

**Table 3. Non-Oil Arab Countries: Tax Effort Index**

| Country | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|
| Algeria | 1.043 | 0.925 | 1.012 | 1.009 | 1.003 | 1.065 | 1.090 |
| Egypt | 1.047 | 1.041 | 1.023 | 0.917 | 0.858 | 0.867 | 0.935 |
| Jordan | 1.027 | 1.073 | 1.057 | 1.081 | 0.936 | 0.945 | 0.948 |
| Lebanon | 1.056 | 0.937 | 0.996 | 1.060 | 0.940 | 0.997 | 1.041 |
| Mauritania | 1.034 | 1.003 | 0.970 | 1.004 | 1.019 | 0.934 | 0.952 |
| Morocco | 0.966 | 0.879 | 0.859 | 0.874 | 1.014 | 1.062 | 1.103 |
| Sudan | 1.070 | 0.940 | 1.098 | 1.068 | 0.967 | 1.020 | 1.012 |
| Syria | 1.015 | 1.024 | 1.014 | 0.898 | 0.941 | 0.955 | 0.966 |
| Tunisia | 0.894 | 0.878 | 0.858 | 0.843 | 0.948 | 0.997 | 1.094 |
| Yemen | 1.041 | 1.007 | 0.904 | 1.022 | 0.996 | 1.034 | 0.908 |

**Table 4. Arab Countries: Tax Effort Index**

| Country | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|
| Algeria | 0.920 | 1.007 | 0.997 | 1.006 | 1.049 | 1.070 | 1.140 |
| Bahrain | 0.987 | 0.956 | 1.007 | 0.807 | 1.076 | 1.049 | 1.089 |
| Egypt | 1.049 | 1.038 | 0.921 | 0.855 | 0.868 | 0.927 | 0.957 |
| Jordan | 1.039 | 1.025 | 1.075 | 0.939 | 0.957 | 0.981 | 0.985 |
| Kuwait | 0.915 | 0.942 | 0.940 | 0.909 | 0.921 | 0.911 | 0.900 |
| Lebanon | 0.945 | 0.990 | 1.046 | 0.942 | 0.994 | 1.041 | 1.051 |
| Mauritania | 0.990 | 0.948 | 0.990 | 1.014 | 0.941 | 0.957 | 0.971 |
| Morocco | 0.872 | 0.860 | 0.849 | 1.005 | 1.055 | 1.029 | 1.196 |
| Oman | 0.907 | 0.943 | 0.949 | 1.001 | 0.890 | 0.943 | 1.006 |
| Qatar | 0.839 | 0.857 | 0.899 | 0.934 | 0.922 | 0.915 | 0.918 |
| Saudi Arabia | 0.883 | 0.889 | 0.892 | 0.971 | 0.960 | 0.971 | 0.971 |
| Sudan | 0.944 | 1.014 | 1.026 | 0.973 | 0.997 | 1.011 | 1.025 |
| Syria | 1.049 | 1.089 | 0.897 | 0.936 | 0.961 | 0.985 | 1.046 |
| Tunisia | 0.901 | 0.882 | 0.853 | 0.963 | 1.026 | 1.118 | 1.134 |
| UAE | 0.721 | 0.832 | 0.932 | 1.023 | 1.004 | 1.005 | 1.007 |
| Yemen | 0.971 | 0.901 | 1.082 | 1.023 | 1.068 | 0.920 | 0.921 |

**Appendix:**

**1- Results of Equation (2)**

LS // Dependent Variable is LTAXES
Date: 04/09/02 Time: 11:51
Sample (adjusted): 1 42
Included observations: 41 after adjusting endpoints
Convergence achieved after 14 iterations

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| BAH | -1.4492 | 1.032228 | -1.7131 | 0.0809 |
| KUW | -3.4022 | 2.012281 | -1.6907 | 0.1006 |
| OMAN | -1.13 | 1.02197 | -1.6202 | 0.0953 |
| QATR | -3.6644 | 2.084081 | -1.7583 | 0.0883 |
| SUDI | -1.8888 | 1.034212 | -1.8298 | 0.0708 |
| UAE | -3.2247 | 2.011577 | -1.9272 | 0.0657 |
| LYP | 0.444155 | 0.265883 | 1.670495 | 0.0946 |
| LMING | -0.1983 | 0.204801 | -1.9684 | 0.0601 |

| | | | |
|---|---|---|---|
| R-squared | 0.597264 | Mean dependent var | 0.985067 |
| Adjusted R-squared | 0.49658 | S.D. dependent var. | 0.866118 |
| S.E. of regression | 0.123852 | Akaike info criterion | -3.9861 |
| Sum squared resid. | 0.490861 | Schwarz criterion | -3.61 |
| Log likelihood | 32.53945 | F-statistic | 240.5209 |
| Durbin-Watson stat | 1.928224 | Prob(F-statistic) | 0 |

**2- Results of Equation (2)**

LS // Dependent Variable is LTAXES
Date: 04/09/02 Time: 12:03
Sample (adjusted): 43 112
Included observations: 69 after adjusting endpoints
Convergence achieved after 23 iterations

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| BAH | 0.635595 | 0.45832 | 1.519244 | 0.094 |
| KUW | -1.5298 | 0.413157 | -3.7028 | 0.002 |
| OMAN | 0.604994 | 0.387292 | 1.455957 | 0.0998 |
| QATR | -1.7229 | 0.46512 | -3.1709 | 0.0028 |
| SUDI | -0.1686 | 0.079768 | -1.8001 | 0.073 |
| UAE | -1.1096 | 0.551399 | -2.0126 | 0.076 |
| TUNS | 2.236735 | 1.30441 | 1.714748 | 0.0899 |
| LEBN | 1.196625 | 0.363961 | 3.87732 | 0.0027 |
| SYRI | 1.7575 | 1.218109 | 1.442809 | 0.1026 |
| ALGR | 2.177308 | 1.206699 | 1.804351 | 0.0746 |
| JORD | 1.950707 | 1.241114 | 1.571738 | 0.1096 |
| EGPT | 1.753999 | 1.075536 | 1.630844 | 0.0893 |
| MORC | 2.275072 | 1.222384 | 1.861176 | 0.0761 |
| SUDN | 0.99375 | 0.50263 | 1.946191 | 0.0662 |
| MAURT | 2.07026 | 1.132296 | 1.828374 | 0.0709 |
| YEMN | 1.516203 | 1.010126 | 1.576857 | 0.092 |
| LYP | 0.213879 | 0.079844 | 2.678737 | 0.0487 |
| LIMPRT | 0.067586 | 0.040681 | 1.6612 | 0.081 |
| LEXPRT | -0.09 | 0.050252 | -1.7136 | 0.0746 |
| LAGRI | -0.0074 | 0.004184 | -1.7917 | 0.0729 |
| LMING | -0.0435 | 0.023718 | -1.8296 | 0.0724 |

| | | | |
|---|---|---|---|
| R-squared | 0.827053 | Mean dependent var | 2.853812 |
| Adjusted R-squared | 0.774842 | S.D. dependent var. | 0.488134 |
| S.E. of regression | 0.097628 | Akaike info criterion | 4.443293 |
| Sum squared resid. | 0.495623 | Schwarz criterion | 3.892861 |
| Log likelihood | 72.38685 | F-statistic | 102.9976 |
| Durbin-Watson stat | 2.021883 | Prob(F-statistic) | 0 |

**3- Results of Equation (4)**

LS // Dependent Variable is LTAXES
Date: 04/09/02 Time: 10:24
Sample (adjusted): 1 112
Included observations: 112 after adjusting endpoints
Convergence achieved after 11 iterations

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| BAH | 0.635595 | 0.45832 | 1.519244 | 0.094 |
| KUW | -1.5298 | 0.413157 | -3.7028 | 0.002 |
| OMAN | 0.604994 | 0.387292 | 1.455957 | 0.0998 |
| QATR | -1.7229 | 0.46512 | -3.1709 | 0.0028 |
| SUDI | -0.1686 | 0.079768 | -1.8001 | 0.073 |
| UAE | -1.1096 | 0.551399 | -2.0126 | 0.076 |
| TUNS | 2.236735 | 1.30441 | 1.714748 | 0.0899 |
| LEBN | 1.196625 | 0.363961 | 3.87732 | 0.0027 |
| SYRI | 1.7575 | 1.218109 | 1.442809 | 0.1026 |
| ALGR | 2.177308 | 1.206699 | 1.804351 | 0.0746 |
| JORD | 1.950707 | 1.241114 | 1.571738 | 0.1096 |
| EGPT | 1.753999 | 1.075536 | 1.630844 | 0.0893 |
| MORC | 2.275072 | 1.222384 | 1.861176 | 0.0761 |
| SUDN | 0.99375 | 0.50263 | 1.946191 | 0.0662 |
| MAURT | 2.07026 | 1.132296 | 1.828374 | 0.0709 |
| YEMN | 1.516203 | 1.010126 | 1.576857 | 0.092 |
| LYP | 0.213879 | 0.079844 | 2.678737 | 0.0487 |
| LIMPRT | 0.067586 | 0.040681 | 1.6612 | 0.081 |
| LEXPRT | -0.09 | 0.050252 | -1.7136 | 0.0746 |
| LAGRI | -0.0074 | 0.004184 | -1.7917 | 0.0729 |
| LMING | -0.0435 | 0.023718 | -1.8296 | 0.0724 |

| | | | |
|---|---|---|---|
| R-squared | 0.833915 | Mean dependent var | 2.157280 |
| Adjusted R-squared | 0.794726 | S.D. dependent var. | 1.117100 |
| S.E. of regression | 0.110383 | Akaike info criterion | 4.230750 |
| Sum squared resid. | 1.072219 | Schwarz criterion | 3.690654 |
| Log likelihood | 98.60804 | F-statistic | 527.4163 |
| Durbin-Watson stat | 1.911150 | Prob(F-statistic) | 0 |

**Equation (2)**

Actual: TAXES — Forecast: TAXESF
Sample: 2 112 — Include observations: 110

| | |
|---|---|
| Root Mean Squared Error | 0.101252 |
| Mean Absolute Error | 0.082693 |
| Mean Absolute Percentage Error | 22.93774 |
| Theil Inequality Coefficient | 0.024198 |
| Bias Proportion | 0.000855 |
| Variance Proportion | 0.002193 |
| Covariance Proportion | 0.859504 |

**Equation (3)**

Actual: TAXES — Forecast: TAXESF
Sample: 2 112 — Include observations: 110

| | |
|---|---|
| Root Mean Squared Error | 0.138748 |
| Mean Absolute Error | 0.096106 |
| Mean Absolute Percentage Error | 32.14147 |
| Theil Inequality Coefficient | 0.107466 |
| Bias Proportion | 0.001576 |
| Variance Proportion | 0.001325 |
| Covariance Proportion | 0.997099 |

**Equation (4)**

Actual: TAXES — Forecast: TAXESF
Sample: 2 112 — Include observations: 110

| | |
|---|---|
| Root Mean Squared Error | 0.103582 |
| Mean Absolute Error | 0.080496 |
| Mean Absolute Percentage Error | 21.54140 |
| Theil Inequality Coefficient | 0.021345 |
| Bias Proportion | 0.000011 |
| Variance Proportion | 0.000397 |
| Covariance Proportion | 0.999592 |