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Countries: a Probit Analysis**

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# **The Choice of Exchange Rate Regimes in the MENA Countries: a Probit Analysis**

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## **Abstract:**

This paper analyses the choice of exchange regimes of 17 economies in the MENA region for the period 1990-2000. For this purpose we use both de jure and de facto regime classifications and estimate a series of binomial and multinomial probit models. Regressions results highlight the important influence of economic development and international reserve levels on exchange regime selection.

**Keywords:** Exchange regime choice, MENA countries, probit model

**JEL Codes:** C25, F33

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## Introduction

The choice of an appropriate exchange rate regime has been at the centre of the debate in international economics for a long time. At the start of the 1960's, the literature on optimal exchange rate arrangements was cast as a general debate over the choice between fixed or flexible rates. There was broad agreement that both regimes had advantages and disadvantages.<sup>1</sup> During this period of time and until 1973, exchange rate policy was dominated by the Bretton Woods agreement of 1944, with its commitment to currencies convertible for current account transactions and fixed exchange rates (beyond a narrow band of permissible flexibility) but adjustable if necessary.

Five years after the breakdown of the Bretton Woods arrangement, the International Monetary Fund (IMF) decided that member countries can choose any exchange arrangement that suits them, provided that it is declared to the IMF and provided that it is consistent with the general objectives of the IMF.<sup>2</sup> Most major industrial nations have abandoned their fixed exchange regimes, with the collapse of the Bretton Woods system, and moved to a system of floating exchange rates. However, the option of a pure floating exchange rate did not seem to be feasible for small developing countries since it was recognized that flexible exchange rates would be associated with inappropriate changes in household's purchasing power, misdirected investment and detrimental effects on trade.

Four decades after the collapse of the Bretton Woods system of fixed but adjustable exchange rates, developing countries (and all IMF members) have the option of adopting a potentially wide variety of exchange rate regimes. Today, in the official classification by the IMF, exchange rate arrangements are divided into three broad categories: pegged or fixed arrangements, flexible arrangements and an in-between category of arrangements with "limited flexibility". Fixed arrangements include: Currency Unions, Currency Boards and truly fixed exchange rates. Floating exchange rates are divided into free floats where monetary authorities do not intervene and allow the exchange rate to be determined by market forces, and managed floats where intervention is done to "lean against the wind". Finally, intermediate arrangements run the continuum from an adjustable peg under which countries can periodically realign their pegs; to crawling pegs in which the peg is frequently reset in a series of devaluations; to a basket peg where the exchange rate is fixed in terms of a weighted basket of foreign currencies; to target zones (or exchange rate regimes with bands) where the authorities intervene when the exchange rate hits pre announced margins on either side of a central parity. Among 192 countries classified by the IMF at the end of 2006, 100 countries were listed as having fixed exchange arrangements (Italy, Germany, Djibouti, Egypt etc.), 76 maintained flexible arrangements (United States, Mexico, Israel, Tunisia etc.) and 16 were regarded as having intermediate arrangements (Iran, Slovenia, Morocco, Denmark etc.).<sup>3</sup> This illustrates the fact that different types of exchange rate arrangements may be appropriate for different countries, depending on their structural characteristics, external environments, and macroeconomic and political circumstances. Clearly, national choices of exchange regimes reveal a lack of consensus in the world today.<sup>4</sup>

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<sup>1</sup> See for instance Friedman (1953), Kindelberger (1969).

<sup>2</sup> See IMF's Article IV of agreement on obligations regarding exchange arrangements.

<sup>3</sup> See IMF (2006) for more details.

<sup>4</sup> In Jeffrey Frankel's words "No Single Currency Regime is Right for All Countries or At All Times".

In spite of the wide range and diversity of exchange rate arrangements adopted by the Middle East and North African (MENA) countries<sup>5</sup>, no theoretical or empirical contributions had been devoted to the question of the choice of exchange rate regime by these economies. These countries are small in economic size, have a low level of export and import diversification and exhibit strong trade with the European Union (EU). Over the period 1990- 2000, nearly 70% of Tunisia's and Algeria's exports have been oriented to the "Euroland" market, 60% of Morocco's, 50% of Egypt's and 45% of Turkey's. The same dependency exists for their imports, since the EU is also the main source of MENA imports.<sup>6</sup> These common structural characteristics would lend support to the hypothesis that these countries should peg to the Euro, however most of the MENA countries including Bahrain, Egypt, Iraq, Jordan, Kuwait, Oman and the Syrian Arab Republic pegged their currencies to the US dollar, while others like Tunisia opted for a managed float exchange rate regime.

This study attempts to uncover possible systematic relationships between the choice of an exchange rate regime by the MENA countries and some traditional determinants proposed in the existing literature. By utilizing two different exchange rate classifications (IMF and Bubula and Ötoker-Robe (2002)), we estimate several binomial and multinomial Probit models of various specifications of the traditional optimum currency area (OCA) theory and of newer hypothesis of exchange regime choice. Regressions results for 17 MENA countries over the 1990-2000 period show that among theoretical long-run determinants proposed by the OCA theory only the level of economic development has exercised an influence on the choice of exchange rate regime through the period studied. We also find that other newer theories like the political view or the capital account openness approach can not adequately explain the choice of the exchange rate regime by these countries. Finally, our results show that the level of international reserves plays a significant role in the choice of exchange regimes in the MENA economies.

The remainder of this paper is structured as follows. Section II briefly reviews the three most important theories of exchange rate regime choice and summarizes previous empirical findings. Section III presents the data used in our analysis and outlines the methodology before discussing the estimation results. Section IV concludes.

## II. Exchange rate regime choice: Theory and Evidence

Theories of exchange rate regime choice can be grouped under three broad headings; the OCA theory initiated in the early 1960's, the political economy theory and the currency crisis (capital account openness) approach.

### II.1 The OCA theory

The starts of the OCA theory are the seminal contributions by Mundell (1961), Mckinnon (1963) and Kenen (1969).<sup>7</sup> OCA theory suggests that the balance of advantages and

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<sup>5</sup> In 2006; Bahrain, Egypt and Jordan opted for fixed exchange arrangements, Morocco, Iran and Libya for intermediate regimes, and Algeria, Tunisia and the Yemen for flexible arrangements. See Appendix (table 1) for more details.

<sup>6</sup> The importance of MENA countries in "Euroland" external trade is much smaller; it does not exceed 5%.

<sup>7</sup> An OCA is defined as the optimal geographic domain of a single currency, or of several currencies, whose exchange rates are irrevocably pegged and might be unified. OCA theory assumes that factors of production, such as labour and capital are mobile between regions of the currency area but immobile out of the OCA. It also assumes that there is limited price and wage flexibility in the economy.

disadvantages between fixed and flexible exchange rates varies according to the manner and extent of economic integration between countries. In essence, it relates the choice of an exchange rate regime to some structural characteristics, criteria or properties that are relatively stable over time. Mundell (1961) suggested that the degree of factor (labour) mobility was a key determinant of the optimal choice of exchange rate regime. According to Mundell (1961), a great degree of labour mobility will make it costlier to adjust to external shocks with a flexible regime. McKinnon (1963) focused on the relevance of openness, as measured by the ratio of tradable goods production to non tradable goods production. The openness of an economy was regarded a key determinant of regime choice. He argued that, other things being equal, the greater the openness of an economy, the greater would be the responsiveness of domestic wages and prices to a change in the nominal exchange rate, so the stronger was the case for fixed exchange rate; as openness increases.<sup>8</sup> Both Mundell (1961) and McKinnon (1963) emphasised the fact that the size of an economy can be a key determinant of exchange regime choice. Openness is expected to be greater, the smaller the economy, therefore the larger the economy, the stronger is the case for flexible regime. The third main contribution on OCA theory is due to Kenen (1969). He suggests production diversification as a characteristic for optimum currency areas and stressed that a well-diversified economy will rarely confront changes in demand for its export products. According to Kenen (1969), Product diversification decreases the likelihood of asymmetric shocks and alleviates their negative effects. Thus, the greater the diversity of an economy's production activities the less severe would be the costs of unpredictable disturbances, so the stronger was the case for fixed exchange rates.<sup>9</sup> During the 1980's and the early 1990's, contributions on the OCA issue have continued to emphasise the criteria approach underlying the choice of an optimum currency domain as well as to enumerate the benefits and drawbacks of monetary integration. More recently, the theory of optimum currency areas has been modified to take in consideration the new views on the long run ineffectiveness of monetary policy and the short run Phillips curve, on the credibility issue and the time inconsistency problems<sup>10</sup> and the new hypothesis on the possible endogeneity of OCA.<sup>11</sup>

Most empirical studies trying to analyse the choice of exchange rate regimes have considered many of the OCA variables<sup>12</sup>. The most common variables used in these studies are; Openness of the country typically measured as exports plus imports divided by GDP, the size of the economy generally measured by the GDP, the patterns of trade (geographical concentration of trade) measured by the share of trade with the country's main partner and the degree of economic development measured by the GDP per capita. The majority of these empirical studies provide large support for the OCA theory suggesting that individual

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<sup>8</sup> As openness increases "flexible exchange rate become both less effective as a control device for external balance and more damaging to internal price level stability McKinnon (1963, p.719)

<sup>9</sup> Following these three main contributions, several other criteria were developed, including the degree of financial integration Ingram (1969), the similarity of inflation rates Haberler (1970) and Fleming (1971), the degree of policy integration Tower and Willet (1970), the degree of financial or economic development Holden, Holden and Suss (1979). See Ishyama (1975) and Tavlas (1993) for and comprehensive review of these criteria.

<sup>10</sup> Tavlas (1993, 1994)

<sup>11</sup> Frankel and Rose (1996)

<sup>12</sup> Heller (1978), Dreyer (1978), Holden, Holden and Suss (1979), Melvin (1985), Savvides (1990), Bosco (1987), Cuddington and Otoo (1990, 1991), Honkapohja and Pikkarainen (1992), Collins (1996), Edwards (1996), Edwards (1998), Rizzo (1998), Berger, Sturm and de Haan (2000), Frieden, Ghezzi and Stein (2000), Poirson (2001), Von Hagen and Zhou (2002), Juhn and Mauro (2002), Papaioannou (2003), Levy Yeyati, Sturzenegger, and Reggio (2002), Bleaney and Francisco (2005) and Markiewicz (2005).

structural characteristics could have exercised an influence on the choice of exchange rate regime.<sup>13</sup>

## II.2 The political economy theory

The Political economy theory of exchange regime choice developed mainly from the concept of “time inconsistency” first introduced by Kydland and Prescott (1977).<sup>14</sup> The time inconsistency problem arises because there are incentives for a policymaker to pursue discretionary policy to achieve short-run objectives, such as higher growth and employment, even though the result is poor long-run outcomes (high inflation).<sup>15</sup> This strand of literature emphasise the role of credibility and political factors in the choice of an exchange rate regime. The argument runs as follows. A country whose authorities have a reputation of pursuing inflationary policies will find it difficult to shed that reputation without a long and costly process of disinflation. The time-consistency literature argues that, to gain a reputation of credibility, authorities must pursue a policy rule that is time consistent. One way to gain credibility is by “tying the hands” of the authorities by fixing the exchange rate vis-à-vis the currency of a country with relatively high anti-inflation credibility Giavazzi and Pagano (1988).<sup>16</sup> In other words, In an environment of high inflation, as was the case in most countries in most countries the 1970’s and the 1980’s, pegging to the currency of a country with low inflation or joining a monetary union is viewed as a pre-commitment mechanism to anchor inflation expectations.

The optimal choice of regime would therefore rest upon a balance between credibility (or discipline) and flexibility. A flexible exchange rate regime allows a country to have an independent monetary policy providing the economy with flexibility to accommodate domestic and foreign shocks, including changes in external terms of trade and interest rates, but this flexibility usually comes at the cost of some loss in credibility and tends to be associated with higher inflation. Alternatively, fixed exchange rates reduce the degree of flexibility of the system, but they are regarded as a commitment technology that national authorities can employ, if they choose, to enhance their credibility.

Several empirical studies on the determinants of exchange rate regime choice have considered variables related to the political economy view, including standard political instability indicators (frequency of government changes or frequency of transfers of powers to an opposition party), government characteristics (monarchical, dictatorial systems or democratic regimes) and central bank independence.<sup>17</sup> In spite of the diversity in the sample of countries taken, periods of time, methods of estimation, classifications of regimes and assumptions of

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<sup>13</sup> See Juhn and Mauro (2002) for a comprehensive survey of the literature on OCA models of exchange rate regimes.

<sup>14</sup> See also Barro and Gordon (1983).

<sup>15</sup> This argument was based on the theory developed by Barro and Gordon (1983) who discuss the case of a central bank using discretionary monetary policy to generate surprise inflation in order to reduce unemployment. They demonstrate that with rational expectations the outcome will be higher inflation but unchanged employment because the inflationary consequences of the central bank’s actions will be incorporated in workers’ wage demands.

<sup>16</sup> As stressed by Tavlas (1993), the time inconsistency literature reverses the ordering between the criterion of similarity of inflation rates, as identified by the OCA theory, and currency area participation; similarity of inflation is no longer a precondition, but it becomes a desirable outcome.

<sup>17</sup> Edwards (1996), Berger, Sturm and de Haan (2000), Frieden, Ghezzi and Stein (2000), Poirson (2001), Juhn and Mauro (2002), Papaioannou (2003) and Levy Yeyati, Sturzenegger, and Reggio (2002).

theoretical and econometric models used by these papers, the empirical findings of these contributions remain inconclusive.

### II.3 The currency crisis approach

According to the currency crisis or the capital account openness hypothesis countries are (or should sooner or later be) moving to the corner solutions. They are said to be opting either, on the one hand, for full flexibility, or, on the other hand, for rigid institutional commitments to fixed exchange rates, in the form of currency boards or full monetary union with the dollar or euro.<sup>18</sup> It is said that the intermediate exchange rate regimes are no longer feasible because of the belief that they have proven themselves to be highly susceptible to speculative crises.<sup>19</sup> However, the so called bipolar view or the hypothesis of vanishing intermediate regimes has absolutely no theoretical foundation; it is only a corollary to the principle of the impossible trinity.<sup>20</sup>

The hypothesis of vanishing intermediary regimes has been challenged by a number of economists including John Williamson and Morris Goldstein. These authors tried to identify a viable middle ground that would give the monetary authorities some policy independence, while eliminating some of the excessive volatility that might otherwise be associated with a completely free float. Williamson (2000) has proposed a modification of the former target zone variant for emerging market economies. The new proposal is called the BBC regime, where BBC stands for basket, band and crawl. Goldstein (2002) has also championed a new exchange rate system for emerging markets, called “Managed Floating Plus”. Unlike the BBC proposal, which gives prominence to the exchange rate, the “Managed Floating Plus” proposal uses a domestic inflation target as the nominal anchor for monetary policy and gives greater attention to stabilizing the domestic economy than to fixing the exchange rate. The bipolar view has also been discredited by recent empirical studies on the concepts of “fear of floating” Calvo and Reinhart (2002) and “fear of pegging” Levy-Yeyati and Sturzenegger (2003).

Several empirical studies looked at capital market factors as potential determinants of the exchange regime choice. To test this hypothesis, these studies usually included an indicator of either capital controls (typically drawn or constructed from the IMF’s Exchange Arrangements and Exchange Restrictions publication)<sup>21</sup> or de facto capital openness measured by the ratio of private capital inflows and outflows to GDP or the ratio of foreign assets of the banking system to the money supply.<sup>22</sup>

Finally, most of the empirical contributions included a number of macroeconomic variables such as inflation (whether the country’s own inflation, or inflation in excess of partner

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<sup>18</sup> Summers (2000) wrote that “the choice of appropriate exchange rate regime, which, for economies with access to international capital markets, increasingly means a move away from the middle ground of pegged but adjustable fixed exchange rates towards the two corner regimes of either flexible exchange rates or a fixed exchange rate supported, if necessary, by a commitment to give up altogether an independent monetary policy.”

<sup>19</sup> Obstfeld and Rogoff (1995) and Fisher (2001).

<sup>20</sup> A country can not achieve the three objectives of exchange rate stability, monetary independence and financial market integration simultaneously.

<sup>21</sup> Edwards (1996), Frieden, Ghezzi and Stein (2000), Poirson (2001) and Juhn and Mauro (2002)

<sup>22</sup> Holden, Holden and Suss (1979), Savvides (1990), Edwards (1996) and Poirson (2001)

countries) and foreign exchange reserves and some measures of macroeconomic or financial volatility such as the variability of output, domestic credit or the real exchange rate.<sup>23</sup>

### III. Data, estimation strategy and results.

#### III.1 Data and estimation strategy

For our empirical analysis, we concentrate on the determinants of exchange rate regime choice in 17 MENA countries during the 1990-2000 period.<sup>24</sup> Unless indicated otherwise, all underlying data are from the International Financial Statistics (IFS) of the IMF series.

In order to study the choice of the exchange rate regime, it is necessary to employ the proper classification of exchange rate systems. The vast majority of previous studies have attempted to explain exchange rate regime choice as self-reported by countries in the IMF's annual report on Exchange Arrangements and Exchange Restrictions.<sup>25</sup> The approach taken here is, first, to report results according to the official classification, which uses the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. In addition, we supplement these results by the de facto classification developed by Bubula and Ötoker-Robe (2002) BB (2002).<sup>26</sup>

From a technical point of view, given that the dependent variable (the exchange rate regime choice) is a qualitative variable that can assume two or more values according to the different theoretical hypothesis, probit models are used. The pooled cross-sectional and time-series nature of the sample necessitates the use of random effects probit model. A random effect probit allows us to obtain unbiased parameter estimates and consistent standard errors in the face of within-unit serial correlation and heteroscedastic errors across units Maddala (1987). Both binomial and multinomial versions of random effects probit are estimated. The dependent variable changes in the binomial and multinomial probit estimations depending on whether we are interested in examining the choice between flexible exchange rate regimes versus all other arrangements or the choice between fixed, intermediary and floating regimes. In the binomial regressions, the dependent variable takes the value of 1 if a flexible regime is chosen by the country *i* in year *t* and 0 otherwise. In the multinomial version, the dependent variable takes the value of 0 if a fixed exchange regime is chosen, 1 if an intermediary regime is chosen and 2 if a flexible regime is adopted by the country *i* in year *t*.<sup>27</sup>

Our analysis of the potential determinants of exchange regime choice involves many of the explanatory variables that have been suggested by theory and used in previous studies. Detailed definitions and data sources are given in Appendix (table 3). The economic fundamentals include the degree of openness of the economy (OPEN), geographical concentration of foreign trade (GEOCON), per capita real GDP (PCGDP), and real GDP

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<sup>23</sup> Dreyer (1978), Melvin (1985), Savvides (1990), Collins (1996) Edwards (1996), Rizzo (1998) Poirson (2001) and Papaioannou (2003)

<sup>24</sup> Countries included in the empirical analysis are; Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Libya, Mauritania, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates (UAE) and Yemen. Djibouti, Lebanon, Sudan, Afghanistan, Iraq and Somalia were omitted from the sample since most of the data used in the analysis is not available for these countries.

<sup>25</sup> Holden, Holden and Suss (1979) and more recently, Poirson (2001) have used measures of the degree of de facto floating on the basis of the actual observed volatility of exchange rates and reserves.

<sup>26</sup> We did not use the de facto classifications developed by Levy-Yeyati and Sturzenegger (2000) and Reinhart and Rogoff's (2002) because most of the data on exchange rate regimes is not available for MENA countries.

<sup>27</sup> See Appendix (table 2) for more details on exchange rate classifications.



(RGDP). The last variable is the ratio of capital inflows plus outflows to GDP (CAPMOB), which approximates the degree of capital mobility.

Two different measures of government characteristics were used in the econometric tests to proxy for government strength. The first is an additive eleven-point scale (0-10) composite indicator of democracy (DEMOC) developed by Marshall and Jaggers (2005)<sup>28</sup>. The second variable, (DURAB) correspond to regime durability as measured by the number of years that the incumbent administration has been in office.

Our empirical tests include two different measures of capital openness. The first is a dummy variable that indicates the existence or not of restrictions on capital account transactions (KAP1). The second is an additive five points scale (0-4) capital controls indicator that adds together four dummy variables, each representing the existence of (a) multiple exchange rates, (b) current account restrictions, (c) capital account restrictions, and (d) export proceeds surrender requirements, respectively (KAP2). The original source for the capital controls data is the IMF Exchange Arrangements and Exchange Restrictions.

Beside these variables, our empirical investigations use three other macroeconomic variables including the central bank reserves as a share of imports (RESM), the inflation differential between the domestic inflation rate and the United States inflation (DINF) and the ratio of current account balance to GDP (CAGDP).

## III.2 Discussion of results

We begin by estimating binary probit models dividing the sample into floats and pegs. While the generated binary index reduces the original eight (thirteen) categories of exchange rate regimes in the IMF (BB) classification to just two, it still has considerable variance. For the 17 MENA countries in our sample between 1990 and 2000 we have 187 observations (17\*11) on the dependent variable IMF1 (BB1)<sup>29</sup>, of which 72% (85%) fall into the flexible exchange rate category and 28% (15%) in the fixed category. Before turning to the regression analysis, we examine the correlation matrix for the potential determinants of exchange rate regimes (table 4 appendix). Even though many of these determinants are correlated (correlations between KAP15, KAP25 and PCGDP5 are relatively high) with each other, there do not seem to be obvious sign of multicollinearity<sup>30</sup>.

### III.2.1 Empirical results from binomial probit analysis

The results of the binomial probit regressions for both the declared (IMF) classification and the de facto (BB) classification are respectively presented in Table 1 and 2. We begin by using only structural (OCA) variables and macroeconomic variables as regressors, then we introduce in turn political and capital account openness variables. One way to interpret this exercise is as a robustness check: are the results of the basic model robust with regard to the introduction of alternative explanatory variables? A positive sign of a coefficient means that

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<sup>28</sup> The democracy variable is an index which takes values from 0 to 10, and captures the competitiveness of political participation, the openness and competitiveness of executive recruitment, and the existence of constraints on the power of the executive.

<sup>29</sup> The dependent variable is noted IMF1 (BB1) when estimations are obtained from the IMF de jure classification (BB de facto classification).

<sup>30</sup>We use 5 period lagged series (indicated by placing a 5 after the variable) where we believe endogeneity may be a concern.

an increase of the associated variable raises the probability of adopting a flexible exchange rate regime. The main results of Table 1 and Table 2 can be summarized as follows.

**Table 1: Probit regressions for IMF1 with structural, macroeconomic and political factors  
(Likelihood to float)**

Variables	Regression (1)	Regression (2)	Regression (3)
<b>OCA Variables</b>			
OPEN5	0.814922 (0.31)	2.767293 (0.98)	3.019145 (1.13)
GEOCON	1.40e-06 (0.01)	1.26e-06 (0.01)	-6.61e-08 (0.01)
PCGDP5	-0.000432 (2.13)**	-0.0005661 (2.03)**	-0.0004281 (1.7)*
RGDP5	-1.87e-11 (0.9)	-1.63e-11 (0.48)	-2.61e-11 (1.15)
CAPMOB	-15.34237 (1.42)	-18.7718 (1.55)	-2.405346 (0.16)
<b>Macroeconomic Variables</b>			
RESM5	-0.8450951 (2.73)***	-0.8290433 (2.09)**	-0.8862867 (2.44)**
DINF	-0.0294867 (0.76)	-.0305794 (0.48)	0.1206738 (1.76)
CAGDP5	0.111106 (1.96)**	0.1591172 (1.56)	0.1710459 (2.15)**
<b>Political Variables</b>			
DEMOC		0.2779743 (0.64)	-0.1558103 (0.41)
DURAB		-0.0219154 (0.36)	0.0018959 (0.05)
<b>Capital controls Variables</b>			
KAP15			-0.7151971 (0.33)
KAP25			3.516986 (2.14)**
<b>Log-Likelihood</b>	-24.93	-23.99	-23.40
<b>Chi-squared</b>	57.15	45.39	41.72
<b>Number of observations</b>	99	99	98

\*: test-statistic is significant at the 10% level; \*\*: significant at the 5% level; \*\*\*: significant at the 1% level.  
Absolute *t*-statistics are displayed in parentheses under the coefficient estimates.  
Constant terms are not reported.

The variables OPEN5 (openness) and GEOCON (geographic concentration of trade) are never significant as determinants of exchange regimes. However the sign of the variable OPEN5 is positive in all regression suggesting that Openness has a positive influence on the probability of a country choosing a flexible exchange rate regime in the model. Collins (1996) argues that less open countries will have thinner markets for foreign exchange and that policy makers in these countries will find it more difficult to manage a flexible exchange rate system. Also, the results show that both RGDP5 (economic size) and CAPMOB (capital mobility) do not matter for the choice of exchange regime since they are not statistically significant. Finally, Analysis of the link between the exchange rate regime and economic development level brings out one clear conclusion: a relationship between the two does indeed exist. However, the findings in this case contradict the traditional OCA prediction, countries with high economic development levels tend to have fixed rather than flexible exchange rates.

**Table 2: Probit regressions for BBI with structural, macroeconomic and political factors  
(Likelihood to float)**

Variables	Regression (1)	Regression (2)	Regression (3)
<b>OCA Variables</b>			
OPEN5	5.724225 (1.29)	4.816462 (0.61)	2.087983 (0.47)
GEOCON	-7.971845 (1.36)	-4.36e-07 (0.00)	-0.1218621 (0.01)
PCGDP5	-0.0004461 (1.69) **	-0.0002962 (0.71)	-0.0003028 (1.04)
RGDP5	-1.02e-10 (1.92) **	2.86e-12 (0.05)	-1.29e-10 (0.6)
CAPMOB	65.32703 (1.77) **	139.4826 (1.57)	52.25949 (-)
<b>Macroeconomic Variables</b>			
RESM5	-0.9795338 (2.11) **	-0.8368479 (1.84)	-0.8699923 (2.6) ***
DINF	-0.143747 (1.01)	-0.3754321 (1.6)	-0.2513504 (1.03)
CAGDP5	-0.1931238 (1.60)	-0.2895444 (1.72) *	-0.3476362 (2.36) **
<b>Political Variables</b>			
DEMOC		1.191812 (1.85) *	0.2993509 (1.96) **
DURAB		-0.7411469 (1.84) *	-0.1452422 (1.75) *
<b>Capital controls Variables</b>			
KAP15			8.314174 (1.66) *
KAP25			0.3374789 (0.25)
<b>Log-Likelihood</b>	-24.11	-21.17	-21.36
<b>Chi-squared</b>	20.40	21.04	13.48
<b>Number of observations</b>	99	99	98

\*: test-statistic is significant at the 10% level; \*\*: significant at the 5% level; \*\*\*: significant at the 1% level.

Absolute *t*-statistics are displayed in parentheses under the coefficient estimates.

Constant terms are not reported.

Turning to macroeconomic variables, we find that the international reserve indicator (RESM5) play a significant role in the selection of the exchange rate regime in the MENA countries. The coefficient of the variable RESM5 is negative and significant in all specifications. This result supports the hypothesis that economies with high reserves to imports ratios tend to adopt fixed exchange rate regimes as large reserves can enhance the sustainability of such regimes. In contrast the two other macroeconomic variables, divergence between rates of inflation (DINF) and the current account balance ratio to GDP (CAGDP5) turn out to be insignificant.

Regarding political variables, the results appear less convincing. Estimations based on the IMF de jure classification (with the dependent variable IMF1) show that neither the variable DEMOC nor the variable DURAB are significant suggesting that government strength does not have any significant explanatory power. However, when using the BB classification, the two variables turn out to be significant and have coherent signs. The democracy (durability) variable has a positive (negative) and significant sign suggesting that authoritarian

governments tend to avoid the temptation to inflate by “tying their hands” by adopting a fixed exchange rate regime.

Finally, the dummy for the restrictions on capital account transactions, included in the IMF (BB) regression was negative (positive) but insignificant (significant), while the composite capital controls variable was positive and significant (insignificant) in the IMF (BB) regression. This result is also surprising, as fixed exchange rate regimes were expected to be more likely when restrictions on the capital account were present. The relatively high correlation between these two variables leads us to suspect that multicollinearity underlies the absence of significant and robust results.

### III.2.2 Empirical results from multinomial probit analysis

So far we have assumed that the dependent variable can take only two values (0 and 1). From an economic point of view we have assumed that the crucial choice is between pegging and floating without considering a third, intermediate possibility. Now we release this hypothesis and assume that a single country faces three different alternatives and can choose between a fixed, an intermediary and a flexible exchange rate regime.

Table 3 and 4 present the results of probit analysis, conducted as in the previous subsection using an unbalanced panel data set. The regressions are presented in their multinomial version- that is, the dependent variable takes the values 0 for a fixed exchange regime, 1 for an intermediary regime and 2 for a flexible exchange rate regime<sup>31</sup>. In this case, for the 17 MENA countries included in our sample we also have 187 observations on IMF2 (BB2), of which 50% (76%) fall into the fixed exchange rate category, 23% (9%) in the intermediate category and 27% (15%) in the flexible category.

The results from multinomial probit regressions, shown in Table 3 and 4, are completely in line with our previous findings. As can be seen, even though the coefficients of most of the explanatory variables included in the estimations are insignificant, it is clear that a robust regularity exists for the variables PCGDP5 and RESM5. In the majority of regressions, the coefficient of the variable PCGDP5 is negative and significant suggesting that countries with relatively developed goods markets tend to opt for fixed exchange rate regimes, a result that is consistent with previous findings of Honkapohja and Pikkarainen (1992) and Edwards (1998). Also, the significant negative coefficient of variables RESM5 supports the evidence that high levels of international reserves are more likely to be associated with fixed exchange rate regimes. Thus, we can assume that a systematic relationship does exist between the choice of exchange regimes by the MENA countries, the economic development level and the amount of reserves in these economies.

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<sup>31</sup> The dependent variable is noted IMF2 (BB2) when estimations are obtained from the IMF de jure classification (BB de facto classification).

**Table 3: Probit regressions for IMF2 with structural, macroeconomic and political factors  
(Likelihood to float)**

<b>Variables</b>	<b>Regression (1)</b>	<b>Regression (2)</b>	<b>Regression (3)</b>
<b>OCA Variables</b>			
OPEN5	1.715045 (1.18)	3.923531 (1.99) *	3.903757 (1.73) *
GEOCON	2.13e-06 (0.00)	1.62e-06 (0.00)	1.54e-06 (0.00)
PCGDP5	-0.0002007 (1.79) *	-0.0004632 (2.49) **	-0.0005542 (1.94) *
RGDP5	1.01e-11 (1.11)	1.36e-11 (1.09)	1.30e-11 (0.83)
CAPMOB	-4.661371 (0.91)	-7.051363 (1.23)	-7.347158 (1.25)
<b>Macroeconomic Variables</b>			
RESM5	-0.4245496 (2.54) **	-0.5829736 (3.38) ***	-0.6008529 (3.13) ***
DINF	-0.0124675 (0.34)	-0.0052717 (0.17)	-0.0195388 (0.48)
CAGDP5	0.0350978 (1.08)	0.055608 (1.45)	0.0612254 (1.45)
<b>Political Variables</b>			
DEMOC		0.9997152 (1.28)	1.327016 (1.23)
DURAB		0.0401459 (1.71) *	0.039684 (1.33)
<b>Capital controls Variables</b>			
KAP1			0.1297164 (0.06)
KAP2			-0.3297622 (0.50)
<b>Log-Likelihood</b>	-36.14	-32.98	-32.80
<b>Chi-squared</b>	51.54	44.35	38.57
<b>Number of observations</b>	99	99	

\*: test-statistic is significant at the 10% level; \*\*: significant at the 5% level; \*\*\*: significant at the 1% level.  
Absolute *t*-statistics are displayed in parentheses under the coefficient estimates.  
Constant terms are not reported.

**Table 4: Probit regressions for BB2 with structural, macroeconomic and political factors  
(Likelihood to float)**

Variables	Regression (1)	Regression (2)	Regression (3)
<b>OCA Variables</b>			
OPEN5	-3.088261 (1.05)	-4.433306 (1.84)	-0.5165456 (0.24)
GEOCON	3.80e-06 (0.00)	5.236312 (0.43)	3.64e-06 (0.00)
PCGDP5	-0.0003885 (1.21)	-0.001475 (1.71) *	-0.0003895 (1.60)
RGDP5	-6.25e-11 (1.01)	-8.80e-11 (1.96) **	-2.41e-11 (0.98)
CAPMOB	11.44181 (0.27)	26.85255 (0.69)	-2.276308 (0.09)
<b>Macroeconomic Variables</b>			
RESM5	-0.2879179 (2.10) *	-0.1586797 (1.58)	-0.204734 (2.13) **
DINF	-0.0850353 (1.14)	-0.1426102 (1.65) *	-0.0544805 (1.29)
CAGDP5	-0.1255599 (0.85)	-0.0897147 (1.74) *	-0.0192205 (0.80)
<b>Political Variables</b>			
DEMOC		0.1821783 (1.13)	0.0858857 (0.66)
DURAB		-0.0383553 (1.10)	0.0405668 (0.87)
<b>Capital controls Variables</b>			
KAP1			0.0211148 (0.02)
KAP2			0.0792916 (0.15)
<b>Log-Likelihood</b>	-26.29	-23.21	-25.59
<b>Chi-squared</b>	20.80	26.52	19.86
<b>Number of observations</b>	99	99	94

\*: test-statistic is significant at the 10% level; \*\*: significant at the 5% level; \*\*\*: significant at the 1% level.  
Absolute *t*-statistics are displayed in parentheses under the coefficient estimates.  
Constant terms are not reported.

## Conclusion

This paper investigated empirically the determinants of exchange rate regime choice in 17 MENA countries during the 1990-2000 period. The explanatory variables considered included three sets of criteria highlighted in recent theoretical analyses: long-run determinants proposed by the OCA, political factors and the degree of capital account openness. In contrast to some of the existing empirical literature, our estimations show that among the variables suggested by the optimum currency area, only the level of economic development is an adequate and robust predictor of exchange regime choice in the MENA countries. It is shown that economies with high per capita incomes tend to opt for fixed exchange rate regimes. Our analysis indicates at the same time that neither the political economy variables nor the capital account openness measures are robust or significant predictors of exchange rate regimes. Finally, the results suggest that international reserves levels have a significantly positive influence on the pegging decision. Based on these findings, we may conclude that the choices of exchange rate regime made by the MENA countries during the last decade have been consistently influenced by the international reserves.

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## Appendix I

**Table 1: Exchange Rate Arrangements in the MENA countries as of July 31, 2006**

	Exchange rate regime						
	Fixed exchange rate regimes			Intermediate regimes		Flexible regimes	
	Exchange arrangements with no separate legal tender	Currency Board arrangements	Other conventional fixed peg arrangements	Pegged exchange rates within horizontal bands	Crawling Peg	Managed Floating with no pre-determined path for the exchange rate	Independently floating
Afghanistan						•	
Algeria						•	
Bahrain			• (1)				
Djibouti		•					
Egypt			• (1)				
Iran					•		
Iraq			• (1)				
Jordan			• (1)				
Kuwait			• (1)				
Lebanon			• (1)				
Libya			• (2)				
Mauritania			• (1)				
Morocco			• (2)				
Oman			• (1)				
Pakistan			• (1)				
Qatar			• (1)				
Saudi Arabia			• (1)				
Syria			• (1)				
Tunisia						•	
UAE			• (1)				
Yemen						•	

(1) Pegged against a single currency

(2) Pegged against a composite

Source: IMF (2006) “Annual Report on Exchange Rate Arrangements and Exchange Restrictions”

**Table 2: Classifications of exchange rate regimes in the regressions**

<b>Binomial probit regressions</b>		
	<b>IMF1</b>	<b>BB1</b>
<b>Fixed exchange rate regimes</b>	1- Exchange arrangements with no separate legal tender 2- Currency Board arrangements 3- Other conventional fixed peg arrangements 4- Pegged exchange rates within horizontal bands 5- Crawling Peg 6- Crawling Band	1- Another currency as legal tender 2- Currency union 3- Currency board 4- Conventional fixed peg of single currency 5- Conventional fixed peg to basket 6- Pegged within a horizontal band 7- Forward-looking crawling peg 8- Forward-looking crawling band 9- Backward-looking crawling peg 10- Backward-looking crawling band
<b>Flexible exchange rate regimes</b>	7- Managed Floating with no pre-determined path for the exchange rate 8- Independently floating	11- Tightly managed floating 12- Other managed floating 13- Independently floating

<b>Multinomial probit regressions</b>		
	<b>IMF2</b>	<b>BB2</b>
<b>Fixed exchange rate regimes</b>	1- Exchange arrangements with no separate legal tender 2- Currency Board arrangements 3- Other conventional fixed peg arrangements	1- Another currency as legal tender 2- Currency union 3- Currency board 4- Conventional fixed peg of single currency
<b>Intermediate exchange rate regimes</b>	4- Pegged exchange rates within horizontal bands 5- Crawling Peg 6- Crawling Band	5- Conventional fixed peg to basket 6- Pegged within a horizontal band 7- Forward-looking crawling peg 8- Forward-looking crawling band 9- Backward-looking crawling peg 10- Backward-looking crawling band
<b>Flexible exchange rate regimes</b>	7- Managed Floating with no pre-determined path for the exchange rate 8- Independently floating	11- Tightly managed floating 12- Other managed floating 13- Independently floating

**Table 3: Variables, Definitions, Data sources**

Variable	Definition	Source
<b>• OCA variables</b>		
OPEN5	Ratio of exports plus imports to GDP	WDI
GEOCON	Share of major total partner in total exports	DOTS
PCGDP5	Per capita, PPP (current international \$)	WDI
RGDP5	Real GDP	IFS
CAPMOB	Absolute value of inward and outward flows of financial assets and liabilities as percentage of nominal GDP	IFS
<b>• Political variables</b>		
DEMOC	Index of democracy (0-10)	Marshall and Jagers (2005)
DURAB	Years the incumbent administration has been in office	Freedom House
<b>• Currency crises variables</b>		
KAP1	A binary dummy that indicates the existence or not of restrictions on capital account transactions	Exchange Arrangements and Exchange Restrictions, IMF
KAP2	the sum of four dummy variables that take the value of one if the country has multiple exchange rates, current account restrictions, capital account restrictions, and export proceeds surrender requirements, respectively.	Exchange Arrangements and Exchange Restrictions, IMF
<b>• Macroeconomic variables</b>		
RESM5	International reserves as percentage of imports	IFS
DINF	Difference between inflation in the country and inflation in the USA	IFS
CAGDP5	Current account balance as a percentage of GDP	IFS

Notes: IFS = International Financial statistics  
 WDI = World Bank World Development Indicators  
 DOTS = Direction of Trade Statistics

**Table 4: Correlation matrix, 17 countries, 1990-2000**

	open5	pcgdp5	rgdp5	geocon	capmob	democ	durab	kap15	kap25	resm5	cagdp5	dinf
open5	1.00											
pcgdp5	0.48	1.00										
rgdp5	-0.44	0.17	1.00									
geocon	0.19	0.18	-0.06	1.00								
capmob	-0.33	-0.29	0.14	0.04	1.00							
democ	-0.08	-0.01	-0.13	-0.13	0.09	1.00						
durab	0.02	0.39	0.39	0.39	0.04	-0.47	1.00					
kap15	-0.42	-0.70	-0.02	-0.02	0.32	0.04	-0.40	1.00				
kap25	-0.46	-0.81	-0.16	-0.16	0.30	0.14	-0.39	0.81	1.00			
resm5	-0.15	-0.01	0.10	0.10	0.06	-0.15	0.16	0.17	0.07	1.00		
cagdp5	-0.07	0.23	-0.01	-0.01	-0.02	-0.09	0.07	0.06	-0.06	0.35	1.00	
dinf	-0.19	-0.05	0.08	0.08	0.06	0.16	-0.31	0.03	0.05	-0.04	0.19	1.00

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