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Responsiveness of the MENA Economic Growth to the EU Financial Integration: A Problem Evaluation

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Abstract
Implementing a currency union may lead members to face financial crisis if their financial markets are not ready to adopt themselves to a new situation. There are still problems like ownership concentration and self-governing states cause limitation in economic growth, financial development, and the ability of a country to take advantage of financial integration. The evidence is that the proportion of global financial flows dedicated to the low- and middle-income developing economies, decreased after the Asian crisis of 1997-98 (Das, 2006). These problems explain why the impact of financial integration has been limited and why it can lead to capital flight and financial crises. In this study, we develop an analytical framework of economic growth and assessing special and differential treatment of currency union (a subject of financial integration) members (like the EU) and apply this framework to MENA countries. We propose specifically that one can evaluate the "average" impact of the currency union membership on growth of the countries. It reveals the fact that the routine program evaluation can be for all the EU and MENA members. We will call this treated or untreated, respectively. Next, we predict such outcomes for a group of countries based on matching of their characteristics. Hence we use the matching method to make a relationship between a response variable (economic growth) and a treatment variable (financial integration) experimentally in the economies of the EU and MENA.

Key words: Financial Integration, Economic Growth, Program Evaluation, EU and MENA.

JEL Classification: C26, F10, O10.

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1. Introduction

Financial integration has a great role in specification of financial relationship between countries. The top six emerging market economies that had the highest financial participation over the decade of the 1990s were: Argentina, Brazil, China, India, Korea (Republic of) and Mexico. They accounted for most of the activity by developing countries in the US equity markets. This group benefited more from the process of financial integration throughout global capital markets by way of lower cost of capital and longer maturity structure of its debt (Schmukler and Zoido-Lobaton, 2001).

Opening up domestic financial markets to international capital should have an unambiguously positive impact on economic growth. It is important to know what kinds of institutions are needed to promote financial development and economic growth. We should turn to the question of how developing countries can improve the likelihood that these institutions are developed. One of the most effective instruments for stimulating institutional development is globalization. Financial integration will confer several important benefits on developing countries. First, by bringing in new capital, financial integration will lower the cost of capital, thereby encouraging investment, which in turn promotes growth. Second, when foreign capital and financial institutions are allowed to enter a country, they improve the allocation of capital resulting in growth. Third, globalization of a country's financial system, if it is designed to promote competition in domestic financial markets, helps promote the development of better property rights and institutions. Better property rights and institutions make the domestic financial sector work better. They facilitate the movement of capital to productive uses and prepare the domestic financial sector to better handle the increased capital flows that would come with the opening of the country's financial sectors in which modern financial instructions could be effective in economic growth process (Mishkin 2006, code 101).[1]

However, Mishkin (2005) argues that there is no clear cut relationship between financial integration and economic growth. He explains that opening up an economy to international capital flows can lead to financial crises that are disastrous to the economy. In addition, implementing a currency union may lead members to face financial crisis if their financial markets are not ready to adopt themselves to a new situation. Among the financial institutions that are most crucial to economic growth are those that enable a country to allocate capital to its most productive uses. Such institutions establish and maintain strong property rights, an effective legal system, and a sound and efficient financial system.

There are still problems like ownership concentration and self-governing states cause limitation in economic growth, financial development, and the ability of a country to take advantage of financial integration. The evidence is that the proportion of global financial flows dedicated to the low- and middle-income developing economies, decreased after the Asian crisis of 1997-98 (Das, 2006). These problems explain why the impact of financial integration has been limited and why it can lead to capital flight and financial crises.

An excellent nontechnical survey of the extensive empirical evidence on the link between financial development and economic growth can be found in World Bank (2001). See also Levine (2004) and Schmukler (2004). Research finds that increases in corruption are associated with lower growth (for example, Mauro, 1995). Wei (1997) also finds that corruption significantly reduces foreign direct investment, which is generally considered to be beneficial to growth. Although financial deepening improves an economy’s rate of growth, it is possible that poverty will remain the same or increase because the resulting growth could lead to greater income inequality. However, Dehejia and Gatti (2002) indicate clearly that financial development is associated with a reduction in poverty and even with a reduction in the use of child labor.

Hence, there are still challenges that whether financial integration causes a higher economic growth rate and more welfare. This is the main task of this paper to evaluate the impact of globalization on growth of the MENA members. In the following, the growth model is specified in Section 2, while the method of program evaluation is set up in Section 3.

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[1] A large literature shows the importance of good institutions to economic growth. See, for example, North and Thomas (1973); Hall and Jones (1999); Acemoglu, Johnson, and Robinson (2001); Easterly and Levine (2001); Rodrik, Subramanian, and Trebbi (2002); Easterly and Levine (2003); Glaeser and others (2004); and the recent survey by Acemoglu, Johnson, and Robinson (2005). Kaufmann and others (1999) also point to the importance of various aspects of good governance.

Section 4 represents the empirical results obtained by the OLS and matching. Finally, Sections 6 concludes.

2. The Model

This section formulates a growth model in order to highlight ultimately the role of financial integration in global economic growth. More specifically financial integration can be considered as an effective program in which all countries worldwide are able to participate in its different progressing aspects involving financial liberalization, currently union and so on.

A country production function can be defined as:

$$Y = Af(L, K) \tag{1}$$

where

$$K = g(K_1, K_2) \tag{2}$$

then

$$Y = Af(L, g(k_1, k_2)) \tag{3}$$

In the above equations, Y is world production, L, K_1 and K_2 denote world labor force, and domestic capital flow and foreign capital flow, respectively. A is a notation for the technology coefficient.

Differentiating Equation (3), we have:

$$dY = dAf(L, g(K_1, K_2)) + Af_L dL + Af_g g_{k1} dK_1 + Af_g g_{k2} dK_2 \tag{4}$$

Dividing Equation (4) by Equation (3), we conclude equation (5) as follows:

$$y = a + [f_L L / f(L, g(K_1, K_2))]l + [f_g g_{K1} K_1 / f(L, g(K_1, K_2))]k_1 + [f_g g_{K2} K_2 / f(L, g(K_1, K_2))]k_2 \tag{5}$$

where a, l, y, k_1 and k_2 indicate growth in technology, labor, domestic capital and foreign capital, respectively:

$$a = dA / A, l = dL / L, y = dY / Y, k_1 = dK_{1/} / K_1, k_2 = dK_{2/} / K_2$$

A re-specification of Equation (5) on the basis of relevant elasticites can be written as:

$$y = a + e_L l + e_K [e_{K1} k_1 + e_{K2} k_2] \tag{6}$$

In the following equation a which is a residual points out technology progress, is a component of growth that is not explained by data, namely:

$$a = y - [e_L l + e_K (e_{K1} k_1 + e_{K2} k_2)] \tag{7}$$

Under perfect competition assumption, we defined each factor marginal production with respect to the ratio of the factor price to output and output price as,

$$Af_L = P_L / P, Af_K = P_K / P, Af_g g_{K1} = P_{K1} / K_1, Af_g g_{K2} = P_{K2} / K_2$$

The labor and capital elasticities appeared in equations (6) and (7) are measured as,

$$e_L = P_L L / PY, e_K = P_K K / PY$$

Thus, we have the following equation,

$$y = a + (P_L L / PY) l + [(P_{K1} K_1 / PY) k_1 + (P_{K2} K_2 / PY) k_2] e_K \tag{8}$$

where this equation shows the existence of a relationship between growth and price rations.

As discussed previously, globalization is able to arrange competitive conditions and makes world markets closer to each other. In this situation, convergence in input and output prices is utilized by freer trade and capital flows, for instance. Hence, it is assumed that in the process of financial integration the price of domestic capital and foreign capital tend to an identical price; eg. P_k, so that equation (9) is defined as:

$$y = a + (P_L L / PY) l + (\overline{P}_K / PY)[K_1 k_1 + K_2 k_2] e_K \tag{9}$$

By assuming output prices unchanged, world economic growth can be related to growth of labor force and capital flows (l, k_1, k_2). This implies the role of financial integration playing in the world economic growth, that is,

$$WG = f(FG, X) \tag{10}$$

where *WG* is a variable for world growth, *FG* stands for financial integration, and *X* is a set of explanatory variables.

2.1. Financial Integration as a Program: Empirical Specification

As previously discussed, endogenous growth is modeled by determinants through research and development, so that trade and trade policy affect widely product innovation within a country and thus on growth. In addition, Feder (1983) and Ram (1986) use an augmented neoclassical production function to organize their empirical studies, while Romer (1989) and Barro (1990) use endogenous growth models that highlight a few aspects of growth. Kormendi - Meguire (1985) and Grier and Tullock (1989) use a variety of variety of models to motivate various variables that they use in empirical studies. Therefore, this implies that there has not been a consensus theoretical framework to direct empirical work on economic growth.

Based on the work of Levine and Renault (1992), a common feature of most cross-country growth regressions is that the explanatory variables are entered independently and linearly. Overall, a typical regression equation of growth can be specified as,

$$y = \beta_1 + \beta_X X + \beta_Z Z + \beta_W W + u \qquad (11)$$

where *y*, either per capita *GDP* or the growth of *GDP*, can be a function of *X*, which is a set of variables always included in the regression, while *Z* is a subset of variables chosen from a pool of variables identified by past studied as potentially significant explanatory variables. Also, *W* may affect the dependent variable y, which is the variable of interest. Depending on samples of countries and time periods, these three types of variables can be different in different specifications of the growth models. Finally, the stochastic variable *u* stands for the disturbance term in the regression.[1]

We start out with the question whether trade is good for growth. If it is good, countries liberalize trade, implying trade liberalization leads to more trade and hence to more growth. Accordingly, Dollar and Kraay (2002) consider a range of measures of international openness, including trade volumes, tariffs, the WTO membership, financial liberalization and the presence of capital controls, and ask whether any of these has systematic effects on growth. Thus, our motivation is that the countries, which are participating in financial integration, have further chance for growth, and benefit from financial integration as the treatment of their growth problems.

This study specifies and estimates an econometric model for evaluating currency union membership program when outcomes response to this as a treatment, and also vary observationally among countries around the world in which some countries participate to a currency union program (as an aspect of financial integration). By evaluating the program, an analyst determines which program (treatment or control) each country joins. For example, a country intends to join a currency union to benefit from a higher economic growth rate, more employment, financial liberalization effectiveness, capital mobility etc. Then, the policymaker decides whether to assign all countries to treatment or to control, or to allow the analyst to choose.

By far the most common way of taking account of selection into treatment on observable characteristics consists of using standard linear regression methods. A new formulation of the growth model would look like

$$y_i = \beta_0 + \sum_{k=1}^{K} \beta_k x_{ki} + \sum_{k'=K+1}^{K'} \beta_{k'} z_{k'i} + \beta_D D_i^{CU} + u_i \qquad (12)$$

where y_i is the response variable (economic growth), Di^{CU} is a dummy variable for receiving treatment, as a result of the currency union (CU) membership with βD the corresponding treatment effect. xki and $zk'i$ are the confounding variables, including both classes of *X*-variables and *Z*-variables, and where the regression would be estimated on a sample of treated and eligible non-treated units. In a common effect world, provided the selection on observables assumptions holds, βD estimates the common treatment effect.

3. Problem Setup

If we consider the effect of the CU membership as a *treatment* on the MENA growth, the test score is *an outcome* variable. If the outcome is economic growth, how do we know if the treatment is effective? What are effects of

[1] Kormendi - Meguire (1985) and Levine –Renelt (1992) use a variant of Leamer's (1983) extreme-bound analysis (EBA) to test the robustness of coefficient estimates. Their EBA involves varying the subset of Z and W-variables included in the regression to find the widest range of coefficient estimates that standard hypothesis tests do not reject.

observed and unobserved characteristics on the policymakers (decision-makers) to put countries into an on-going treating program (CU membership process)? We can compare two potential results, one (Y_1) with the treatment and the other (Y_0) without. Thus, in the framework, each country has two potential outcomes for the treatment of growth. Y_{i1} is the outcome of country *i* when exposed to the treatment, and Y_{i0} is the outcome of country *i* when not exposed to the treatment. If $Y_{1i} - Y_{0i} > 0$, then we can say that the membership is effective for country *i*, while the observed response for the country is $Y_i = D_i Y_{1i} + (1 - D_i) Y_{0i}$, where D_i=1 means treated and D_0 = 0 means untreated.

Different treatment effects, such as those in Heckman and Vytlacil (1991) and Zhao (2005), are defined as,

$$\Delta_i = Y_{1i} - Y_{0i} \tag{13}$$

which denotes treatment effect for country *i*,

$$\Delta^{ATE} = E[\Delta_i] = E[Y_{1i} - Y_{01}] \tag{14}$$

which denotes average treatment effect (ATE) for the population, and

$$\begin{aligned} \Delta^{SATE} &= E[\Delta_i \mid i \in N] \\ &= \frac{1}{N}\sum_{i=1}^{N}(Y_{1i} - Y_{01}) \end{aligned} \tag{15}$$

This calculates for the sample average treatment effect (SATE). When $N = \{i: D_i = 1\}$, Δ^{SATE} is the treatment effect on the treated (TT), denoted as Δ^{SATE}. While the SATE is useful for judging how a CU membership program has affected a particular group of country participants, the PATE can be used to evaluate whether another group of participants drawn from the same population is likely to benefit from the program. Abadie et al. (2004) also define the population and sample average treatment effect for the subpopulation of the treated, PATT and SATT,

$$\begin{aligned} \Delta^{PATT} &= E[\Delta_i \mid D_i = 1] \\ &= E[(Y_{1i} - Y_{01}) \mid D_i = 1] \end{aligned} \tag{16}$$

and

$$\begin{aligned} \Delta^{SATT} &= E[\Delta_i \mid i \in N_1, D_i = 1] \\ &= \frac{1}{N_1}\sum_{i|D_i=1}(Y_{1i} - Y_{01}) \end{aligned} \tag{17}$$

the population and sample average treatment effect for the controls, PATC and SATC,

$$\begin{aligned} \Delta^{PATC} &= E[\Delta_i \mid D_i = 0] \\ &= E[(Y_{1i} - Y_{01}) \mid D_i = 0] \end{aligned} \tag{18}$$

And

$$\begin{aligned} \Delta^{SATC} &= E[\Delta_i \mid i \in N_0, D_i = 0] \\ &= \frac{1}{N_0}\sum_{i|D_i=0}(Y_{1i} - Y_{01}) \end{aligned} \tag{19}$$

$N_1 = \sum_i D_i$ and $N_0 = \sum_i (1 - D_i)$ are the number of treated and control units, respectively. In the estimation of average treatment effect (ATE), only one of the two outcomes is observed, so either Y_{1i} or Y_{0i} is missing for each *i*. Thus the challenge when estimating ATE is that both counterfactual outcomes have to be constructed (Caliendo and Kopeinig, 2005).

To estimate treatment effect at the individual level, one needs strong assumptions, such as the assumption of homogeneous treatment effect across the population (Zhao 2004). The average treatment effect can be estimated without bias either by experimental data, or by observational data if the selection bias is only due to observables. The bias is characterized by the following two assumptions:

A-I: ***Conditional independence assumption***: $Y_0, Y_1 \perp D \mid X$

This assumption states that, conditional on X (a set of observable covariates), the outcomes are independent of treatment. Indeed, under completely random assignment one may even make a stronger assumption as $Y_0, Y_1 \perp D$. This assumption is also known as un-confoundedness, or 'selection on observables'.

Assuming that the treatment effect is fixed ($\Delta_i = Y_{1i} - Y_{0i}$, for all *i*), the control outcome is defined to be linear in X_i:

$$Y_{0i} = \alpha + X'_i\beta + \varepsilon_i \tag{20}$$

with $\varepsilon_i \perp X_i$. Then we have,

$$Y_{1i} = \alpha + \beta_D D_i + X'_i\beta + \varepsilon_i \tag{21}$$

where β_D is the average treatment effect. Given the assumption of fixed treatment effect, un-confoundedness is equivalent to independence of D_i and ε_I conditional on X_i, which would also imply that D_i is exogenous (Imbens 2004).

A-II: ***Common support assumption***: $0 < \Pr[D = 1| X] < 1$

The assumption is necessary for identifying some population measures of impact. It states that for each treated individual there is another matched untreated individual with a similar X.

In the Rosenbaum and Rubin's (1983) terminology, treatment assignment is 'strongly ignorable' when these two assumptions are true. Also under these assumptions, the treatment effect on treated (Δ^{TT}) can be defined as,

$$\Delta^{TT} = E_{X|D=1}\{E[Y_1 \mid D=1, X=x] - E[Y_0 \mid D=1X=x,]\}$$
$$= E_{X|D=1}\{E[Y_1 \mid D=1, X=x] - [Y_0 \mid D=0, X=x\} \quad (22)$$

Accordingly, Rosenbaum and Rubin (1983) define the ***propensity score***, which is a conditional probability measure of treatment participation given X and is denoted by $p(X)$, where,

$$p(X) = \Pr[D=1 \mid X] \quad (23)$$

An assumption that plays an important role in treatment evaluation is the 'balancing condition', which is a testable hypothesis (Cameron and Trivedi 2005):

$$D \perp X \mid p(X) \quad (24)$$

This implies,

$$Y_0, Y_1 \perp D \mid X \Rightarrow Y_0, Y_1 \perp D \mid p(X) \quad (25)$$

which expresses that the conditional independence assumption given X implies conditional independence given $p(X)$, that is, the independence of Y_0, Y_1 and D given $p(X)$. The balancing condition is also defined as,

$$\Pr[X_i \mid D_i = 1, p(X_i) = p]$$
$$= \Pr[X_i \mid D_i = 0, p(X_i) \quad (26)$$
$$= p] = \Pr(X_i \mid p)$$

Then the confoundedness and common support assumptions imply new assumptions:

B-I: $(Y_0, Y_1) \perp D \mid p(X)$

B-II: $0 < \Pr[D=1 \mid p(X)] < 1$

which is due to Rosenbaum and Rubin (1983). From B-I and B-II we have,

$$\Delta^{TT} = E_{p|D=1}\{E[Y_1 \mid D=1, p(X)=p] - E[Y_0 \mid D=1, p(X)=p]\}$$
$$= E_{p|D=1}\{E[Y_1 \mid D=1, p(X)=p] - E[Y_0 \mid D=0, p(X)=p\} \quad (27)$$

The advantage of this equation is that instead of controlling for a high-dimensional vector of X, Δ^{TT} only needs to control for a scalar p (Zhao 2004).

3.1. Estimation Methods of Average Treatment Effects

There are a number of statistics proposed for estimating PATE and PATT, which are also appropriate estimators of SATE and SATT: regression estimators, matching estimators, propensity score, combination of these methods, and Bayesian approaches[1].

Regression estimators comprise of methods that rely on consistent estimation of the two conditional regression functions: $f_0(x)$ and $f_1(x)$. Given $\hat{f}_0(x)$ and $\hat{f}_1(x)$ for these functions, the average treatment effects are estimated by averaging their differences over the empirical distribution of the covariates:

$$\hat{\Delta}^{reg} = \frac{1}{N}\sum_{i=1}^{N}[\hat{f}_1(X_i) - \hat{f}_0(X_i)] \quad (28)$$

Estimators for these functions can include parametric functions-for example, linear regressions, which consist of least squares estimators with regression function specified as,

$$f_D(x) = \beta' x + B^D D \quad (29)$$

where D = 0, 1, and the average treatment effect is equal to β^D. Thus, one can estimate β^D directly by OLS using regressions specified in (12).

In the process of treatment, a range of factors can affect Y (response variable), which can be defined as observed variables (X) and unobserved variables (ε) that both of them would matter for Y. If the CU membership, for instant, is considered as a treatment policy, the size of an economy (GDP for example) can be as an observed variable. All both types of these variables can affect output that can be economic growth. Basically, dealing with the difference in X and ε is the main task in finding treatment effects with observational data. If there is no

[1] For discussion on Bayesian approaches, see Imbens (2004).

difference in ε, then only the difference one should deal with is in X. The basic way to remove the difference (or imbalance) in X is to select different groups (i.e. treatment and control groups) that share the same X, which is called '*matching*'. In technical words, it is said that,

$$\begin{aligned}&E(Y \mid X, D=1)-E(Y \mid X, D=0)\\&=E(Y_1 \mid X, D=1)-E(Y_0 \mid X, D=0)\\&=E(Y_1 \mid X)-E(Y_0 \mid X)=\\&E(Y_1-Y_0 \mid X)\end{aligned} \tag{30}$$

If the treatment and control groups are different in observed variables X, then the difference in outcome Y cannot be the difference in the treatment. The obvious solution is to compare only those subjects with the same value of X across the two groups. Selecting subjects similar in X across the treatment and control groups is thus matching. Therefore, one can obtain treatment effect estimators with matching, which are also called 'matching estimators'. If X is high dimensional, it is hard to find matched subjects, that is the matching version of the 'curse of dimensionality'[1], but there is a simple way to avoid the dimension problem, called 'propensity score matching' (Lee 2005). Propensity score first takes a convenient function (typically linear, but often augmented with polynomial terms), and then transforms this into the unit interval by inversion through some cumulative distribution function (CDF), normal or logistic CDF predominate in determining 'treatment probability' (Maasoumi 2005).

Zhao (2004) specifies the following selection equations in order to examines more closely how covariant matching and propensity score matching work,

$$Y_{1i} = f_1(X_i)+\varepsilon_{1i} \tag{31}$$
$$Y_{0i} = f_0(X_i)+\varepsilon_{0i} \tag{32}$$
$$D_i = I(D_i^* > 0) \tag{33}$$

where $D_i^* = h(X_i)+\mu_i$, and $I(.)$ is the indicator function. ε_{1i}, ε_{0i}, and μ_I are i.i.d. with zero conditional means. In principle, the basic ideas of covariate matching are,

$$X_i = X_j \Rightarrow f_t(X_i) = f_t(X_j), t=0,1 \tag{34}$$

and

$$d(X_i, X_j) < \varepsilon \Rightarrow d'(f_t(X_i), f_t(X_t)) < \delta, t=0,1, \tag{35}$$

where d and d' are some metrics in the mathematical sense. Equation (34) justifies exact matching, while Equation (35) implies that f_t is continuous at X, so that Zhao (2004) emphasizes on the assumption in which f_t is a continuous function of X.

Trough covariate matching, observation i in the treated sample is matched with observation j in the comparison sample if $X_i = X_j = x$. We define the estimator of treatment effect as

$$\begin{aligned}\hat{\Delta}_i^{CVM} &= Y_{1i}-Y_{0j} = [f_1(X_i)+\varepsilon_{1i}]\\&-[f_0(X_j)+\varepsilon_{0j}] = \Delta_i + (\varepsilon_{0i}-\varepsilon_{0j})\end{aligned} \tag{36}$$

where Δ_i is the true treatment effect for i, which equals $\{[f_1(x)-f_0(x)]+(\varepsilon_{1i}-\varepsilon_{0i})\}$. Thus, the treatment effect on treated can be estimated by the estimator $\hat{\Delta}_{TT}^{CVM}$,

$$\begin{aligned}\hat{\Delta}_{TT}^{CVM} &= \frac{1}{N^{CVM}}\sum_{i=1}^{N^{CVM}}\hat{\Delta}_i^C = \Delta^{TT}\\&+\frac{1}{N^{CVM}}\left\{\sum_{i=1}^{N^{CVM}}\varepsilon_{0i}-\sum_{j=1}^{N^{CVM}}\varepsilon_{0j}\right\},\end{aligned} \tag{37}$$

where N^{CVM} is the number of covariate-matched pairs. Obviously, $\hat{\Delta}_{TT}^{CVM}$ is an unbiased estimator of Δ_{TT}.

4. Empirical Results

4.1. OLS Results

Now a version of the growth model specified in (12), which is re-defined in (38), is estimated by the OLS method using data for the selected countries of Middle East, North Africa and Mediterranean European countries in 2004,

$$\begin{aligned}LnY_i &= \alpha + \beta_{EU}D_{EUj}+\beta_1 LnK_i\\&+\beta_2 LnLF_i+\beta_3 LnFDI_i\\&+\beta_4 H_i+\beta_5 OPEN_i+\varepsilon_i\end{aligned} \tag{38}$$

i= 1, 2, …, 190 j= 1, 2, …, 12

(j stands for numbering of the EU members)

[1] If there are several discrete X, each with several values, the number of cells may become large, and many cells will have no untreated observations corresponding to each treated observation. For example, if we have five variables each with three values, we have 35 = 243 cells. This is the matching version of the "curse of dimensionality."

where LnY_i denotes the logarithm of GDP for country i in 2000 constant price. D_{EU} is a dummy variable pointing out the currency union in the EU. In fact, this variable catches one if countries are the member of the Euro Zone, otherwise zero. LnK_i, $LnLF_i$, and $LnFDI_i$ stand for logarithm of capital formation, labor force, and foreign direct investment of country i, respectively. In addition, H_i and $open_i$ represent human capital (here is the number of enrolment of the secondary school) and openness variable. Data for these variables have been obtained from the Penn World Table at http://pwt.econ.uepenn.edu and WDI, CD-ROM.

Table (1) reports the estimation results for the above growth equation. According to the relevant findings, Euro has a positive and significant effect on the MENA economic growth. This result shows that the implementation of such currency union brings more growth to all countries whether they are either the members or not. All the variables have correct effects on the MENA growth. The coefficient of the dummy variable (D_{EU}) implies a significant role of the financial integration by applying Euro in the MENA growth.

Table (1): The OLS estimation results for the MENA growth model

variable	coefficient	t	P>|t|
cons	1.395267	5.24	0.000
lnK	.7521790	8.03	0.000
lnLF	.1521822	3.32	0.002
H	.013231	2.83	0.011
lnFDI	.0521087	1.97	0.043
OPEN	.0014663	-2.26	0.026
D_{EU}	.293726	2.13	0.030

R-squared = 0.9307 Adj R-squared = 0.91637
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of l*nY*
chi2(1) = 2.21, Prob > chi2 = 0.061

Source: Authors

4.2. Treatment Effects

This section provides empirical results to matching estimators for average treatment effects using 'Stata' command *nnmatch* which implements these estimators. The command implements nearest-neighbor matching estimators for average treatment effects (ATE) for either the overall sample or a sub-sample of treated or control units (ATT and ATC). In this regards, we use cross-section data of the countries in the MENA zone as described before. The empirical results are reported in the following tables (Tables 2 to 5).

Table (2): Average treatment effect of euro on economic growth (SATE)

Number of matches	coefficient	z	P>|z|
1	1.053753	2.46	0.016
2	1.140071	2.74	0.006
3	1.190424	2.96	0.003
4	1.404808	3.16	0.002
8*	2.02765	4.38	0.000
Matching variables: *LnLF LnK lnFDI H OPEN*			

*The Maximum number of matches is 8, which is equivalent to the number of the treated group.

Source: Authors

Following Abadie and Imbens (2002), *nnmatch* allows individual observations to be used as a match more than once. Compared with matching without replacement, this method generally lowers the bias but increases the variance. While *nnmatch* provides many options for fine-tuning the estimators, a key feature of the program is that it requires few decisions by the researcher. The default settings are generally sufficient for many applications. Although theoretically matching on multidimensional covariates can lead to substantial bias, the matching approach combined with the bias adjustment implemented in *nnmatch* often leads to estimators with little remaining bias.

Following Abadie and Imbens (2002), we use five matches performed well in terms of mean-squared error, the process of matching is iterated by different number of matching, in which the method of 5 matching is more reliable rather than the preceding ones. The coefficient of SATE indicates the possible sample average treatment effect of the Euro membership on the log of countries' GDP (*LnGDP*) in 2004. In the data described in the previous section, the Euro membership is recorded in the variable D_{EU}, and the observable covariates that we use to match similar countries are given as *LnLF* (log of labor force), *LnK* (log of fixed capital formation), *LnFDI* (log of FDI), *H* (human capital, based on tertiary education, %) and *OPEN* (openness, % of total trade).

Abadie and Imbens (2002) show that the population and sample average treatment effects are useful for answering different questions. For instance, the SATE is useful for judging whether this particular CU program was successful. In contrast, if we were considering launching another CU program in which we would obtain a second sample from the same population, the PATE would be more useful. For the specification at hand, we conclude that the sample average is significantly different from zero at the 1% level.

Since the standard error of the SATE is in large samples less than or equal to the standard error of the PATE, the PATE might not be significantly different from zero at either the 5% or the 1% level. In Table, we estimate the population and sample average treatment effects (PATE). As expected, the point estimate is exactly the same as for the SATE. We also see that the standard error of the PATE is slightly smaller than that of the SATE, so we can still reject the null hypothesis of no effect; however, our conclusion is different. We now conclude that the Euro membership is likely to have an effect on another group of countries drawn from the same population.

Table (3): Population average treatment effect (PATE) of euro on economic growth with five matches

coefficient	z	P>|z|
2.02765	4.39	0.000
Matching variables: LnLF LnK lnFDI H OPEN		

Source: Authors

As discussed in Imbens (2004) and Heckman, Ichimura, and Todd (1998), the effect of the treatment on the subpopulation of treated units is frequently more important than the effect on the population as a whole, when evaluating the importance of a narrowly targeted integrated financial market program, like Euro. In Table, we therefore estimate the SATT using our collected data: The output indicates that the effect of the CU program (Euro membership) on the participants in this sample is statistically different from zero but is much lower than the SATE.

Table (4): Average treatment Effect for the treated (ATET) of euro on economic growth with five matches

Coefficient	z	P>|z|
1.956697	3.91	0.000
Matching variables: *LnLF LnK lnFDI H OPEN*		

Source: Authors

Table (5): Average treatment effect for the controls (ATEC) of euro on economic growth with five matches

Coefficient	z	P>|z|
2.116341	5.12	0.000
Matching variables: *LnLF LnK lnFDI H OPEN*		

Source: Authors

5. Conclusion

In this paper we focused on the specification of a framework that was able to develop the relationship between financial integration and economic growth in the light of an evaluation problem. A conceptual framework of growth was constructed, while the paper provided a deep discussion on program evaluation. The methodology of program evaluation including 'treatment effect' and 'matching' was used to finalize an empirical frame on economic growth and an application of financial integration in which Euro as a currency union explained one aspect of the financial integration. Then, we used this method (matching) for evaluating the role of the Euro membership in economic growth of all countries worldwide. Overall, the results showed that economic growth in all MENA countries, both in members and in non-members, responded positively to the progress of CU implementation. More specifically, implementing a currency union is a good example of financial liberalization that has significantly positive effect on the economic growth of all countries.

Evaluations of the CU membership in most countries typically are based on post-program outcome measures. Such an evaluation strategy gives policymakers in the non-member countries of MENA an incentive to select the most efficient way for the CU membership having more effective participation in the integration process.

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