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BANKING SECTOR CONTROLS AND FINANCIAL DEEPENING: A STRUCTURAL ERROR CORRECTION MODEL FOR TUNISIA

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The aim of this paper is to investigate empirically the effects of several types of banking sector controls on financial deepening in Tunisia. The hypotheses addressed in this study are discussed within the general framework of the McKinnon/Shaw approach and the monopoly bank model. A structural error correction model in Ericsson's (1995) sense has been specified and used to estimate the effects of financial repression in Tunisia over the period 1961–2000. The main empirical finding suggests that, in the long and short terms, financial repression has had significant and negative effects on financial development, independently of its well-known influence via the level of the real interest rate. This finding shows a contrast with the prevalence of financial market imperfections, but it is consistent with traditional literature on financial liberalization. In addition, this paper shows that financial deepening and per capita income are jointly determined since they both appear not to be weakly exogenous with each other.

I. INTRODUCTION

THE effects of banking sector controls on the process of financial deepening still remain "ambiguous" at the empirical level as indicated by Arestis et al. (2002). Theoretically, the seminal contributions of McKinnon (1973) and Shaw (1973) postulate that government intervention in the pricing and allocation of loanable funds impedes financial deepening mainly by depressing real interest rates. These authors and others such as Fry (1995) recommend the liberalization of the financial system to increase the volume and the productivity of investments. Despite his support for financial liberalization, Fry (1998) did not accept this policy at any cost. In his speech at the Cyprus Economic Society's 1997 annual lecture, he analyzed the "pitfalls" of financial liberalization and warned of the importance of a number of prerequisites for its success. On the other hand, Stiglitz (1994), Caprio (1994), and Hellmann, Murdock, and Stiglitz (2000) focused on financial market imperfections (asymmetric information and imperfect competition) and announced their skepticism about the prediction of the financial liberalization thesis.[1]

[1] The financial liberalization thesis (McKinnon 1973; Shaw 1973) predicts a financial deepening in the course of interest rate liberalization.

In this paper, I propose that interest rate restrictions and other banking policies may have effects on financial development which are independent of the orthodox interest rate effect of McKinnon and Shaw. This hypothesis is based on the works of Courakis (1984) and Stiglitz (1994). The former argued that credit market structure (official and unofficial credit markets) influences the way in which banking policies affect financial deepening[2] while the latter thought that imperfect information between lenders and borrowers increases adverse selection and moral hazard problems in credit markets. In this situation, according to Stiglitz (1994), the perfectly competitive models of banking argued by McKinnon (1973) and Shaw (1973) are inappropriate for assessing the effects of financial policies.

Estimation of the effects of banking sector policies on the process of financial development has been the object of a number of empirical studies. Roubini and Sala-i-Martin (1992), utilizing cross-section data of 60 countries over the period 1960–85, found that the various indicators of financial repression have negative effects on growth. Demetriades and Luintel (1996a, 1996b, 1997, 2001), Arestis and Demetriades (1997), and Arestis et al. (2002) have all found differing effects of banking sector controls on financial development in a number of developing countries, such as India, Nepal, the Republic of Korea, the Philippines, and Thailand.[3] In the case of India, Demetriades and Luintel (1996b) estimated a conditional error correction model for financial deepening and found that financial repression indices (interest rate control index, index of other financial sector restrictions in the form of reserve requirements, minimum liquidity requirements, and directed credit programs) exhibited a significant negative influence (–0.0465). The econometric investigation of the effect of individual repression policies shows that interest rate controls as well as other controls have a significant negative effect on financial deepening equal respectively to –0.0154 and –0.0083.

In their study on Nepal, Demetriades and Luintel (1996a) show that banking sector policies expressed by a summary index of financial repression have a significant positive effect (0.0216). In order to show the effect of each repression policy on financial deepening, Demetriades and Luintel estimated the effect of seven policy variables. They found a positive effect for all interest rate controls (0.0436 on average) while the non-interest rate controls seem to have a negative effect (–0.007 on average). In the case of Korea, Demetriades and Luintel (2001) constructed an econometric model which is closely linked to the "Korean banking model." The main

[2] Unofficial credit markets are capable of reversing the conclusions of McKinnon/Shaw. Indeed, an interest rate increase in the official market may not raise investment if the increase in bank deposits crowds out curb market loans.

[3] Financial development and financial deepening are used interchangeably throughout this paper, although the focus on financial development refers to a host of instruments which includes the innovation of financial products, an increase in various financial savings mechanisms and in bank branches, institutional changes, and interest deregulation.

prediction of their long-term financial deepening equation is that financial repression has a positive impact on the volume of bank loans. Unlike their previous works (Demetriades and Luintel 1996a, 1996b), this equation expresses a much more powerful influence of the financial repression index on financial deepening (0.15).[4]

In this respect, this paper provides empirical evidence about the effects of financial repression policy in Tunisia on its financial deepening and growth over the period 1961–2000. For this purpose, I have identified three banking sector policies which are interest rate, reserve and liquidity requirements, and directed credit program. I am interested in studying the case of Tunisia for two reasons. On the one hand, it is one of the earliest countries in the Middle East and North Africa to have made significant efforts over the past three decades to reform its financial system. On the other hand, this country has witnessed phases of both financial repression and liberalization. Following Demetriades and Luintel (1996a, 1996b, 1997, 2001), Arestis and Demetriades (1997), and Arestis et al. (2002), I have constructed a summary index of financial repression using the method of principal components. This index is used to assess the effects of financial sector policies on financial development independently from the impact of interest rates. A system of variables (which includes an indicator of financial deepening, the real per capita income, the real interest rate, an index of financial repression, and other variables) has been considered to estimate cointegration relations, if any, and to construct a structural error correction model (SECM) of financial deepening.[5] The weak exogeneity test is also performed to determine the dynamic interaction between financial deepening and growth over the long term.

This paper thus provides two main empirical contributions related to the impact of banking sector policy on financial deepening. Firstly, it proposes a direct measurement of banking system repression in Tunisia by collecting information on various types of interest rate controls, on reserve and liquidity requirements, and on the directed credit program. Secondly, it determines the effects of this policy independently of interest rates by incorporating several direct measurements of financial repression into a financial deepening equation.

The paper is organized as follows. Section II outlines the financial reforms in Tunisia by focusing on the banking sector policies implemented by the government. Section III presents the theoretical specification of the model. Section IV sets forth the econometric results and their economic and statistical interpretation. Section V highlights the main conclusions.

[4] In the case of Korea, Arestis and Demetriades (1997) also found a positive financial repression index elasticity of financial deepening (0.36). This result is in line with that of Demetriades and Luintel (2001).

[5] According to Boswijk (1995), a structural error correction model (SECM) represents a certain type of a vector error correction model (VECM) that satisfies restrictions involving cointegration, weak exogeneity, and structurality (the number of endogenous variables is equal to that of cointegrating vectors).

II. FINANCIAL REFORMS IN TUNISIA

Tunisia has made notable efforts over the past three decades to reform its financial system. Considered as an integral part of macroeconomic policy, the financial reforms are expected to bring about significant economic benefits, particularly through a more effective mobilization of domestic savings and a more efficient allocation of resources.

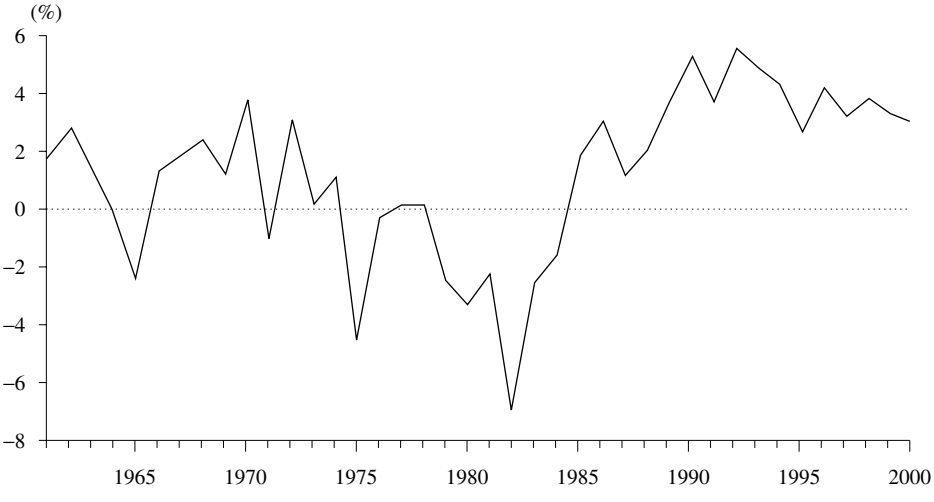
Following independence in 1956 up until the middle of the 1980s, the government in Tunisia was mainly concerned with establishing the necessary infrastructure to support its different macroeconomic policies.[6] Nevertheless, the financial sector in Tunisia remained heavily controlled; interest rates were set administratively and were usually negative in real terms (see Figure 1), monetary policy was conducted primarily through the direct allocation of credit and refinancing, the monetary market was underdeveloped, and bond and equity markets were virtually nonexistent. Commercial banks often had to lend to priority sectors with little concern for the borrowing firm's profitability. The inefficiencies and distortions of this financial system were exacerbated by the emergence of severe macroeconomic difficulties in Tunisia in the late 1970s and early 1980s. In order to overcome the financial problems and spur economic growth, the government embarked on a wide stabilization and structural reform program. Financial sector reforms were an important component of this broad program. In analyzing the financial reforms, this study focuses on the banking system and monetary policy.

The important initial step in reforming the Tunisian financial sector was raising administered interest rates to the level of positive real interest rates,[7] with the exception of rates for priority sectors. In 1987 the interest rate on special savings accounts was pegged to the money market rate (*taux du marché monétaire*, TMM). Banking institutions were also allowed to freely determine lending rates within a spread of 3 percentage points above the TMM. Figure 1 shows that over the period 1987–2000 the real interest rate became positive and varied between 1.25 and 5.5 percent after having been negative over the period 1961–82. Concerning bank lending, the requirement for prior authorization of loans from the Central Bank was abolished in December 1987. The financing of some public enterprises at preferential interest rates was discontinued as well. Thus, deposit banks no longer had to gain authorization from the monetary authorities to grant credit and therefore were

[6] The first phase of development policy (1962–69) was characterized by intensive industrialization which required a fast rate of capital accumulation (27.7 percent on average). But the Tunisian economy performed badly during this period, and the government introduced a new investment policy based on the country's comparative advantage putting an end to its heavy industrialization program in 1969.

[7] The real interest rate is defined as the nominal interest rate minus the rate of inflation.

Fig. 1. Real Interest Rate in Tunisia, 1961–2000



allowed, within certain limits, to decide the interest rates on their deposits and loans. This liberalization of credit and interest rates was followed by the suppression of rediscounting in 1996 and a boosting of the money market.

One of the essential objectives of these reforms was to facilitate the flow of sufficient short-term liquidity at variable rates to meet current banking needs for liquidity. Thus, it was necessary to expand the monetary market potential by making it accessible to new operators, particularly to those who were experiencing an excess of liquidity, such as insurance companies and social security organizations as well as investment banks. This widening of the range of operators on the money market was followed by the creation of new financial products, such as deposit certificates, treasury bills, and treasury bonds which are naturally negotiable.

The globalization of Tunisia's financial system was implemented gradually and was sequenced with the aim of better integrating the domestic financial system into international markets. The above financial reforms were accompanied by a gradual liberalization of capital account transactions aimed in particular at improving the allocation of foreign exchange resources and attracting foreign direct investment. In 1994 restrictions on some capital transactions were partially relaxed, and foreign borrowing and certain outward investments (those related to export activities) were allowed to some extent.[8] Full convertibility of the Tunisian dinar was established for foreign investments and partial convertibility for transactions on the current account. Tunisia also made efforts to tap the international equity and bond markets, which supported the increased integration of the Tunisian economy into interna-

[8] Foreign borrowing and outward investment were limited as they varied respectively from 3 to 10 million Tunisian dinars and from 50,000 to 80,000 Tunisian dinars.

tional financial markets. The Tunisian government has been issuing long-term bonds on the Japanese capital market since 1994 and these have received a favorable rating from international rating agencies. The establishment of an interbank foreign exchange market in Tunisia in 1994 also marked an important step toward decentralizing the management of foreign exchange and allowing market forces to play a greater role in exchange rate determination.[9]

These financial reforms may have had a positive impact on the indicators of financial deepening in Tunisia. For example, domestic bank liabilities to GDP (M2/GDP) and the ratio of the private sector credit to GDP (CR/GDP) witnessed a significant increase, rising from 21% and 28% in 1961 to 51% and 55% in 1990 respectively. The trend of these two indicators seems to be in line with McKinnon/Shaw analysis which predicts a financial deepening in the course of interest rate liberalization. The decline in M2/GDP and CR/GDP at the beginning of the 1990s may be explained by the significant increase in very liquid and attractive treasury bills which substituted for bank deposits for a short time (1990–95).[10]

III. THEORETICAL QUESTIONS, MEASUREMENTS, AND DATA

A. *The McKinnon/Shaw Approach*

The theoretical specification of the financial deepening equation draws on the literature of finance and development which postulates a symbiotic relationship between the evolution of the financial system and the development of the real economy. The literature on this relationship predicts that financial deepening depends on real income and real interest rate. This is predicted by both the McKinnon and Shaw models and in the endogenous growth literature.

According to the McKinnon model (1973), the relationship between financial deepening and economic development is based on the complementarity between money and capital. It is assumed that investment cannot be realized without the accumulation of a significant amount of savings in the form of bank deposits. In the Shaw model (1973), financial intermediaries witness an expansion in their activities and promote investment when savings grow more than the level of real economic activity. In these models, a positive real interest rate increases financial deepening through the mobilization of an increased volume of savings and promotes growth through a higher productivity of capital. However, the McKinnon/Shaw approach suggests that any distortion and limitation on the banking sector, such as

[9] Despite the reform efforts of the government and financial authorities, the banking system retained shortcomings, major ones being: the maturing of both assets and loans continued to be very short; the appearance of new financial products became fertile ground for speculation which hampered the development of a market for long-term securities; and financial fragility increased.

[10] The issuance of treasury bills increased significantly rising from 448.3 million Tunisian dinars in 1990 to 2.2 billion dinars in 1996 (Central Bank of Tunisia, *Financial Statistics*).

interest rate controls, reserve and liquidity requirements, and government rationing of available credit to so-called priority sectors, inhibit financial development mainly by depressing the real interest rate (McKinnon 1973; Shaw 1973; Galbis 1977; Kapur 1976; Mathieson 1980; Fry 1995). The deficiency in the amount of savings due to such repressive measures thwarts economic development through the perverse effects on the volume and the quality of investment. Thus, the main argument of McKinnon and Shaw is that financial repression has a detrimental effect on financial development and economic growth.

B. *The Monopoly Bank Model*

In analyzing the effects of financial institutions on financial deepening, McKinnon (1981) and Fry (1995) assumed that these institutions operate under conditions of perfect competition allowing them to turn deposits into loans at zero cost. Under such conditions, the behavior of banks is ignored and the emphasis is on the influence that restrictions on interest rate have on savings and investment. Demetriades and Luintel (1994, 1996a, 1996b, 1997) argued that models of perfectly competitive banking are implausible and theoretically inadequate for assessing the effects of financial policies in less-developed countries. They pointed out two reasons for the implausibility. Firstly, the banking industry in many developing countries is dominated by a small number of banks, therefore collusive behavior is not uncommon; secondly, asymmetric information in the loan market is an important source of imperfectly competitive behavior in the banking system. This situation gives lenders a degree of market power over borrowers which makes the former behave as monopolists as suggested by Stiglitz (1994). This case of a monopoly bank facing deposit rate controls "could be thought of as either the only bank in the economy—a bank cartel—or, perhaps more realistically, as a representative bank which behaves as a monopolist" (Demetriades and Luintel 2001, p. 464).

The monopoly bank model (Demetriades and Luintel 1994, 1996a, 1996b, 1997, 2001; Arestis and Demetriades 1997) shows that a deposit rate ceiling does not prevent the supply of deposit from varying. Such a situation can be achieved essentially through a representative bank or a bank cartel. According to these authors, this may be realized when activities allow variations of the marketing efforts or an increase in the number of bank branches.[11] In fact, resorting to these activities requires substantial financial resources, which is a serious impediment to small commercial banks since they are not able to use the non-interest rate policies as effectively as the major banks. Thus, the monopolistic structure of the banking industry in less-developed countries favors the big banks over the small ones in the mobilizing of funds in savings deposits.

[11] Demetriades and Luintel (2001) state that this assumption is plausible if there are savings outside of the banking system which can be mobilized and channeled to financial institutions.

Courakis (1984) asserts that under monopoly banking, a lending rate ceiling can alter the volume of deposits by influencing the underlying marginal cost or revenue curve of the banks. Furthermore, the effects of other financial controls, assuming the existence of a fixed deposit rate, can be analyzed. On the one hand, a higher reserve requirement (i.e., an increase in $1 - q$) increases the average interest cost per dollar of loans (i/q)[12] which shifts the marginal cost of loans upward and reduces the volume of loans. On the other hand, the directed credit program forces banks to operate in a market where the demand for loans declines which leads to a downward shift in the marginal revenue of loans. As a result, the volume of loans will decrease (Demetriades and Luintel 1997).

C. *Measurements and Data*

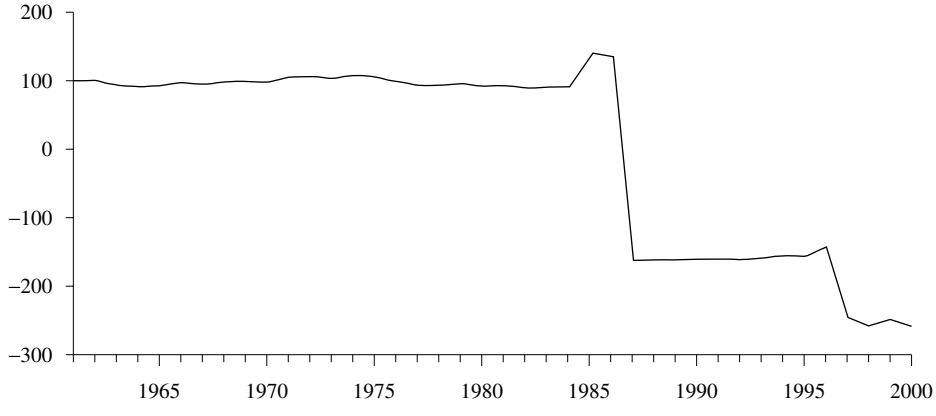
I used the ratio of broad money (usually M2 deducted from bills and money in circulation) to the level of nominal GDP to measure the financial depth in Tunisia. This indicator has been criticized by Demetriades and Luintel (1996a) since they assert that its growth can express the extension of monetization rather than financial deepening. This criticism is not relevant for Tunisia since the ratio of currency in circulation to the country's nominal GDP was negative over the period 1961–2000. Consequently, the monetized sector in Tunisia has not constituted an important part of the national economy, especially since 1983. Following standard practice, I use real GDP per capita to measure the level of real income. The preceding macroeconomic variables (GDP, population, money, quasi-money, and currency in circulation) are available in *International Financial Statistics* published by the IMF.[13]

A direct measurement of Tunisia's financial repression index is not available, and I had to collect information on variables such as interest rate controls, reserve and liquidity requirements, and directed credit program from the financial statistics of the Central Bank of Tunisia. The government uses two types of interest rate controls: a fixed deposit rate and a fixed lending rate. Multinomial qualitative variables have been used to measure the intensity of these controls which has the value of 2 if the controls are severe, 1 if relaxed, and 0 if freely determined by banking institutions within a spread of 3 percentage points above the TMM. Using the method of principal components, I have constructed the first financial repression index which encapsulates the two interest rate controls. The second index of financial repression summarizes all remaining controls expressed by the minimum obligatory reserves, liquidity requirements, and directed credit program. A multinomial qualitative variable has been used to quantify the intensity of this program. It has the value of 2 when the government puts a high ceiling of credit, 3 if this ceiling is raised, 1 if it is

[12] i expresses the interest rate.

[13] The other macroeconomic variables used in my model were provided by Tunisian's Professional Association of Banks (for the number of bank branches) and by the Tunis Institute of Quantitative Economy (for the amount of capital stock).

Fig. 2. Financial Repression Index for Tunisia, 1961–2000



lowered, and 0 when the government terminates the directed credit program.[14] The data related to the minimum obligatory reserves and liquidity requirements were collected from the *Financial Statistics* of the Central Bank of Tunisia. Finally, I constructed an overall index (see Figure 2) which encapsulates interest rate and non-interest rate controls.

The overall index of financial repression appears to reflect quite well many of the policy shifts that occurred in Tunisia over the period 1961–2000. During the first decade after independence in 1956 and in the early 1970s, the index showed a moderate increase in the level of financial repression. This behavior coincides with many financial repression policies in Tunisia such as the increase in the ratio of obligatory reserves and in the liquidity ratio. The former went up from 3.2% in 1961 to 10.4% in 1974, while the latter underwent a significant increase, moving from 35% in 1963 to 43% in 1975. The period 1975–84 experienced a moderate decline in financial repression which seems to be explained by the rise in Tunisia's external receipts due to the first and second oil shocks. The index of financial repression rose again in 1985 which can be explained by the raise in the directed credit program ceiling (which climbed from 0.6 to 1 million Tunisian dinars in 1985). The index dropped significantly in 1987, which coincided with Tunisia's structural adjustment program that included the many financial reforms explained in Section II. In 1996 the index experienced another drop though less significant than the one in 1987. The 1996–2000 period was characterized by more financial reforms, such as the decrease in obligatory reserves (which fell from 10.6% in 1996 to 3.8% in 2000), the abolition of preferential lending rates for all priority sectors,

[14] It should be noted that even if the choice of the variable coding is changed, the statistical results provided by the principal components method does not change significantly.

the suppression of the rediscount, and a boosting of the money market which led to the creation of new financial products.

IV. MODEL SPECIFICATION AND ECONOMETRIC QUESTIONS

The McKinnon/Shaw approach and the monopoly bank model constitute the theoretical references for the financial deepening equation. The "repressionist school" predicts that financial deepening is a positive function of real income and real interest rate. According to the monopoly bank model, banks can develop their financial activities through non-interest rate methods (e.g., marketing efforts and increasing the number of bank branches), and financial repression may have a positive impact on financial development. Under these assumptions, an equation for financial deepening can be expressed as follows:

$$LFD_t = \lambda_1 + \lambda_2 Ly_t + \lambda_3 R_t + \lambda_4 FR_t + \lambda_5 LB_t + U_{1t}, \quad (1)$$

where *FD* is an indicator of financial depth measured by the ratio of broad money (M2) to nominal GDP, *y* is the real per capita income, *R* is the real interest rate, *FR* is an indicator of a summary measure of financial repression, and *B* is the density of bank branches per population. *L* denotes the natural logarithm of variables. *U* is a stochastic term. Following Demetriades and Luintel (2001), I assume that real per capita income is likely to be endogenous, which leads me to specify an econometric equation for this variable. The real GDP per capita is assumed to take the form of a log-linear production function. Specifically, I follow Demetriades and Luintel (1996b) by specifying that the logarithm of output per capita is determined by the capital stock per head (k), the real interest rate (R), and financial deepening (FD) as follows:[15]

$$Ly_t = \delta_1 + \delta_2 Lk_t + \delta_3 R_t + \delta_4 LFD_t + U_{2t}. \quad (2)$$

To estimate the financial deepening and output equations, I use the partial approach advocated by Ericsson (1995) and Boswijk (1995) which is based on the so-called structural error correction models. Let's assume $q \times 1$ vector X_t which contains the variables of equations (1) and (2). If some of these variables are assumed to be exogenous, we partition $X_t = (Y_t', Z_t')'$ with Y_t, a $(p \times 1)$ vector of endogenous variables, and Z_t, a $(k \times 1)$ vector of exogenous variables. Thus, we can write a p dimensional vector error correction model (VECM) as described in Johansen (1988) and Pesaran, Shin, and Smith (2000) to estimate the eventual cointegrating vectors between the variables of X_t:[16]

[15] Instead of using capital stock per head, Demetriades and Luintel (1996b) used per capita investment.

[16] In the cointegration test, the critical values used in the trace and the λ_{max} tests are those provided by MacKinnon, Haug, and Michelis (1999, Table 4, Case III). They assume a VECM with exogenous I (1) variables and a deterministic component.

$$\Delta LY_t = \mu + \sum_{i=1}^{m-1}\Phi_i \Delta LY_{t-i} + \sum_{i=0}^{m-1}\Psi_i \Delta LZ_{t-i} + \Pi LX_{t-1} + \Phi D_t + \eta_t, \qquad (3)$$

where $\Delta LY_t' = (\Delta LFD_t,\ \Delta Ly_t,\ \Delta Lk_t)'$, $\Delta LZ_t' = (\Delta R_t,\ \Delta FR_t,\ \Delta LB_t)'$, Π is a $(p \times q)$ matrix of the form $= \alpha\beta'$,[17] $q = p + k$, α and β are $(p \times r)$ and $(q \times r)$ matrices of full rank, respectively, with β containing the r cointegrating vectors and α carrying the corresponding adjustment coefficients. η_t denotes a p-dimensional normal innovation sequence with mean zero and non-singular covariance matrix. μ is a $(p \times 1)$ vector of constant terms, which indicates the presence of a linear deterministic trend in the variable in terms of levels.[18] Financial savings underwent a structural break in 1990, which can give rise to meaningless long-run relationships between *LFD*, *Ly*, *Lk*, *R*, *FR*, and *LB*. Following Hoffman, Rasche, and Tieslau (1995) and Kouretas (1997), I have specified a VECM including a shift qualitative variable, D_t,[19] in all regressions. The value of m is large enough to capture the short-run dynamics of the underlying VECM and to produce normally distributed white noise residuals.

Preliminary analysis of the statistical properties of the data using the Augmented Dickey-Fuller (ADF) test and the Perron test suggested that all the variables are stationary in the first difference while they possess a unit root in term of levels.[20] Cointegration analysis is shown in Table I.[21] The λ_{trace} and $\lambda_{\max}$ tests support the existence of two unrestricted cointegrating vectors ($\beta_1^{UNRES.}$, $\beta_2^{UNRES.}$). The next step involves the identification of these two cointegration vectors by referring to my prior hypotheses based on equations (1) and (2). Pesaran and Shin (1995) developed a long-run structural modeling framework for identifying and testing hypotheses in cointegrating vectors. Exact identification of these vectors requires at least r restrictions (including the normalizing restrictions) on each of the r long-term relationships proposed by economic theory. In the case here, at least two restrictions are required to identify exactly the long-run relationships. We can normalize the first and second cointegrating vectors ($\beta_1^{RES.}$, $\beta_2^{RES.}$) regarding financial deepening

[17] This expression has been demonstrated by Engle and Granger (1987) in the case of a rank reduction of the matrix Π.

[18] I tested for the existence of a deterministic linear time trend in the data (H_2) against the absence of such a trend (H_2^*) using the likelihood ratio (LR) test developed by Johansen and Juselius (1990). The econometric results suggest the existence of a deterministic trend in the variables *LFD*, *Ly*, *Lk*, *FR*, *LB*, and *R*. These results are available from the author.

[19] Since the structural break lasted from 1990 to 1996, the qualitative variable D_t takes the value 0 over the period 1961–89, the value 1 during the years 1990–96, and 0 during the rest of the period.

[20] The econometric results are available from the author. I applied the Perron test to *FD*, *FR*, and *R* since each variable undergoes structural breaks, and the application of the ADF test to these variables leads to a misleading result.

[21] The lag length of the VECM is chosen so that the residuals are normally distributed and are not serially correlated. According to these criteria, the value of m is equal to 2.

TABLE I

COINTEGRATION ANALYSIS OF A PARTIAL VECM (2) MODEL FOR $\Delta LY_t' = (\Delta LFD_t, \Delta Ly_t, \Delta Lk_t)'$

	λ_{trace} Test			$\lambda_{\max}$ Test		
Null hypothesis	$r = 0$	$r \leq 1$	$r \leq 2$	$r = 0$	$r = 1$	$r = 2$
Alternative hypothesis	$r \geq 1$	$r \geq 2$	$r = 3$	$r = 1$	$r = 2$	$r = 3$
Statistic values	138.70	34.33	13.42	104.70	26.61	13.42
Critical values at 5% level	54.27	33.98	17.23	31.24	25.54	17.23

	LFD	*Ly*	*Lk*	*FR*	*LB*	*R*	Constant
Unrestricted $\beta_1^{UNRES.'}$ eigenvector	–1	2.655	3.165	–0.33	0.859	0.063	8.01
Unrestricted $\beta_2^{UNRES.'}$ eigenvector	4.89	–1	1.558	0.131	1.851	0.028	5.60
Restricted $\beta_1^{RES.'}$ eigenvector	–1	0.783	0	–0.015	0.155	0.005	5.932
Restricted α_1 coefficients	–0.81	0.97	–0.015				
Student statistic	–3.7	5.91	–1.44				
Restricted $\beta_2^{RES.'}$ eigenvector	1.054	–1	0.359	0	0	0.003	5.065
Restricted α_2 coefficients	–0.08	–0.48	–0.007				
Stastistic values	–2.2	–6.01	–1.34				

and output, and can impose a set of theoretically plausible parametric restrictions as follows:

$$\beta_1' LX_{t-1} = (1 \;\; -\beta_{12} \;\; 0 \;\; -\beta_{14} \;\; -\beta_{15} \;\; -\beta_{16}) \begin{bmatrix} LFD_{t-1} \\ Ly_{t-1} \\ Lk_{t-1} \\ FR_{t-1} \\ LB_{t-1} \\ R_{t-1} \end{bmatrix},$$

$$\beta_2' LX_{t-1} = (-\beta_{21} \;\; 1 \;\; -\beta_{23} \;\; 0 \;\; 0 \;\; -\beta_{26}) \begin{bmatrix} LFD_{t-1} \\ Ly_{t-1} \\ Lk_{t-1} \\ FR_{t-1} \\ LB_{t-1} \\ R_{t-1} \end{bmatrix}.$$

Theoretically, capital stock has no direct effect on financial deepening; hence $\beta_{13} = 0$. The level of output is determined according to equation (2), which restricts on the second cointegrating vector. These restrictions give us one overidentifying restriction that can be tested by the standard likelihood ratio (LR) test. The one testable overidentifying restriction on the second vector refers to the zero value of β_{24} or $\beta_{25.}$ Since only the first vector is identified, one overidentifying restriction is imposed on the β matrix. The LR test statistic for testing one overidentifying restriction is distributed as $\chi^2(1)$ under the null and gives a value of 0.94 which is insig-

nificant at the 33 percent level.[22] Imposing the restrictions discussed above, the LR test allows the interpretation of the two restricted cointegrating vectors ($\beta_1^{RES.}$, $\beta_2^{RES.}$) as financial deepening and output relationships respectively. Table I shows that the financial policy variables (*FR*, *R*, and *LB*) enter the first cointegrating vector, which indicates that these variables have long-run effects on financial development. It also shows that financial repression in Tunisia has had a negative long-run effect on financial deepening, which confirms the traditional literature on financial liberalization and contrasts with the predictions of financial market imperfection model.[23] Moreover, long-run financial deepening is positively affected by the level of real per capita income and real interest rate. This finding is consistent with the theoretical predictions of the finance and growth literature. Furthermore, the long-run financial development seems to be affected positively by the density of bank branches per population. Compared to the long-run financial deepening equations of Demetriades and Luintel (2001) and Arestis and Demetriades (1997), I find the effect of the financial repression index to be lower than those estimated by the above authors.[24] Moreover, the branch density elasticity (0.155) is smaller than the one estimated by Demetriades and Luintel (1997) (0.821). The second restricted eigenvector ($\beta_2^{RES.}$) is interpreted as long-run per capita income. It is a positive function of financial deepening and capital stock per capita. I also show that real output shows a diminishing return relative to capital, and it appears sensitive to financial deepening. The real interest rate effect is positive, which is in line with the finance and growth literature in predicting that this variable improves the productivity effect.

We will now consider a structural reformulation of the VECM written above by dealing with only the two endogenous variables *LFD* and *Ly* as shown in Table I.[25] For this purpose, I follow Ericsson's (1995) analysis by pre-multiplying equation (3) by a particular nonsingular $p \times p$ matrix Γ:

$$\Gamma \Delta LY_t = \mu_1 + \sum_{i=1}^{m-1} \Gamma_i \Delta LY_{t-i} + \sum_{i=0}^{m-1} B_i \Delta LZ_{t-i} + \lambda \beta' LX_{t-1} + \Phi_0 D_t + V_t, \qquad (4)$$

where $\mu_1 = \Gamma\mu$, $\Gamma_i = \Gamma\Phi_i$, $B_i = \Gamma\Psi_i$, $\lambda = \Gamma\alpha$, $\Phi_0 = \Gamma\Phi$, $V_t = \Gamma\eta_t$.

The econometric results in Table I show two endogenous variables, $y_{1t}(LFD_t)$ and $y_{2t}(Ly_t)$, and two identified cointegrating vectors, $\beta_1^{RES.}$. and $\beta_2^{RES.}$. Thus, equation (4)

[22] The LR test statistic for testing the overidentifying restriction is performed using the procedure, CATS in RATS.

[23] This model predicts that financial repression may play a prudential role, limiting moral hazard behavior by banks.

[24] In the case of Korea, the impact of the financial repression index estimated by Demetriades and Luintel (2001) and Arestis and Demetriades (1997) is equal to 0.1358 and 0.36 respectively.

[25] In the short-run equations of the variable *Lk*, it is shown that the error correction terms (ECTs) are not significant (see Table I), which allows us to consider the capital stock as a weakly exogenous variable relative to the restricted cointegrating vectors.

can be rewritten as two conditional equations of Y_t given Z_t where the indices arise from the partitioning of Y_t:

$$\Gamma_{11}\Delta y_{1t} + \Gamma_{12}\Delta y_{2t} = \mu_{11} + \lambda_1\beta_1^{RES.'}LX_{t-1} + \sum_{i=1}^{m-1}(\Gamma_{1i}\Delta LY_{t-i} + B_{1i}\Delta LZ_{t-i}) + B_{10}\Delta LZ_t + \Phi_{10}D_t + V_{1t}, \quad (5)$$

$$\Gamma_{21}\Delta y_{1t} + \Gamma_{22}\Delta y_{2t} = \mu_{12} + \lambda_2\beta_2^{RES.'}LX_{t-1} + \sum_{i=1}^{m-1}(\Gamma_{2i}\Delta LY_{t-i} + B_{2i}\Delta LZ_{t-i}) + B_{20}\Delta LZ_t + \Phi_{20}D_t + V_{2t}. \quad (6)$$

The identification of $\beta_1^{RES.}$ and $\beta_2^{RES.}$ will be followed by the identification of the short-run structure of equations (5) and (6). This requires further restrictions on the matrix Γ. The preceding system can be normalized by $\Gamma_{ii} = 1$, $i = 1, 2$, which gives us a SECM in the Ericsson's (1995) sense.[26] Specifications (5) and (6) are identified as short-run financial deepening and short-run per capita income equations respectively. The ordinary least square technique is used to estimate the short-run dynamics of financial development in Tunisia over the period 1961–2000. The standard general-to-specific reduction approach (Hendry 1995) is applied to (5) in order to obtain a parsimonious congruent error correction specification for financial deepening. The starting point of the modeling process is a general unrestricted financial deepening model (GUFDM) both in terms of the number of explanatory variables (chosen according to economic theory) and of lag structure. The congruency of this model is tested through an array of residual tests (Chow's structural stability test, Jarque-Bera's residual normality test, tests of residual autocorrelation and heteroscedasticity, and a test for the ARCH effects). When the GUFDM is congruent, this equation is viewed as the maintained general model which undergoes a sequential simplification and re-parametrization to obtain a parsimonious structural representation of financial deepening.

The estimations of equation A (see Table II) are used as the basis for examining the effects of Tunisia's financial sector policies on its financial deepening. It should be noted that this equation does not contain any index of financial repression.

Three econometric representations (equations B, C, and D) have been estimated and each of them contains an index of financial repression (index of interest rate controls in equation B, index of other controls in equation C, and index of all controls in equation D). These equations are found to be congruent and reduced (see residual tests in Table II). This means that there is no loss of relevant economic information despite the exclusion of some lags from the underlying GUFDM. Furthermore, the reduced equations B, C, and D are acceptable at the economic and

[26] Alternative ways of identifying the short-run structure of equations (5) and (6) exist, such as restricting Γ to being a unit matrix, or considering a recursive system by restricting the Γ of contemporaneous effects. For further discussion see Boswijk (1995), Ericsson (1995).

TABLE II

FINANCIAL DEEPENING EQUATIONS (Dependent Variable: ΔLFD, OLS Estimates: 1961–2000)

Regressor	Equation A Coefficient		Equation B Coefficient		Equation C Coefficient		Equation D Coefficient	
Intercept	0.0991	(3.881)	0.1114	(6.344)	0.1219	(8.812)	0.1185	(6.609)
ΔLFD_{t-1}	0.1696	(1.202)	0.2285	(2.854)				
ΔLFD_{t-2}	0.0444	(0.347)	0.1945	(2.124)				
ΔLFD_{t-3}	0.1764	(1.494)	0.1462	(1.881)				
ΔLy_{t-1}	0.3469	(1.592)	0.3621	(2.245)	0.3954	(3.012)	0.2851	(1.852)
ΔLy_{t-2}	0.6631	(3.571)	0.6102	(4.851)	0.5124	(4.451)	0.6548	(5.012)
ΔLy_{t-3}	−0.0371	(−0.21)						
ΔR_{t-1}	0.0041	(1.680)	0.0047	(2.411)	0.0027	(1.895)	0.0044	(2.851)
ΔR_{t-2}	−0.0016	(−0.54)	0.0019	(1.741)				
ΔR_{t-3}	−0.0003	(−0.48)						
ΔLB_{t-1}	0.3655	(1.495)	0.3878	(2.251)	0.3211	(2.251)	0.5814	(2.112)
ΔLB_{t-2}	0.2915	(1.142)						
ΔLB_{t-3}	−0.2913	(−1.14)	−0.2124	(−2.01)	−0.1712	(−1.96)	−0.4211	(−1.99)
Indices of financial repression								
Interest rate controls (*IRC*):								
ΔIRC_t			−0.0527	(−2.73)				
ΔIRC_{t-1}								
ΔIRC_{t-2}			−0.0491	(−3.88)				
Other controls: obligatory reserve, liquidity requirements, etc (*OC*):								
ΔOC_t					−0.0524	(−2.12)		
ΔOC_{t-1}								
ΔOC_{t-2}					−0.1405	(−6.71)		
All controls: overall index (*ALC*):								
ΔALC_t							−0.0310	(−2.75)
ΔALC_{t-1}								
ΔALC_{t-2}							−0.0514	(−5.77)
ΔALC_{t-3}							−0.0311	(−2.17)
Error Correction Term (*ECT*):								
ECT_{t-1}	−0.5720	(−4.49)	−0.7142	(−8.21)	−0.7741	(−10.45)	−0.8012	(−8.12)
Statistics and residual tests:								
R^2	0.5593		0.7299		0.7101		0.7399	
DW	1.9661		2.2114		2.2771		2.2110	
LM (1) *F*-statistics	0.1610	(0.69)	0.0301	(0.86)	0.5612	(0.45)	0.0799	(0.77)
LM (2) *F*-statistics	0.3645	(0.69)	0.1954	(0.80)	0.3296	(0.71)	1.8751	(0.18)
Ljung-Box (16)	10.19	(0.86)	15.587	(0.47)	11.851	(0.68)	12.014	(0.68)
White test *F*-statistics	1.8117	(0.18)	0.8125	(0.72)	0.9312	(0.59)	0.7451	(0.80)
ARCH (1) *F*-statistics	1.6231	(0.22)	1.2125	(0.21)	0.3100	(0.60)	0.3845	(0.55)
ARCH (2) *F*-statistics	1.6471	(0.35)	1.3001	(0.13)	0.7121	(0.19)	2.0145	(0.14)
RESET (1) *F*-statistics	1.4471	(0.24)	0.9551	(0.30)	0.2511	(0.20)	0.7145	(0.41)
RESET (2) *F*-statistics	0.8764	(0.43)	1.1211	(0.37)	1.3001	(0.25)	0.7752	(0.55)
Chow test *F*-statistics	2.1645	(0.12)	1.0781	(0.76)	1.0115	(0.70)	0.8845	(0.48)
Jarque-Bera test	0.4846	(0.78)	0.7812	(0.38)	0.8124	(0.66)	1.4125	(0.50)

Note: Figures in parentheses are *t*-ratios.

statistical level (see Table II). The congruency can be checked, as mentioned above, through an array of diagnostics. Equations B, C, and D pass a number of residual tests. The Breusch-Godfrey test shows the absence of any autocorrelation problem while the Jarque-Bera statistic indicates the normality of the residuals. There is no heteroscedasticity problem detected by the White test and no functional form problem detected by the RESET test. Moreover, the Chow test can be used to verify over time the stability of the impact of the different explanatory variables on financial savings. The *F*-statistic value is insignificant as can be seen in Table II, which shows the parameter stability of the financial savings equation.[27] The cumulative sum (CUSUM) and the cumulative sum of squares (CUMSUMSQ) of the recursive residuals are also used to test the stability conditions of the parameters.[28] Figures for both the CUSUM and CUMSUMSQ[29] are within the significance line suggesting that there is no instability. The stability test is relevant considering the policy shifts that occurred during the estimation period.

Equation B examines the effects of interest rate controls on financial deepening.[30] What is interesting is that the econometric results exhibit a higher performance compared with those in equation A. The summary index of interest rate controls has highly significant negative effects on savings at the dates t and t–2. This finding allows us to conclude that interest rate controls have very much altered the process of financial deepening in Tunisia. It is also noteworthy that the magnitude of the estimated error correction term (ECT) has experienced a highly significant increase (–0.7142), which suggests that interest rate controls have accelerated the adjustment of financial deepening towards its equilibrium level. It is also important to note that the density of bank branches has contributed significantly to mobilizing financial savings.

Equation C shows that non-interest rate controls (other controls) have a significant and negative effect on financial deepening, which allows us to say that non-interest rate financial reforms have also altered financial development significantly in Tunisia. The overall index of financial repression exhibits highly significant and negative effects on savings, which confirms the preceding conclusion. Interestingly, in all equations the short-run effects of the interest rate and of output per head on financial deepening are positive and significant. This confirms the analysis by

[27] In the case of equation A, the value of the *F*-statistics is equal to 2.1645 (0.12). The values in parentheses are the *p*-values to reject the null hypothesis (equation stability). To test the stability of the financial savings equation, I have considered the year 1987 as a possible date for the "structural break point."

[28] The CUSUM and CUMSUMSQ tests require no specific date as a "structural break point" to test the stability of the parameters. For more details concerning the different statistics used in these tests, the reader can refer to Brown, Durbin, and Evans (1975).

[29] The figures for the CUSUM and CUMSUMSQ are available from the author.

[30] The index of interest rate controls incorporates two dummy variables expressing the monetary policy for interest rates on lending and bank deposits.

TABLE III

REAL PER CAPITA INCOME EQUATION (Dependent Variable: ΔLy, OLS Estimates: 1961–2000)

	Inter-cept	ΔLFD_{t-2}	ΔLk_{t-1}	ΔLk_{t-2}	ΔLk_{t-3}	ΔR_{t-1}	ΔR_{t-2}	*LCV* of *FD*	*LCV* of Growth
EQ1 coefficients	0.0361	0.1744	0.995	−1.1245	0.9512	0.002	0.0057		–0.11
	(2.22)	(1.68)	(2.54)	(−1.78)	(1.59)	(1.03)	(2.11)		(–1.65)
EQ2 coefficients	0.0363	0.1721	0.876	−1.111	0.9704	0.0024	0.0058	–0.145	
	(2.32)	(1.62)	(2.11)	(–1.64)	(1.758)	(0.95)	(2.31)	(–1.88)	

	EQ1		EQ2	
Statistics and residual tests:				
R^2	0.4056		0.4090	
DW	1.9101		1.9256	
LM (1) *F*-statistics	0.0133	(0.79)	0.0497	(0.82)
LM (2) *F*-statistics	1.0981	(0.34)	1.3792	(0.27)
Ljung-Box (16)	21.552	(0.15)	22.671	(0.11)
White test *F*-statistics	0.9712	(0.43)	0.8325	(0.62)
ARCH (1) *F*-statistics	0.4611	(0.50)	0.509	(0.48)
ARCH (2) *F*-statistics	0.2424	(0.78)	0.3184	(0.72)
RESET (1) *F*-statistics	3.4811	(0.21)	2.5182	(0.14)
RESET (2) *F*-statistics	2.3368	(0.77)	2.1931	(0.13)
Chow test *F*-statistics	0.3326	(0.94)	0.3120	(0.95)
Jarque-Bera test	1.2892	(0.52)	1.0444	(0.59)

Notes: 1. *FD*: financial deepening; *LCV*: lagged cointegration vector.
2. Figures in parentheses are *t*-ratios.
3. EQ1 expresses the estimation of equation (6), EQ2 expresses the estimation of equation (6) using the error correction term of financial deepening.

McKinnon and Shaw of the relationship between growth and finance. Thus, this study's econometric results provide support for the traditional thesis of financial liberalization which argues that the imposition of financial repression hinders rather than helps financial deepening.

The final econometric result which will be presented concerns the estimation of a structural error correction equation of real per capita income. This will provide a better understanding of the dynamic interaction between financial development and economic growth. In this sense, we have already performed the weak exogeneity test by using in equation (6), the ECT of the short-run financial deepening equation. This time, however, we will specify in equation (6), the ECT of the short-run real per capita income equation. Table III presents the estimated equation of real per capita income and provides the results of the weak exogeneity test.

Firstly, the estimation of equation (6) shows that the sensibility of real per capita income with respect to financial deepening and to real interest rate is positive. This finding is in line with the finance and growth literature. Secondly, it is interesting to interpret the significant coefficient (–0.145) of the ECT of the short-run financial

deepening equation. This suggests that per capita income is not weakly exogenous with respect to financial development, implying that such development brings about economic growth in the long run. The estimation of a short-run financial development equation using the ECT of the short-run growth equation also reveals a highly significant adjustment coefficient (–0.35).[31] Since neither economic growth nor financial deepening is weakly exogenous with respect to each other, we can conclude that they are jointly determined. Thus, any policy that affects financial deepening can also affect growth and vice versa.

V. CONCLUSION

This paper assessed the effects of several types of financial repression on financial deepening in Tunisia in a multivariate time series framework. A VECM as described in Johansen and Juselius (1990) and Pesaran, Shin, and Smith (2000) made it possible to determine two cointegrating vectors. They were identified through the tests of over-identifying restrictions as long-run financial deepening and output relationships. A SECM in the Ericsson (1995) sense was specified for financial deepening and per capita income to examine the effects of financial policies on financial development. The main finding of this paper is that the long- and short-run direct effects of financial repression in Tunisia had significant negative effects during the estimation period (1961–2000). This finding contrasts with the prevalence of financial market imperfections, but it is consistent with the traditional literature on financial liberalization.

The empirical approach followed in this estimation is in line with that of Demetriades and Luintel (1996a, 1997, 2001) and Arestis and Dematriades (1997) since this paper provided firstly a direct measurement of financial repression to evaluate the effects of different types of financial policies in Tunisia; then secondly, by estimating a conditional error correction model and performing weak exogeneity tests, it showed that financial deepening and economic growth are jointly determined in the long run. This result is consistent with a number of endogenous growth models (Greenwood and Jovanovic 1990; Berthelemy and Varoudakis 1996) which predict a two-way causation between finance and growth. Thus, the policies which affect financial deepening seem to have an effect on economic growth and vice versa. The findings of this study also suggest that financial deepening in Tunisia can be altered by the real interest rate and the number of bank branches. Therefore, it seems that the new monetary policy implemented in Tunisia since 1986 has succeeded in mobilizing financial savings. Nevertheless, these empirical results must be interpreted with substantial caution because of several factors linked to the quantification of financial repression and to the applied financial deepening indicator.

[31] The econometric results of this short-run financial deepening equation are available from the author.

REFERENCES

Arestis, Philip, and Panicos Demetriades. 1997. "Financial Development and Economic Growth: Assessing the Evidence." *Economic Journal* 107: 783–99.

Arestis, Philip; Panicos Demetriades; Bassam Fattouh; and Kostas Mouratidis. 2002. "The Impact of Financial Liberalization Policies on Financial Development: Evidence from Developing Economies." *International Journal of Finance and Economics* 7, no. 2: 109–21.

Berthelemy, J. C., and A. Varoudakis. 1996. "Economic Growth, Convergence Clubs, and the Role of Financial Development." *Oxford Economic Papers* 48, no. 2: 300–28.

Boswijk, H. Peter. 1995. "Efficient Inference on Cointegration Parameters in Structural Error Correction Models." *Journal of Econometrics* 69, no. 1: 133–58.

Brown, R. L.; J. Durbin; and J. M. Evans. 1975. "Techniques for Testing the Constancy of Regression Relationship over Time." *Journal of the Royal Statistical Society: Series B* 37, no. 2: 149–92.

Caprio, Gerald, Jr. 1994. "Banking on Financial Reform? A Case of Sensitive Dependence on Initial Conditions." In *Financial Reform: Theory and Experience*, ed. Gerald Caprio, Jr., Izak Atiyas, and James A. Hanson. New York: Cambridge University Press.

Courakis, Anthony S. 1984. "Constraints on Bank Choices and Financial Repression in Less Developed Countries." *Oxford Bulletin of Economics and Statistics* 46, no. 4: 341–70.

Demetriades, Panicos O., and Kul B. Luintel. 1994. "Financial Repression, Financial Deepening and Economic Growth: Evidence from India." Working Paper in Economics 94-12. Keele: Department of Economics, Keele University.

———. 1996a. "Banking Sector Policies and Financial Development in Nepal." *Oxford Bulletin of Economics and Statistics* 58, no. 2: 355–72.

———. 1996b. "Financial Development, Economic Growth and Banking Sector Controls: Evidence from India." *Economic Journal* 106: 359–74.

———. 1997. "The Direct Costs of Financial Repression: Evidence from India." *Review of Economics and Statistics* 79, no. 2: 311–320.

———. 2001. "Financial Restraints in the South Korean Miracle." *Journal of Development Economics* 64, no. 2: 459–79.

Engle, Robert F., and Clive W. J. Granger. 1987. "Co-integration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55, no. 2: 251–76.

Ericsson, Neil R. 1995. "Conditional and Structural Error Correction Models." *Journal of Econometrics* 69, no. 1: 159–71.

Fry, Maxwell J. 1995. *Money, Interest, and Banking in Economic Development*, 2nd ed. London: Johns Hopkins University Press.

———. 1998. "Pitfalls and Potential of Financial Liberalization." *Ekonomia* 2, no. 1: 1–28.

Galbis, Vicente. 1977. "Financial Intermediation and Economic Growth in Less-developed Countries: A Theoretical Approach." *Journal of Development Studies* 13, no. 2: 58–72.

Greenwood, Jeremy, and Boyan Jovanovic. 1990. "Financial Development, Growth, and the Distribution of Income." *Journal of Political Economy* 98, no. 5, part 1: 1076–1107.

Hellmann, Thomas F.; Kevin C. Murdock; and Joseph E. Stiglitz. 2000. "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?" *American Economic Review* 90, no. 1: 147–65.

Hendry, David F. 1995. *Dynamic Econometrics*. New York: Oxford University Press.
Hoffman, Dennis L.; Robert H. Rasche; and Margie A. Tieslau. 1995. "The Stability of Long-Run Money Demand in Five Industrial Countries." *Journal of Monetary Economics* 35, no. 2: 317–39.
Johansen, Søren. 1988. "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control* 12, nos. 2–3: 231–54.
Johansen, Søren, and Katarina Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration: With Applications to the Demand for Money." *Oxford Bulletin of Economics and Statistics* 52, no. 2: 169–210.
Kapur, Basant K. 1976. "Alternative Stabilization Policies for Less-developed Economies." *Journal of Political Economy* 84, no. 4, part 1: 777–95.
Kouretas, Georgios P. 1997. "Identifying Linear Restrictions on the Monetary Exchange Rate Model and the Uncovered Interest Parity: Cointegration Evidence from the Canadian-U.S. Dollar." *Canadian Journal of Economics* 30, no. 4: 875–90.
MacKinnon, James G.; Alfred A. Haug; and Leo Michelis. 1999. "Numerical Distribution Functions of Likelihood Ratio Tests for Cointegration." *Journal of Applied Econometrics* 14, no. 5: 563–77.
Mathieson, Donald J. 1980. "Financial Reform and Stabilization Policy in a Developing Economy." *Journal of Development Economics* 7, no. 3: 359–95.
McKinnon, Ronald I. 1973. *Money and Capital in Economic Development*. Washington, D.C.: Brookings Institution.
———. 1981. "Financial Repression and the Liberalization Problem in Less-Developed Countries." In *The Past and Prospects of the World Economic Order*, ed. Sven Grassman and Erik Lundberg. New York: Macmillan.
Pesaran, M. Hashem, and Yongcheol Shin. 1995. "Long-Run Structural Modelling." DAE Working Paper no. 9419. Cambridge: Department of Applied Economics, University of Cambridge.
Pesaran, M. Hashem; Yongcheol Shin; and Richard J. Smith. 2000. "Structural Analysis of Vector Error Correction Models with Exogenous I (1) Variables." *Journal of Econometrics* 97, no. 2: 293–343.
Roubini, Nouriel, and Xavier Sala-i-Martin. 1992. "Financial Repression and Economic Growth." *Journal of Development Economics* 39, no. 1: 5–30.
Shaw, Edward S. 1973. *Financial Deepening in Economic Development*. New York: Oxford University Press.
Stiglitz, Joseph E. 1994. "The Role of the State in Financial Markets." In *Proceedings of the World Bank Annual Conference on Development Economics 1993: Supplement to the World Bank Economic Review and the World Bank Research Observer*, ed. Michael Bruno and Boris Pleskovic. Washington, D.C.: World Bank.