Economic Growth and Fiscal Policy in Selected MENA Countries.

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Introduction:

Government activities in MENA is not confined to its classical functions, that is, maintaining the rule of law and security, supplying (public) goods that the market does not optimally supply, substituting the market when it fails, financing poverty reduction schemes and social programs, and investing in basic infrastructure. Governments in developing countries, and in particular MENA, profess to be also an agent of growth and development, in part to justify and legitimize their extensive control over economic resources and the political power that emanates from it. MENA countries, as a group, have the highest fiscal ratios, most notably government revenue/GDP and government expenditure/GDP ratio in the world. The proportion of *total revenue* in GDP in MENA countries, as a group, is the highest in the world. Total revenue to GDP ratio in MENA countries averaged 31.5 per cent during 1980-1995, compared to 19 per cent in developing countries and 21 per cent in industrial countries during the same period.[1] These are indications of the leading role and position of the state in the economy in MENA, an observation that applies to both oil exporting and non-oil exporting countries in MENA.[2] The share of government expenditures in GDP is quite large even in non-oil countries like Morocco and Tunis with no significant oil revenue. MENA countries tend to allocate a large share of government expenditures to capital expenditures compared to both developing and developed countries.[3] The above observations indicate the important role of governments in MENA countries in funding capital accumulation and development finance through the government budget. The important question is to find out how fiscal variables influence economic growth in some selected MENA countries for which we have a sufficiently long time-series data, and to test if these variables have effects similar to those identified in other cross section studies.

In this paper, we intend to provide a brief review of the literature on fiscal policy and growth. In this connection, the impact of public finance variables on the growth rate of output in several growth models will be examined and reviewed. Furthermore, we shall test the effect of fiscal variables, such as government expenditures, taxes, and government investment on economic

[1] See Eken, Helbling, and Mazarei (1997) for more details.
[2] See Jalali-Naini (2000) for more details regarding the fiscal ratios in MENA compared to other regions of the world economy.
[3] Turkey is an exception, however, it is no longer officially a MENA country.

growth for Egypt, Iran, Tunis, and Morocco. The last section of the paper contains a summary of the findings and some policy conclusions.

1. Fiscal Policy and Economic Development

Although a crucial policy matter, perceptions regarding the role of fiscal policy in development finance and economic growth has changed considerably over the last four decades. In the three decades following the WW II development economics and development policy was primarily focused on ways to boost the national saving rate to finance capital accumulation. Raising the share of taxes in GDP was a strategy to mobilize resources to finance a higher investment/GDP rate; to launch a public-investment led growth process. This Keynesian "big-push" thinking could be easily knotted to a neo-classical growth model to show the positive impact of a higher tax-financed rate of capital accumulation on the transitional dynamics of per capita output. Enhancing taxable capacity in developing countries was an important policy objective during this period. In the context of a simple Phelps-Shell type growth model, it can be shown that an increase in the tax ratio to finance a higher government investment rate will result in a higher capital per worker and per capita income (Bartsch and Tolkemitt 1989). The insight some pioneers in development finance had in mind (Nurkse 1953) were not to obtain "big-push" results from neo-classical growth models. Rather, how taxation can substitute an underdeveloped credit/money market to fund more investment. Under funding and rationing by a rudimentary financial market with costly information was later shown to be pervasive (Stiglitz and Weis 1981, Stiglitz 1994). When asymmetric information exists, moral hazard and adverse selection problems can result in credit rationing, because the riskiness of projects and individual borrowers cannot be determined a priori. The implied market failure and under-funding of investment projects were thought to be rectifiable by reallocation of savings to the public sector through a higher tax ratio. It was implicitly assumed that positive externalities of a higher investment rate (Rosenstein-Rodan 1943) financed in this fashion outweighed distortion effect of taxes. Development thinking up to the early 1970s reflected this general view but did not have the policy-friendly endogenous growth models in their arsenal to deliver the point pin more convincingly. Although the emergence and popularity of AK and endogenous growth models (Lucas 1988, Roemer 1986, and Barro 1995) since mid-1980s have made the case for raising saving, investment, and policy intervention more potent, structural adjustment policies disfavored government-financed "big-push" strategy. This was partly a reaction to over expansion of government activity and huge budget deficits during the early 1970-mid 1980s[4], and inferior growth and inflation performance compared to the previous two decades. Higher tax/GDP ratio became of interest for a different reason: monetary stability and control of inflation. In fact, policy targets for the tax ratio became a part of IMF supported stabilization (Tanzi 1990).

Interest regarding the effect of the size of the government, as measured by the share of government expenditure in GDP (G/GDP), motivated a number of papers on this subject. Early large-sample empirical studies tended to support the orthodox position. Ram (1986) studied the effect of the size of government on economic growth for 115 countries for the 1960-80 period. He found that although a higher rate of increase in G is associated with a higher growth rate, a higher share of government expenditure in GDP dampens growth. Ram's findings were sensitive to his model's assumptions. In his model the type of government expenditures (consumption versus investment) is not differentiated, the government activity is assumed to always have a positive external effect on private activities[5], and the potential adverse effect of higher taxation (to finance higher expenditures) on growth is not allowed. Dudley and Montmarquette (1991) extend Ram's model by allowing three production functions.[6] Private activities are specified in the form of two distinct production functions, one for production of domestic goods (N) and the other for exportables (X). Public-goods production by the government (S) positively affects private activities. Non public-good production activities by the government (A) negatively affect private production of N and X (therefore, X_s, $N_s >0$, X_A, $N_A<0$). Moreover, it is assumed that government activities have a negative effect on private investment efficiency, resulting in a lower growth rate. This allowance was

[4] The share of government expenditure and the budget deficit in GDP grew significantly during the late 1970s and the early 1980s in Egypt, Iran, Morocco, and Tunis. These ratios declined during the late 1980s and the early 1990s, an experience similar to a number of developing countries in other regions of the world. For more details see Jalali-Naini (2000) and Eken et al (1997).

[5] In Ram's model a private (Y) and a government (G) production function is assumed. These functions are specified in terms of capital and labor in each sector, thus $Y=f(K_p, L_p, G)$ and $G=G(K_g, L_g)$, where K and L are the labor and capital inputs. Note that G in the private production function has a positive external effect on Y.

[6] $S=S(K_s, L_s)$, $X=X(K_x,L_x, S, A)$, and $N=N(K_s, L_s, X, S, A)$, hence S enters as external effect in production of exportables and X and A enter as external effects in production of non-traded goods.

made by the assertion that dK/dt=I-γG. Both, S and A enter private production functions and are specified to have positive and negative externalities. The reduced form solution of the model relates the growth rate of output (g) to the ratio of investment to GDP (I/Y); the growth rate of growth of the labor (n); the growth rate of exports (g_x) weighted by share of exports in GDP (X/Y); and government expenditure to GDP ratio as in (1).

$$g = \beta_1.\frac{I}{Y} + \beta_2(n) + \beta_3.(g_x)\frac{X}{Y} + (b.(\frac{G}{G}) - \beta_1.\gamma).\frac{G}{Y} \qquad (1)$$

Where b is equal to (1-a)(X_s + N_s)+a (X_A + N_A), and (1-a) is equal to the share of government expenditures used in public goods production. The sign of the last term in (1) is dependent on the coefficient of the share of public expenditures in GDP. For a sample of fifty countries and for the 1970-75 and 1975-1980 period, G/Y was found to have a negative sign.

2-Growth Theory and Fiscal Variables

Government activity affects production and growth via several distinct channels. The most obvious channel is direct public investment in production of goods and services, a situation in which public and private capital become close substitutes. Government expenditures can also affect growth through its effect on the economy-wide level productivity, and also by investment in production of public goods with complementary effect on private productive activity. In the first part of this section we discuss a very simple model where public and private capital are substitutes and examine how allocation between consumption and investment activities by government can affect growth.

A production function relating output (Y) to factor inputs (K and L) and homogeneous of degree one with respect to factor inputs is assumed (1).[7] Labor force grows at a constant exogenous rate (n). Government levies a fixed tax rate on output (τ) and raises per capita tax equal to τ.f(k). Private savings per capita is defined as s=i_P +b, where b is equal to the government budget deficit per capita (2) and is equal to the difference between

[7] It is also assumed that $f'(k)>0$, $f''(k)<0$, $f'(k)_{\rightarrow 0}=\infty$, and $f'(k)_{\rightarrow\infty}=0$.

government expenditures per capita (g) plus interest payments on public debt (m) less total taxes per capita.

$$Y=F(K, L), \quad y=f(k), y=Y/L, k=K/L \qquad (1)$$

$$b= g+m-\tau.[f(k)+m] \qquad (2)$$

Assuming that short-term debt and equity are perfect substitutes, interest on short-term debt is equal to the marginal product of capital ($r=f'(k)$). This allows us to equate public interest payments with r φ, where φ is equal to public debt per capita. Note that b is equal to the time rate of change of the stock of public debt (D), hence $b=d(D)/dt =d(\varphi)/dt + n\varphi$. In steady state where all variables growth at the natural rate (n), $d(\varphi)/dt=0$ so $b= n\varphi$. The government budget constraint (2) can be rewritten as (3).

$$b=g+r\varphi - \tau.[f(k)+r\varphi] \qquad (3)$$

Disposable income is equal to $(1-\tau).[f(k)+r\varphi]$. Private savings per capita (s_P) in descriptive models of growth (Solow-Swan) is a fixed fraction (s) of disposable income. From (2) we can express private saving per capita as

$$s_P =s.[f(k)+b-g] \qquad (4)$$

If private and public investments are perfect substitutes, then the rate of accumulation of physical capital is additive and equal to

$$d(k)/dt=dk_P /dt + dk_G/dt + nk_P + nk_G \qquad (5)$$

Government investment per capita (i_G) is defined as expenditures per capita less government consumption per capita ($g-c_G$). Assuming that government consumption is a policy parameter such that $c_G=\alpha g$, then the capital formation differential equation for the economy, allowing for a constant rate of depreciation of capital (δ), is

$$dk/dt=s.[f(k)+b-g]+g(1-\alpha)-(n+\delta) (k_P + k_G)-b \qquad (6)$$

A lower value of α, other things being the same, results in a higher rate of capital accumulation and a temporary increase in growth. In long-run equilibrium (steady state) where $dk/dt=0$ and all variables grow at n, the level of capital intensity and output per capita will rise. When f(k) has the properties that $f'(k)>0$ and $f''(k)<0$ and obeys Inada conditions long-run growth rate effect is zero. However, if the production function is not subject to diminishing returns, as in an AK model, the social saving rate becomes an important determinant of long-run growth.[8] Hence, a lower government consumption ratio results in a higher short run and long run growth. A higher per capita government expenditure with constant government consumption and a constant budget deficit financed by tax results in a higher rate of capital accumulation. Since we have not introduced labor/leisure tradeoffs into the model taxes do not have real effects. A higher government investment financed by government debt does not change the level of k since public capital completely crowds out private capital, and hence there is no steady state effect on the level of capital intensity.

The effect of fiscal policy on growth can also be examined for transfer payments. Intergenerational transfers that are effectuated through social security payments can have a significant impact on aggregate savings and economic growth. In the overlapping generation (OG) models (Diamond 1965), social security tax is a mechanism to correct the problem of dynamic inefficiency[9] due to over-saving. This is done through transferring income from the working generation (who save) to the "old" (who consume). In many developing countries, the problem is not over-saving but under-saving. This has the potential of leaving them at a low-income steady-state (or low-level equilibrium trap). Jalali-Naini and Ghorashi (1998) show that due to the possibility of multiple equilibria in an OG model, economies with low saving can be trapped at a low-income steady-state. However, for given initial values of capital per worker, one can compute the magnitude of intergenerational transfer necessary to launch the economy on a transitional path to a high-income steady state, at the golden rule level of per capita capital.[10] This policy reduces the short-run consumption of the "old". However, in the long run it can increase the consumption of both "young" and "old" generations.

2.1. Fiscal Policy, Public Goods and Growth

[8] In a Solow-Swan setting only technical progress can affect long-run growth and the saving rate only influences transitional growth.
[9] A saving rate higher than necessary to set the steady-state capital per worker at the golden-rule level.
[10] Calibrating the model with reasonable production function elasticities, discount rate, and population growth rate results in well-behaved convergence properties.

A number of studies consider government expenditures (or capital investment) to be complementary, not a substitute, for private investment, and examine the effect of government expenditures on growth in this light (Barro 1990, Barro and Salai-Martin 1992). Given the above general remarks, the effect of government on the private economy can be approached in two ways. The more traditional approach assumes that government expenditure (G)--which is also taken to be a proxy for the size of the government--results in the provision of nonrivalrous and nonexcludable public services to the economy. These government-financed services are complementary to private factor inputs, hence positively affect their marginal products. These effects can be modeled within an endogenous growth model. Following Barro (1990) we assume that the representative agent has a concave continuous utility function obeying Inada conditions as in (7), where c is consumption per capita and ρ is a discount factor. Household budget constraint relates per capita asset accumulation (here k_i) to the sum of the income from labor and interest income less consumption. The economy is populated with competitive producers. Each firm utilizes services financed by government expenditure (G) in its production function (8). The aggregate labor force is assumed fixed as well as the tax rate τ. Given the restriction on the parameters of the production function, production for each firm exhibits constant returns to scale in private inputs. With a fixed G, the economy experiences diminishing returns with respect to the aggregate capital stock (K). However, when G rises with K, the production function exhibits constant returns in K_i and G for a constant L_i. For a balanced budget we have $G=\tau.Y$, where τ is a fixed tax rate on output. Utility maximization by households yields the Euler's condition (9), which determines households' equilibrium consumption choice over time. In (9) g_c is the equilibrium growth and θ is the elasticity of intertemporal substitution. Profit maximization by firms determines factor prices that are paid to households. Firms' after-tax profits can be written as in (10), where $r+\delta$ is the rental rate and w is the wage rate. After-tax marginal product of capital (assuming $k_i=k$) is given by (11). By combining (10) and (11), and noting that from (8) and balanced budget condition we can obtain $G= k(\tau AL)^{1/\alpha}$, the growth rate (g) can be found as in (12). The effect of government expenditures on the rate of growth is positively related to $(G/Y)^{(1-\alpha/\alpha)}$ in (12) and negatively related to $(1-\tau)$. At low values of G/Y the positive effect of a higher G on the marginal product of capital dominates the negative distortionary effect of taxes. As G/Y and hence the tax rate (τ) increases the distortive effect of taxes becomes larger, the growth rate reaches a peak and then declines. The maximum growth rate--where $\partial g/\partial(G/Y)=0$—is $G/Y=1-\alpha$, which is the efficiency condition for G. If public expenditure (e.g. in infrastructure) is complementary to private investment, the marginal product of private capital increases and so does the rate of economic growth, up to a maximum. Thus one would expect government expenditure to have a negative effect on growth if G is too large relative to GDP and have no effect on growth when it is at the optimal level. With the budget balance assumption that G=τY, the same can be extended to taxes.

$$U = \int_0^\infty \left[\frac{c^{(1-\theta)}-1}{(1-\theta)}\right] e^{-\rho t}dt, \qquad (7)$$

$$Y_i = AL_i^{1-\alpha}K_i^{\alpha}G^{1-\alpha} \quad , \quad 0 \prec \alpha \prec 1 \qquad (8)$$

$$g_c = dc/c = (1/\theta)(r-\rho) \qquad (9)$$

$$L_i[(1-\tau)Ak_i^{\alpha}G^{1-\alpha} - w - (r+\delta)k_i] \qquad (10)$$

$$(1-\tau)\partial Y_i/\partial K_i = \alpha A^{1/\alpha}[(G/Y)]^{(1-\alpha)/\alpha}(1-\tau) = r+\delta \qquad (11)$$

$$g = (1/\theta).[\alpha\ A^{1/\alpha}.(L(G/Y))^{(1-\alpha)/\alpha}.(1-\tau)-\delta-p] \qquad (12)$$

The above prototype model can also be set up for "social planner." The basic ingredient for a "social planner" problem is the same utility function and production function as (7) and (8) and the capital accumulation (resource) constraint.[11] In fact, the "planner" solution results in a higher growth rate. The main distortion in the decentralized model is a tax on output, which creates a wedge between private and social marginal product of capital, with

[11] The resource constraint of the planner is dK/dt=Y-C-G-δK, which sets the rate of private accumulation equal to the net savings.

the latter being larger than the former. The "planner" can set the ratio of government expenditures (G/Y) to 1- α for optimal provision of public goods. The growth maximizing government expenditure can be financed by a lump-sum consumption tax. Since in this model labor supply decision is not modeled, the switch in taxes could result in a higher growth rate, and a first best solution under a competitive decentralized setting can be obtained.

For oil-exporting countries in MENA one can observe episodes of fiscal expansion without a proportional increase in taxation. A limitation of the above model is that it assumes tax-financed government expenditures. However, the long-run balanced budget constraint in this model can be amended to include oil revenues. In such a case the long-run finance constraint is $\tau.Y=G+OR$, where OR is defined as oil revenues. The growth maximizing level of G in this case is approximated by (13).[12] Note that, since oil revenues do not have the distortionary effect of taxes but they can finance production of public goods, other things being equal, they have a positive effect on growth.[13] Thus one would not expect a negative effect from oil-financed increases in the share of government revenue in GDP on growth via the above channel. However, oil-financed expansionary fiscal policy might affect growth rate due to other reasons. For instance, rent-seeking activities are likely to increase in oil-boom times. Also, certain unproductive expenditures, such as military spending, tend to increase during such periods. These tend to dampen growth-inducing effects of government spending.

$$Log(g) \approx \alpha[Log(1-\tau) + Log(\tau)] + \gamma Log(OR) \qquad (13)$$

Cashin (1994 and 1995) extends the endogenous growth model of Barro and Salai-Martin 1992 by including the effect of the *stock* of public capital on growth, which is determined endogenously in this model. This model bears features similar to Barro and Salai-Martin (1992), i.e. a constant intertemporal elasticity of substitution utility function similar to (7) and a congestion model of public goods. With congested public services, it is assumed that for a given quantity of aggregate public services (G), the

[12] For the derivation of this result see Nili and Amid 1999.
[13] The optimal government size that maximizes growth rate was estimated to be 15 per cent in Iran (Nili and Amid 1999).

quantity accessible to an individual producer declines as other users congest the facilities (e.g. highway and water systems). In contrast to Barro and Salai-Martin (1992) which enter public input *flow* to private production, Cashin considers the *stock* of public inputs. It is assumed that the production function is specified in terms of the ratio of the stock of public capital to the aggregate private capital stock (G/K) and the ratio of aggregate public transfer payments to the aggregate private capital stock (T/K). Each household producer has a per capita output production function as in (14). A is the level of technology, k is per capita private capital stock, and α and β are the elasticities of output with respect to the ratio of public to private capital and transfer payments to private capital ratio, respectively. N is the constant number of household-producers in the economy such that Nk=K. Moreover, y is homogenous of degree one with respect to k(t), for a given ratio of G/K and T/K or the state of congestion use of private capital and transfer payments. The aggregate production (Ny=Y) function exhibits constant returns to K, G, and T, and diminishing returns to K with a fixed level of G and T because of increases in the congestion use of public resources. Moreover, y is homogenous of degree one with respect to k(t) for a fixed quantity ratio of G and T to private capital or a given state of congestion. Cashin (1994) obtains the growth rate of output in this model which is increasing in public investment and transfer payments per unit of output and decreasing in the ratio of current (non-lump sum taxes) revenue to GDP.[14] In addition to the effect of taxes, this model delivers some results

[14] The constraint to the private optimization problem is the private capital accumulation equation (f.1), which is equal to the private after-tax income minus consumption. The constant marginal (average) tax rate on output to finance government investment expenditures is τ_1, and τ_2 is the constant tax rate applied to finance transfer payments. The public capital accumulation equation is given by (f.2), and (f.3) is the equation describing the flow of transfer payments. Individuals maximize their utility subject to (f.1) and take fiscal variables, τ_1, τ_2, T(t)/K(t), G(t)/K(t), and dG(t)/dt as given policy variables. These equations plus the utility function yield the Hamiltonian in (f.4) for the derivation of the first order conditions and the growth rates of private and public capital stock, private consumption, which in steady state are all equal to the rate of growth of output (Cashin 1994).

similar to Barro(1990). For instance, for a Cobb-Douglas production technology, the size of G and T that maximizes the growth rate is equal to their respective share in output, if they were private inputs in a competitive market. If some public goods are not directly productive then the size of the government should be less than its share in aggregate income. Moreover, if the production function is not approximated by a CD technology, the utility maximizing government will set a rate of growth which is less than the maximum, and hence one would expect to see a positive effect by government investment on growth.

$$y(t) = Ak(t)\left[\frac{G(t)}{K(t)}\right]^{\alpha}\left[\frac{T(t)}{K(t)}\right]^{\beta} \qquad (14)$$

3. Empirical Studies of Fiscal Policy and Growth:

Research interest on the impact of taxes and government expenditures on growth in the recent years has been strong. There is no widely followed theoretical or empirical model of fiscal policy and growth. Depending on the availability of data and the particular interest of the researchers different frameworks have been built and tested. Empirical studies of the impact of fiscal policy on growth can be divided into several groups. Those studies that focus on the effect of the size of the government on growth, e.g. Ram,

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$$dk(t)/dt) = (1-\tau_1-\tau_2)Ak(t)\left\{\left[\frac{G(t)}{K(t)}\right]^{\alpha}\left[\frac{T(t)}{K(t)}\right]^{\beta}\right\} - c(t) \qquad (f.1)$$

$$dG(t)/dt = \tau_1 ANk(t)\left\{\left[\frac{G(t)}{K(t)}\right]^{\alpha}\left[\frac{T(t)}{K(t)}\right]^{\beta}\right\} \qquad (f.2)$$

$$T(t) = \tau_2 ANk(t)\left\{\left[\frac{G(t)}{K(t)}\right]^{\alpha}\left[\frac{T(t)}{K(t)}\right]^{\beta}\right\} \qquad (f.3)$$

$$H[k(t),\lambda(t),c(t),t] = e^{-rt}[(c(t)^{1-\theta}-1)/(1-\theta)]$$
$$+\lambda(t)[1-\tau_1-\tau_2)Ak(t)(G(t)/K(t))^{\alpha}(T(t)/K(t))^{\beta} - c(t)] \qquad (f.4)$$

Dudley, and Barro's work mentioned previously. Empirical studies that examine the influence of the composition of government expenditure (consumption and investment) on growth. Studies that consider the effect of the type of expenditures and taxes (infrastructure, education, health, communication, transportation spending, and income, corporate, trade taxes) on growth. In this section we shall review some relevant works for the above mentioned type of empirical studies.

Much of the empirical works on economic growth and fiscal policy is of cross-country regression variety. A large number of variables have been used as explanatory variables. A positive relationship between the investment rate and the growth rate is cited quite frequently in the published studies. The composition of government spending has important implications on economic growth (Tanzi and Zee 1997). When expenditures are disaggregated there is a stronger evidence of a negative relationship between public consumption and growth. Fiscal measures to boost public savings are the most effective way to raise national savings (Easterly, Rodriguez, and Schmidt-Hebbel 1994). For instance, reducing government consumption expenditures can leave more resources for capital formation, hence the rationale for a negative relationship between government consumption expenditures and growth rate—as indicated in international cross-section studies (Barro 1995). Balassa (1990) also produces evidence indicating that higher government expenditures relative to GDP, particularly if spent on consumption, reduces growth is. Reducing government consumption expenditure, hence a higher domestic saving rate, lifts the transitional growth rate but only a level-effect in the long-run in the original version or the Mankiw, Romer, and Weil (1992) version of the Solow model. In the context of endogenous (including AK) growth models a reduction in current expenditures and a higher public investment can generate long-run growth effect.

The empirical evidence regarding the effect of taxes on economic growth is mixed (Tanzi and Zee 1997). Martin and Fardmanesh (1990) show that, amongst the least developed countries, there is a negative relationship between the tax level and economic growth. Engen and Skinner (1992) show a negative relationship between the rate of change in the tax level and economic growth. Easterly and Rebelo (1993) found that amongst a relatively large number of tax measures, only an estimate of marginal income tax was negatively related to growth.[15] A more recent study (Mendoza, Milesi-Ferreti and Asea 1998) shows that based on panel regressions for 18 OECD countries, a lower income tax has a statistically significant and positive impact on investment.[16] However, the positive investment effect was not of the order to have a significant long-run growth effect.

In MENA countries government financed investment constitutes a large proportion of aggregate gross investment. Moreover, in many MENA countries the government, through public enterprises, directly produces goods and services and competes with private producers. In certain industries, government monopolies limit private sector entry and competition. In this case, higher public investment may crowd-out private investment. As shown by Khan and Kumar (1993), private investments are usually more productive than public investment, so a large reallocation away from the private sector might negatively affect growth. [17] Knight, Loayza, and Villanueva (1993) show that the level of investment by the public sector in infrastructure has a significant positive impact on growth. Easterly and Rebelo (1993) also found strong support for a positive correlation between growth and core public investment (communication and transportation). In contrast, Levine and Renelt (1992) found that the growth effects of public investment or public education expenditures are not robust.[18]

A previous study of the impact of fiscal variables on economic growth in MENA countries indicates that, for non-oil exporting countries, the share of government revenue in GDP and the share of current expenditures in GDP, had a negative level effect on economic growth.[19] However, there is a positive relationship between growth and overall budget balance. The share of private investment was positively correlated with economic growth. In sharp contrast, for a panel of oil-exporting MENA countries, economic growth was found (surprisingly) to be positively correlated with the share of total government revenue (including oil) in non-oil GDP, and the share of

[15] The estimate of the marginal income tax was obtained by regressing income taxes on GDP.
[16] A lower consumption tax had a negative impact on investment.
[17] Blassa (1990) finds a negative correlation between public investment, private investment, and economic growth. Concerning the negative impact of government consumption on growth the weight of evidence is in her favor, however, the same cannot be said about the issue of the relative size of public investment. See Knight, Loayza, and Villanueva (1993).
[18] This is in contrast to the findings of Barro and Salai-Martin (1995) regarding a positive impact of government financed public education on growth.
[19] See Eken, Helbling and Mazarei (1997) for more details.

current expenditures in non-oil GDP. The positive correlation between growth and government revenue may not be surprising according to equation (13). In a modified version, the share of capital expenditures in non-oil GDP was found to be positively but insignificantly related to growth in oil-exporting countries. The results of our statistical tests in the next section can confirm only some of the above observations. We shall also examine the relationship between growth and fiscal policy by considering other variables.

4. Fiscal Variables and Growth in Selected MENA Countries

As mentioned previously, three distinct, though related, ideas are embedded in cross-country regressions that attempt to capture the impact of fiscal policy on growth. The effect of the size of the government (as hypothesized in Ram (1986), Blasa (1990), and public finance variables on growth as hypothesized in Barro(1990) Barro and Salai-Martin (1992), and Cashin (1995). The effect of the type of expenditures on growth (Knight, Loayza, and Villanueva (1996), Levine and Renelt (1992), Easterly and Rebelo (1993). The effect of taxes and inflationary-finance on economic growth (De Gregorio 1993, Fischer 1993, Nelson and Singh 1994, Mendoza, Milesi-Ferreti and Asea 1998.)

We shall make an attempt to test the effect of the above sets of hypothesized influences on growth using both single-country regressions and panel regressions along five different empirical specifications. In most empirical analyses (Knight, Loayza, Villanueva 1996, Cashin 1995, Eken, Hebling, and Mazarei 1997), panel data is constructed with non-overlapping five-year averages for the variables used in the estimations. Taking five-year averages is one way to smooth the annual data. In this study we estimate the relationship between fiscal variables and growth as implied by the theoretical and empirical literature cited in this paper for Egypt, Iran, Morocco, and Tunis. We shall use pooled time series and cross-section data. Our main data source is World Bank, World Development Index, CD-ROM, 1999. We also used PDS data bank at IRPD.[20]

The first estimated model (I) has a simple specification relating the per work force growth rate of GDP to the natural logarithm of aggregate investment output ratio (I/Y). Since this variable captures the effect of physical capital

[20] For more information please see IRPD web site, www.irpd.ac.ir.

accumulation on growth, the expected sign for this variable is positive. The rate of inflation as an index of macroeconomic stability is another explanatory variable in this regression. Higher inflation rates create more uncertainty and instability with detrimental effects on economic growth, hence the expected sign of this variable is negative.[21] The log of the lagged value of GDP per worker is included in this equation to capture the tendency for short-run growth rates to converge to the long-run steady state growth rate. This regression is estimated as a four-country panel.[22] In (I), as in the other four models, μ^i refer to the fixed effect. The fixed effect estimator treats μ^i as a fixed but unknown constant, which takes different value for different countries. In (I), i=1,..4 countries, and t=1,…T time. The fixed-effect formulation takes μ^i to be a group specific constant term in the regression. Hence it is assumed that differences across units can be captured by differences in constant terms, so each μ^i is a parameter to be estimated. The differences between countries in this setting is parametric shifts of the regression function. In (I), β_i is a vector of coefficients associated with the matrix of observations. The disturbance term ε^i is assumed to be independently and identically distributed over i and t and obeys the usual orthogonality assumption. The result of this regression appears in tables 1. As indicated in the table, the coefficient of I/Y has the expected sign and is highly significant. The coefficient for the rate of inflation also has the expected sign but is not significant in table 1. The sign of the convergence term is negative as expected and significant. If we let the convergence term to be estimated for each country, then the coefficient of inflation rate also becomes significant.[23] In this situation the convergence term reflect the tendency of growth to approach the average for individual countries. In most of the pooled regressions that follow a version with convergence estimate for each country was also estimated and the results do not significantly differ from the ones reported here. For the panel regression table 3 we allowed for specific country convergence terms.

$$\Delta \ln(y_t^i = \beta_1 \ln(y_{t-1}^i) + \beta_2 \ln(I_t^i / Y_t^i) + \beta_3 \pi_t^i + \mu^i + \varepsilon_t^i \qquad (I)$$

[21] See Agenor and Montiel (1996) for a model of inflation and growth, where growth is negatively related to inflation because it adversely affect the profitability of investments.

[22] Pooled data can be used to estimate equations with the following general form.

$$y_{it} = \mu_{it} + \beta' x_{i_t} + \varepsilon_{it}$$

For i=1,…N cross-section units, and t=1,…T periods. Excluding the constants, there are K regressors in $\mathbf{x}_{it}$, the individual effect is μ_i . This is a classical regression model. If μ is the same across all units, OLS provides consistent and efficient estimate of the parameters. For more details see Green (1997) and Baltagi (1995).

[23] This estimate is not reported here but it's available upon request.

In following models a set of fiscal policy variables will be added to the basic model to capture their effect on growth. The variables chosen are either those implied from the theoretical models reviewed in this paper or those that are suggested by the empirical models mentioned previously. The second model focuses on the effect of the size of government as measured by G/Y. It combines the log of this ratio as a regressor along with the log of I/Y and the convergence term. This model is estimated both as a four-country panel (table 2) and as single equations for each country (tables 2.1-2.4). Both I/Y and the convergence term have the expected signs in all regressions. The sign of the log of G/Y is negative in the panel estimate, indicating the negative effect of over-sized governments, though the coefficient is not statistically significant. The estimated equations produced a positive sign for G/Y in Iran, though not significant, but a negative coefficient for Egypt, Morocco, and Tunis. Only for Tunis this coefficient was found to be statistically significant. To capture non-linearity of the effect of G/Y on growth the square of G/Y was added to the variables mentioned in the above but it was insignificant.

$$\Delta \ln(y_t^i) = \beta_1 \ln y_{t-1}^i + \beta_2 \ln(I_y^i / Y_t^i) + \beta_3 \ln(G_t^i / Y_t^i) + \mu^i + \varepsilon_t^i \quad (II)$$

Model III makes an attempt to capture the effect of the type of government expenditures on growth, in particular public investments. Empirical evidence cited in Barro (1991) points to a weak correlation between public investment and growth. He interprets this as either government investment are not a significant determinant of growth or that government are optimizing and spend on investment up to the point where the marginal effect of such investments on growth is close to zero. A number of other studies (Aschauer 1989, Knight et al 1993, and Skinner 1987) show that public investment positively affects growth. To test for the effect of public investment, aggregate investment is broken into private and public investments and as shown by (III) they enter as separate explanatory variables. Two regression estimates are reported here, one for a four-country panel (table 3) and the other for Iran (table 3.1). In both regressions the coefficients of private and public investments have the expected positive sign, though in the case of Iran the coefficients are highly significant. Two additional variables were included in model III as regressors. Public spending on education and primary school enrollment were used as proxies for government investment expenditures on education and as a broad measure of the level of education, respectively. These variables can be considered as proxies for human capital and their inclusion (separately) in the regression equation can capture their potential effects on growth. None of the estimated coefficient for these two variables had the expected sign and both of them were statistically insignificant, and therefore not reported here.

It should be mentioned that, due to data limitations we do not have choice over the full range of empirical growth models and the whole range of explanatory variables but some key variables could be tested. For instance, Easterly and Rebelo (1993) argue that government expenditures do not affect growth in the same way and certain categories of government expenditures may have stronger effects on growth. They found that government investment, especially that in transportation and communication was positively correlated with growth. In the case of Iran we had access to data on government investment in transportation and communications and investment in public utilities (electricity and water). To capture the effect of different types of public investment on growth, government investment were divided into strategic and non-strategic sectors. The former consists of government investments in transportation, communications, water, and electricity, and the latter as non-strategic investments. Per worker non-oil GDP growth rate was regressed on the above variables along with private investments. The results (table 3.2) show that the coefficient of strategic government investment is higher than that of non-strategic investments. Wald test does not reject the null hypothesis that the coefficient of strategic investment is larger than non-strategic investments.

$$\Delta \ln(y_t^i) = \beta_1 \ln(y_{t-1}^i) + \beta_2 \ln(I_{P_t}{}^i / Y_t^i) + \beta_3 \ln(I_{G_t}{}^i / Y_t^i) + \beta_4 \pi_t^i + \mu^i + \varepsilon_t^i \qquad (III)$$

In model IV, the ratio of government consumption to GDP was also added to model III. In most international cross section studies the estimated sign for the coefficient of this variable is negative (Barro 1995). The result of a four-country panel estimation is given in table 4. All the variables have the expected sign. In particular, government consumption has a negative and statistically significant coefficient. This result has very orthodox policy implications. Both private and public investment positively influence growth but a higher consumption rate by the government and macroeconomic instability, as suggested by the inflation variable, tend to dampen growth.

$$\Delta \ln(y_t^i) = \beta_1 \ln y_{t-1}^i + \beta_2 \ln(I_{P_t}^{\ i} / Y_t^i) + \beta_3 \ln(I_{G_y}^{\ i} / Y_t^i) + \beta_4 \ln(C_{G_t}^{\ i} / Y_t^i) + \beta_5 \pi_t^i + \mu^i + \varepsilon_t^i \quad (IV)$$

Model V is a variant of the Cashin (1995) model, where economic growth is positively related to government investment (per unit of GDP) but negatively related to the share of current revenue in GDP (as a proxy for distortionary taxes), and a convergence term. In model V the ratio of current revenue to GDP was added to model IV. The sign of the estimated coefficient was positive which is contrary to the theoretically predicted sign and the empirically obtained sign for a sample of 23 OECD countries (Cashin 1995). A number of prior studies also show detrimental partial effect of distortionary (vs. lump sum) taxes on economic growth (Barro 1989, Koester and Kormendi 1990, Martin and Fardmanesh 1990, Engen and Skinner 1992). It should be mentioned that while individual income taxes for MENA countries as a whole are quite low compared to other regions of the world, there are significant differences between oil-exporting MENA and other countries in the region. The proportion of *total revenue* in GDP in MENA countries, as a group, is the highest in the world. Total revenue to GDP ratio in MENA countries averaged 31.5 per cent during 1980-1995, compared to 19 per cent in developing countries and 21 per cent in industrial countries during the same period.[24] The proportion of non-tax revenue in Total revenue in GDP in MENA countries is also the highest in the world. Non-tax revenue is the largest component of government revenue in oil-exporting MENA countries. Morocco and Tunis raise a relatively higher proportion of their revenue from income taxes. Even in these two countries the share of non-tax revenue to total revenue is fairly large, particularly compared to OECD countries. Income tax in Egypt and Iran is a relatively low proportion of total government revenue. Thus a high G/Y (or I_P /Y) need not have a large distortive tax impact a la Barro (or Cashin) for at least a large number of MENA countries, because a large proportion of expenditures are financed by either oil rents and a smaller fraction by grants. Equation (13) indicated that in the amended Barro model, oil revenue and growth are positively related. Moreover, the argument that the size of the government can affect the growth rate in a non-linear fashion may not hold, unless public good production is assumed to be either subject to decreasing economies of scale and/or bureaucratic misallocation. An alternative specification of the negative impact of distortionary taxes on economic growth is to include the ratio of taxes to total government revenue. A rise in this ratio is indicative of a greater proportional tax-financed public goods

[24] See Eken, Helbling, and Mazarei (1997) for more details.

production. Inclusion of this ratio (TX) in model III yields the estimated equation (IV). The estimation result is shown table 5. The coefficient of TX has the expected negative sign. Likewise, all other explanatory variables of model V have the expected signs.

We also ran a single equation test for model V in the case of Iran for which we had longer time series data to work with (table 5.1). Moreover, instead of growth of GDP per work force we used non-oil GDP growth per work force. We obtained very similar results to the pooled regression for model V, in particular with respect to the sign of the coefficient of TX. In another version, instead of the ratio of taxes to total revenue, the ratio of taxes to oil revenue was used and we obtained similar results (not reported here). This, agin can be taken as empirical support for the argument that higher non-tax revenues may not have growth reducing effects.

$$\Delta \ln(y_t^i) = \beta_1 \ln(y_{t-1}^i) + \beta_2 \ln(I_{p_t}^{\;i} / Y_t^i) + \beta_3 \ln(I_{G_t}^{\;i} / Y_t^i) + \beta_4 \pi_t^i + \beta_5 \log(C_{G_t}^{\;i} / Y_t^i) +$$

$$\beta_6 \ln(TX_t^i) + \mu^i + \varepsilon_t^i \quad (V)$$

5. Summary and Policy Conclusion

In this paper we presented a simple growth model and reviewed several others. These models implied certain relationships between growth and fiscal policy variables. These included the effect of the composition of government expenditures on growth, the effect of the size of the government, and the effect of taxation. The hypothesized relationships were tested in the context of our empirical models for Egypt, Iran, Morocco, and Tunis. The results were, to a large extent, consistent with a number of cross-section studies for developing and developed country samples. In particular it was shown that, controlling for the effect of investment and economic instability, government consumption is negatively related to growth.

Both private and government investment were correlated with growth. Public investment, especially those in strategic sectors, is positively correlated with growth. Our empirical tests, however, indicate that public spending in education is not positively correlated with growth. Public expenditure (as a share of GDP) seems to be negatively correlated with growth in non-oil exporting MENA countries (in our sample), but in only one case the coefficient of G/Y was statistically significant.

Contrary to a number of published studies, the share of current government revenue in GDP was positively correlated with growth. Since the share of non-tax revenue in total government revenue is fairly significant in a number of MENA countries, particularly in the oil-exporting nations, this variable may not reflect the impact of taxes on growth. As an alternative, the ratio of taxes to total government revenue, an indication of the share of distortionary taxes in government revenue was included in the regressions and they were found to be negatively and significantly correlated with growth.

Policy implications emanating from our empirical findings are fairly straightforward: significant trade-offs are involved with different fiscal policy packages. Lower consumption expenditures and more government spending in sectors that enter private production functions as inputs, and positively influence their productivity, e.g. transportation, communication, electricity, and water, is pro growth. Obviously, the same can be extended to government investment in social institutions that create an environment conducive to growth--though we were not able to specifically test for this. Government consumption expenditure is clearly a drag on growth. Improved public administration and higher standards of efficiency in government operations can release resources for more productive use in both the public and private sectors. Such a measure also contributes to fiscal discipline and inflation control—the evidence provided here indicated a negative correlation between inflation and growth.

Given that the share of taxes in *GDP* and in *total government revenue* in MENA countries is significantly lower than Middle to high income countries[25], the presence of governments larger than the average for developing countries can be justified by the models reviewed in this paper. However, in the long-run, this situation will not be tenable, particularly in populated nations, since the requirement of a higher share of taxes in GDP will reduce the net positive contribution of the government to growth.

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[25] See Jalali-Naini (2000).

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