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# Private Investment and Financial Sector Policies in India and Malaysia

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**Summary.** — This paper examines the role of financial sector policies in determining private investment in the economies of India and Malaysia. The results suggest that significant directed credit programs favoring certain priority sectors tend to discourage private capital formation in both countries. Interest rate controls appear to have a positive impact on private investment, with the effect being more pronounced in Malaysia. While high reserve and liquidity requirements exert a negative influence on private investment in India, the effect is found to be positive in Malaysia.

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## 1. INTRODUCTION

Although it is widely accepted that expansion of private investment is the main catalyst for generating long-run growth in developing countries, the response of private investment to various financial sector policies has received little attention in the analysis of investment behavior. An understanding of the way financial sector policies impact on private investment is important given that a number of developing countries have undergone significant financial sector reforms over the last few decades, leading to a widely observed increase in the degree of financial globalization. Drawing on the financial liberalization thesis of McKinnon (1973) and Shaw (1973), this study addresses the question of how government intervention in the financial system (including directed credit programs, interest rate controls, and reserve and liquidity requirements) affects the evolution of private investment in two rapidly growing developing economies – India and Malaysia. Understanding how each type of financial sector policy affects private investment provides some insight into the costs and benefits associated with each component of financial reform.

This study is related to several strands of literature. One has explored the determinants of private investment for developing countries (e.g., Greene & Villanueva, 1991; Guimaraes & Unterberdoerster, 2006; Jongwanich & Kohpaiboon, 2008; Kinkyo, 2007; Serven, 2003). Another strand has attempted to examine the impact of financial sector reform on macroeconomic variables such as saving, investment, or financial deepening in developing economies (e.g., Ang, 2008, 2009; Ang & McKibbin, 2007; Bandiera, Caprio, Honohan, & Schiantarelli, 2000; Hermes & Lensink, 2005). Our work is also similar in some respects to that of Emran, Shilpi, and Alam (2007), who assess the effects of financial liberalization on the price responsiveness of private investment in India. Their results indicate that private investment has become more sensitive to changes in the cost of capital after liberalization. However, our focus, unlike theirs, is on the role of financial sector policies in determining private investment activity.

This paper aims to complement the above studies, and to enrich the literature by providing further evidence on how financial sector policies affect the evolution of private investment, drawing on the experience of two leading developing economies that have undergone significant financial sector reforms. We focus on just two economies instead of a larger sample

given that the effects of financial sector policies may be heterogeneous across countries at different stages of economic development. Case studies are particularly useful in disentangling the complexity of the financial environments and economic histories of each country. By analyzing case studies, the econometric findings of this project can be related to the prevailing institutional structure, thus informing both academic and policy debate.

Several interesting features emerge from a comparative analysis of India and Malaysia. Firstly, both are high growth developing economies with British common law origins. Secondly, Malaysia was one of several economies severely impacted by the 1997–98 Asian financial crisis while India was largely unaffected by this episode of financial turbulence. In Malaysia's case there has been a sharp decline in gross domestic investment following the 1997–98 crisis. This emanated predominantly from the private sector whereas public investment has been boosted significantly as part of the crisis management program. However, it is not clear whether such government's pump-priming efforts will be sustainable in the long run. Consequently, this disappointing trend in private investment has become a major focus of economic policy debate in the crisis-affected Asian countries (see, e.g., Guimaraes & Unterberdoerster, 2006; Kinkyo, 2007).

In the case of financial sector reforms, Malaysia initiated a series of financial liberalization programs in 1978 whereas India launched its reforms much later, in 1991. Surprisingly, the financial liberalization paths pursued in each country are remarkably similar despite their different starting points. Both countries have followed the conventional recommendations of a gradual reform approach for interest rate liberalization and reductions in reserve and liquidity requirements. However, quite apart from these measures, significant directed credit controls favoring certain priority sectors in the economies have remained in force in both countries. Notwithstanding their financial systems remaining partially restricted, India and Malaysia have achieved significant improvements in their

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financial sector development. In India, the ratio of private credit to GDP has increased from just 9% in 1960 to 45% in 2005. During the same period, this indicator increased significantly from just 7% to 117% in Malaysia (IMF, 2007). Finally, both India and Malaysia have relatively good databases by the standards of developing countries, providing an added incentive for this research.

The remainder of the paper is structured as follows. The next section describes the financial repression and liberalization experience of India and Malaysia. Section 3 discusses the private investment function derived from the neoclassical framework. This conventional framework is then modified to provide an alternative specification by incorporating the role of financial sector policies into the private investment equation. Section 4 sets out the empirical model and explains the construction of variables. A cost minimization approach is adopted in Section 5 to introduce dynamics into the model. This dynamic private investment function is then estimated using the appropriate time series techniques in order to provide an analysis of the short-run dynamics as well as the long-run relationship between private investment and its determinants. Section 6 presents and analyzes the econometric estimates of the private investment function covering the period 1950–2005 for India, and 1959–2005 for Malaysia. Finally, we summarize the main findings and conclude.

## 2. FINANCIAL SECTOR REFORMS IN INDIA AND MALAYSIA

There was little financial repression in the financial system of India during the 1950s and 1960s. However, the government gradually imposed more controls by raising reserve and liquidity requirements in the 1970s and 1980s. Revenue from financial repression was estimated to be 22.4% of total central government revenue during the period 1980–85 (see Giovannini & De Melo, 1993). Furthermore, several interest rate controls were implemented in the late 1980s. A series of comprehensive financial reform policies were undertaken in 1991 as part of broader economic reform. This strategy was aimed at changing the entire orientation of India's financial development from a financially repressed system to a more open, market-type one. Since then, interest rates were gradually liberalized and reserve and liquidity requirements significantly reduced enabling the market to play a greater role in price determination and resource allocation.

However, despite the liberalization programs launched in the early 1990s, the Indian financial system has continued to operate within the context of repressionist policies. In particular, significant directed credit programs favoring certain priority sectors still prevail in the banking system. Moreover, although the government divested part of its equity position in some public banks in the 1990s, the banking sector has remained predominantly state-owned due to the bank nationalization program in 1969, which has enabled the Reserve Bank of India to effectively implement its credit allocation policy. As such, it appears that repressionist measures coexist with a set of liberalization policies aimed at promoting freer allocation of resources.

In the case of Malaysia, the Central Bank has actively pursued interest rate liberalization, with the objective of developing a more market-driven financial system. The Bank followed a gradual approach with interest rate reform, beginning by cautiously liberalizing them in the 1970s. The major phase of liberalization occurred in 1978 when commercial banks were allowed to set deposit and lending rates freely. The liberalization policies adopted seem to have worked well at the early

stage of development as significant financial deepening took place. In the 1980s, the Malaysian financial sector underwent a radical transformation along with expansion in the economy. The upshot of this was the emergence of a broader, deeper, more organized, and better structured financial system.

However, Malaysia has never completely and consistently liberalized its financial sector. The reform programs appear to have been narrow in scope, with much of the effort focused on eliminating interest controls. Quite apart from the liberalization policies pursued, a series of directed credit programs were implemented in 1975. During this year, at least 50% of total lending made by banks had to be advanced to the native Malay community. The requirement was reduced to 20% in the following year, but then adjusted to 30% in 1996. These financial sector policies, liberalization or repression, and the development that followed may have had a significant impact on the evolution of private investment activities in Malaysia.

## 3. ANALYTICAL FRAMEWORK

### (a) *The neoclassical investment model*

The neoclassical investment model of Jorgenson (1963) postulates that the desired capital stock depends on the level of output and on the user cost of capital. Lags in delivery and decision making create a gap between current and desired capital stocks, giving rise to an investment equation in the form of:

$$I_t = \lambda \sum_{j=0}^n b_j \Delta(GDP_{t-j}/COC_{t-j}) + dK_{t-1}, \quad (1)$$

where gross investment ( $I_t$ ) is represented by the sum of a distributed lag on the past changes in desired capital stock and replacement investment, and  $d$  is the rate of depreciation of capital stock ( $K_t$ ), which is usually assumed to be constant. Hence, this simple neoclassical framework assumes that output levels ( $GDP_t$ ) and the user cost of capital ( $COC_t$ ) are the two key determinants of private investment.<sup>1</sup>

### (b) *Modifications and extensions*

#### (i) *Public investment*

Several authors have argued that public investment may be complementary to, rather than competing with, private investment in developing countries. Public investment may facilitate and stimulate private investment through the provision of infrastructural support (Blejer & Khan, 1984; Sundararajan & Thakur, 1980). This could raise the productivity of capital and expand the overall resource availability by increasing output. On the other hand, public investment may also crowd out private investment. This occurs when additional public investment requires raising future tax and domestic interest rates, or if the public sector produces investment goods that directly compete with private goods. In addition, the utilization of additional physical and financial resources, which would otherwise be available to the private sector, may also depress private investment (Aschauer, 1989; Blejer & Khan, 1984). Therefore, the impact of public investment on private investment is theoretically indeterminate.

#### (ii) *Financial sector policies*

The Jorgenson investment model assumes a perfect financial market, where the firm faces an unlimited supply of capital. It is not difficult to see that under this framework, the user cost

of capital is a crucial determinant of private investment. Within this context, attention has traditionally been focused on the implications of investment tax credits and depreciation rules on the cost of capital. Under repressed financial systems, however, firms do not have access to an unlimited supply of credit, as would be the case postulated under the neoclassical framework where a perfectly competitive market prevails. In fact, developing countries are often characterized by credit constraints due to market imperfections such as asymmetric information and agency problems (Stiglitz & Weiss, 1981). Imperfections in credit markets may prevent firms from borrowing as much as they would wish. Such a constraint will in general discourage the undertaking of investment projects.

Empirical studies that focus on analyzing the impact of financial deregulation on private investment have tended to emphasize the relaxation of borrowing constraints. The standard proxy used to capture the effect of financial liberalization has been real bank credit to the private sector or the ratio of bank credit to GDP. Financial liberalization does not necessarily lead to reduced financial constraint, which results in more funds intermediated in the market (see, e.g., Ang & McKibbin, 2007). Therefore, the effect of financial liberalization has to be captured separately by considering an appropriate proxy for it in the model specification. A more satisfactory approach to assessing the effect of financial sector reforms would explicitly account for each of their components. This would provide a more complete analysis of the costs and benefits associated with financial repression or liberalization. Thus, the overall effectiveness of the entire reform programs would depend on the relative strength of each type of financial sector policy implemented. Analysis performed at the disaggregated level also helps to identify an appropriate mix of financial liberalization and repressionist policies that are effective in stimulating private investment.

The early literature on financial liberalization, initiated by McKinnon (1973) and Shaw (1973), challenges the financial repressionist ideology and provide a new paradigm in the design of financial policies. They argue that financial repressionist policies are largely accountable for the poor economic performance of developing countries in the 1960s, where credit rationing and low investment were prevalent. Investment suffered in terms of both quantity and quality as funds were allocated at the discretion of policy makers instead of following free market forces. Their theories suggest that distortions in the financial systems, such as loans issued at an artificially low interest rate, directed credit programs, and high reserve requirements are all unwise and unnecessary. These can reduce saving, retard capital accumulation, and prevent efficient resource allocation. Therefore, they call for financial liberalization, which refers to the process of eliminating or significantly alleviating financial system distortions, in order to stimulate private investment and growth.

However, some counter arguments suggest that financial liberalization may not necessarily lead to higher investment. For instance, the neostructuralist contributions of van Wijnbergen (1982) and Taylor (1983) suggest that the impact of lower taxation on financial systems may reduce the flow of credit to the private sector. Since the formal financial systems are subject to reserve requirements, which involve a leakage in the intermediation process, the neostructuralists argue that curb (unorganized) markets perform more efficiently in intermediating savers and investors. A rise in bank deposit rates following financial liberalization induces households to substitute curb market loans for bank deposits, resulting in a fall in the supply of loanable funds. Thus, in the presence of efficient curb mar-

kets, removing interest rate restraints discourages private investment activities. Moreover, with deposit insurance, the absence of interest rate controls may result in overly risky lending behavior among banks due to moral hazard problems (McKinnon & Pill, 1997; Villanueva & Mirakhor, 1990).

Stiglitz (1994) also argues that interest rate restraints may lead to higher financial saving in the presence of good governance in the financial systems. When depositors perceive restrictions as policies aimed at enhancing the stability of the financial system, they may well be more willing to keep their savings in the form of bank deposits, thereby providing more resources for investment in the absence of perfect capital mobility. Hellmann, Murdock, and Stiglitz (1996) show that in a competitive equilibrium, banks have no incentive to attract new customers and deepen market penetration since their profit margin on deposits is zero due to intense competition. However, if the government imposed a deposit rate ceiling, banks can make positive returns and therefore have an incentive to attract more depositors, as long as the market is not fully penetrated. Thus, deposit rate controls can induce banks to spend more resources on deepening the financial system, enabling more investment activity to be carried out. In a similar vein, Honohan and Stiglitz (2001) argue that interest rate ceilings can effectively reduce reckless banking competition and allow for differential rewards for various risks.

In the case of reserve requirements, the neostructuralists view them in the same way as the McKinnon–Shaw school of thought since these requirements constitute a leakage in the intermediation process (Fry, 1995). However, Courakis (1984) shows that under the condition where the demand for loanable funds is not perfectly inelastic, higher reserve requirements may increase the profit-maximization deposit rate and hence the volume of loanable funds. Using a general equilibrium model, Bencivenga and Smith (1992) show that the optimal degree of financial repression depends on the size of government deficits. In the presence of large government deficits, it is desirable to impose higher reserve requirements. Their model also shows that financial liberalization will not necessarily increase capital formation since savings in the formal sector translate into lower investment than those savings in the informal sector due to the latter's absence of reserve requirements.

Furthermore, Kim and Santomero (1988) and Gennotte and Pyle (1991) show that capital requirements increase a bank's portfolio risk and hence may result in inefficient allocation of resources. This is arguably the case when the funds related to these repressionist programs are not allocated efficiently to generate productive returns. More recently, Hellmann, Murdock, and Stiglitz (2000) use a dynamic model of moral hazard to show that capital requirements can be used as a prudential tool to help combat moral hazard problems. However, a Pareto-optimal outcome can only be achieved by a combination of capital requirements and deposit rate controls in order to increase the incentives for banks to invest prudently.

The implementation of directed credit programs generally involves the administered allocation of credit to priority sectors, mainly agriculture and small-scale industry. Without such interventions, banks generally will not fund those activities with low returns. Although the McKinnon–Shaw thesis advocates the removal of directed credit programs since they displace investment projects with potentially higher returns, Stiglitz and Weiss (1981) show that financial liberalization is unlikely to result in allocative efficiency. This is because under asymmetric information, banks will practice credit rationing and be reluctant to raise interest rates in response to higher

demand for loans due to adverse selection problems. Furthermore, directed credit programs may lead to increased investments in the targeted sectors, which may generate productive gains throughout the economy (Schwarz, 1992). Given the above, it appears that the impact of each of these financial sector policies on private investment is theoretically ambiguous.

#### 4. EMPIRICAL SPECIFICATION AND CONSTRUCTION OF VARIABLES

Based on the above discussion, our specification for the private investment function combines the neoclassical investment factors with public sector investment and three types of financial sector policies. Specifically, it is postulated that the steady-state relationship for the real private investment ( $I_t$ ) equation can be given as follows:

$$I_t = f(GDP_t, COC_t, PUB_t, DCP_t, IRR_t, RLR_t). \quad (2)$$

The independent variables, with the expected signs in parentheses, are given as:

- $GDP_t$  = real output (+)
- $COC_t$  = real user cost of capital (-)
- $PUB_t$  = real public investment (?)
- $DCP_t$  = directed credit programs (?)
- $IRR_t$  = interest rate restraints (?)
- $RLR_t$  = reserve and liquidity requirements (?)

The neoclassical investment model predicts that  $GDP_t$  should have a positive effect on private investment whereas  $COC_t$  discourages private investment.  $PUB_t$  may crowd in or crowd out  $I_t$ . The impact of each type of financial sector policy on private investment is theoretically ambiguous. The above-mentioned private investment specification also includes a dummy variable in the analysis for Malaysia to account for the impact of the Asian financial crisis, which takes the value of 1 for the period 1997–98.

Annual data covering the period 1950–2005 for India and 1959–2005 for Malaysia are used in the empirical analysis. The data for India are directly obtained or compiled from the National Accounts Statistics of the Government of India, the Annual Reports and Reports on Currency and Finance of the Reserve Bank of India. For Malaysia, the data are collected from the Economic Report of the Ministry of Finance, and the Annual Reports and Monthly Statistical Bulletin of the Central Bank of Malaysia. Except for the financial policy variables, which may carry a zero value, all variables are measured in natural logarithms.

$I_t$  and  $PUB_t$  are measured by gross capital formation in the private and public sectors, respectively. The gross capital formation deflator is used to express them in real terms. Following the standard practice, we use gross domestic product at constant prices as the measure of real output ( $GDP_t$ ). The user cost of capital ( $COC_t$ ) is constructed using an analytical expression similar to that of Hall and Jorgenson (1969), which can be formulated as  $COC_t = P_t^k (i_t - \pi_t^e + \delta_t) / P_t$ . Price of capital ( $P_t^k$ ) is measured by the gross capital formation deflator,  $i_t$  is the average lending rate, the expected rate of inflation ( $\pi_t^e$ ) is constructed using contemporaneous percentage change in the GDP deflator, the depreciation rate ( $\delta_t$ ) is assumed to be constant at 4%,<sup>2</sup> and  $P_t$  is the GDP deflator.

For Malaysia,  $DCP_t$  is measured by the priority sector target lending rate of the native Malay community.<sup>3</sup> Hence, it is a *de jure* measure that reflects the strength of directed credit controls designed to repress the financial system in Malaysia. However, such a measure is not available for India on a consistent and reliable basis. Therefore, we use a *de facto* measure,

which involves measuring the share of actual directed credit in total credit. Specifically, it is measured by 0, 1, 2, and 3 when the programs cover zero, up to 20%, 21–40%, and more than 40%, respectively, of total bank loans.<sup>4</sup>

The measure for reserve and liquidity requirements ( $RLR_t$ ) is given by the sum of the cash liquidity ratio and the statutory reserve requirement. The former requires banks to hold part of their deposits in the form of cash balances at the central banks whereas the latter imposes a requirement for banks to keep a share of their assets in government securities at below-market interest rates. To provide a measure of the interest rate restraints ( $IRR_t$ ), we collect six series of interest rate repressionist policies imposed on the Indian and Malaysian financial systems. For Malaysia, these include a maximum lending rate for priority sectors, a policy intervention rate, a minimum lending rate, a maximum lending rate, a minimum deposit rate, and a maximum deposit rate. The construction of this index for India involves a fixed deposit rate, a deposit rate ceiling, a deposit rate floor, a fixed lending rate, a lending rate ceiling, and a lending rate floor. These policy controls are translated into dummy variables which take the value of 1 if a control is present and 0 otherwise.<sup>5</sup> In order to reflect their joint influence, we take the unweighted average of these policy variables and reduce them to just one summary measure. Figure 1 gives the time series plots of these variables.

#### 5. ESTIMATION TECHNIQUES

##### (a) Dynamic specification

Although economic theory provides some guidance on the formulation of steady-state relationships, it is not particularly helpful in explaining dynamic adjustments, which are critical in any time series investigation. Hence, to derive a dynamic investment model suitable for econometric estimation, we follow Sims' (1974) approach by postulating a dynamic cost optimization problem that imposes costs on "mistakes" made by agents.

Suppose every year, each firm in the economy has a desired level of private investment,  $I_t^*$ . This ideal level of investment depends on a number of factors stated in Eqn. (2). The actual level of private investment ( $I_t$ ) differs from that of the desired level ( $I_t^*$ ) due to the costs associated with adjusting  $I_t$ . To illustrate how this would lead to a dynamic investment model, consider that in any period  $t$ , the representative firm's objective is to minimize the following penalty function by optimizing the level of investment:

$$\text{Min}_{I_t} E_t \left\{ \sum_{i=1}^{\infty} \delta^i [a(I_t - I_t^*)^2 + b(I_t - I_{t-1})^2 - 2c(I_t - I_{t-1})(I_t^* - I_{t-1}^*)] | \Omega_t \right\}, \quad (3)$$

where  $\delta^i$  is the discount factor that takes a value between 0 and 1, and  $\Omega_t$  is the firm's information set at time  $t$ . The first term in the square bracket represents the cost of deviation from the desired level of private investment. The second term is the cost of rapidly changing the level of private investment. The last term is included due to Hendry and von Ungern-Sternberg (1981), who argue that the penalty is reduced if firms move in the correct direction, that is, toward the equilibrium level of investment. The last term will converge to zero if the desired level of private investment remains unchanged. The firm seeks to minimize the expectation of the future stream of costs asso-

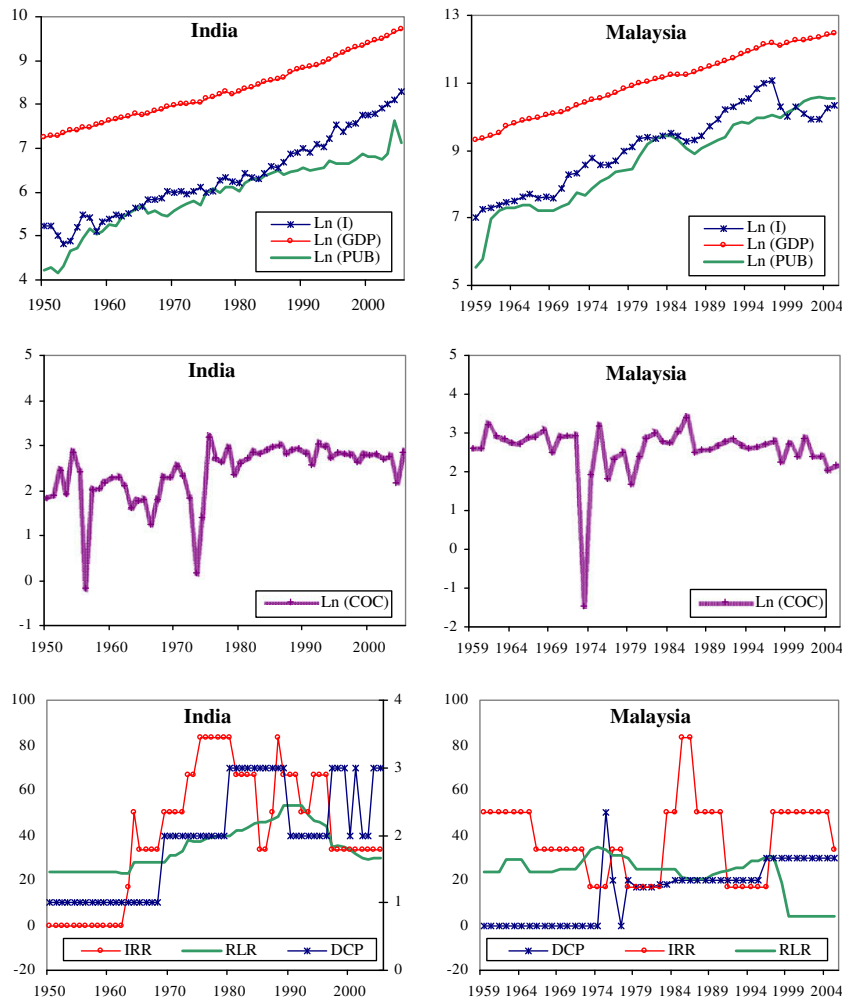


Figure 1. Time series plots of the variables.

ciated with investment decision making, conditional upon all available information  $\Omega_t$  at time  $t$ . Since it is difficult to estimate the discount factor, we follow Callen, Hall, and Henry (1990) by setting it to unity for simplicity. This does not affect the general form of the solution to the model. Invoking the certainty equivalence theorem and the rational expectations hypothesis so that expectations are replaced by future realizations, and choosing  $I_t$  at time  $t$  to minimize expected costs lead to the following Euler condition:

$$(a + 2b)I_t - b(I_{t-1} + I_{t+1}) = (a + 2c)I_t^* - c(I_{t-1}^* + I_{t+1}^*). \quad (4)$$

A solution for Eqn. (4) may be defined as:

$$[(a + 2b) - bL - bL^{-1}] = \lambda(1 - \theta L)(1 - \phi\theta L^{-1}). \quad (5)$$

So that:

$$\left(I_t - \frac{c}{b}I_t^*\right) = \theta\left(I_{t-1} - \frac{c}{b}I_{t-1}^*\right) + \frac{a(b-c)}{\lambda b} \sum_{i=0}^{\infty} (\theta\phi)^i I_{t+i}^*. \quad (6)$$

After some manipulation, we obtain:

$$\begin{aligned} \Delta I_t &= (\theta - 1)I_{t-1} + \frac{c}{b}\Delta I_t^* + \frac{c(1-\beta)}{b}I_{t-1}^* \\ &+ \frac{a(b-c)}{\lambda b} \sum_{i=0}^{\infty} (\theta\phi)^i I_{t+i}^*. \end{aligned} \quad (7)$$

We follow Nickell (1985) by assuming that  $I_{t+i}^*$  follows a random walk with drift:

$$I_{t+i}^* = I_t^* + gi, \quad (8)$$

where  $g$  is the drift term. Then substituting Eqn. (8) into Eqn. (7), and rearranging the terms we obtain the familiar error-correction representation of the dynamic investment demand model:

$$\Delta I_t = a_0 + a_1\Delta I_t^* - a_2(I_{t-1} - I_{t-1}^*). \quad (9)$$

The error-correction term  $(I_{t-1} - I_{t-1}^*)$  captures the long-run equilibrium relationship between variables whereas the differenced terms  $(\Delta I_t^*)$  capture the short-run dynamics. The use of an error-correction model (ECM) is appropriate in this context, since investment decisions are likely to be gradual and subject to revision in developing countries. Although equilibrium investment  $I_t^*$  is unobservable, Eqn. (9) can be estimated by using the steady-state private investment equation in Eqn. (2).

(b) The ARDL estimator

The dynamic adjustment of the private investment process can be characterized by a conditional ECM, which can be used to test for the existence of a long-run relationship using the ARDL bounds test developed by Pesaran, Shin, and Smith

(2001) and the ECM test of Banerjee, Dolado, and Mestre (1998) to test for the presence of a cointegrated relationship. The former involves a standard *F*-test whereas the latter is a simple *t*-test. Using Eqn. (9) with appropriate modifications, and replacing the long-run equilibrium level of private investment with the variables in Eqn. (2), we obtain the following conditional ECM:

$$\Delta I_t = \alpha_0 + \beta_0 I_{t-1} + \sum_{j=1}^k \beta_j DET_{j,t-1} + \sum_{i=1}^p \gamma_{0i} \Delta I_{t-i} + \sum_{i=0}^p \sum_{j=1}^k \gamma_{ji} \Delta DET_{j,t-i} + \varepsilon_t, \quad (10)$$

where  $I_t$  is real private investment and  $DET_t$  is a vector of the determinants of private investment, which includes  $GDP_t$ ,  $COC_t$ ,  $PUB_t$ ,  $DCP_t$ ,  $IRR_t$ , and  $RLR_t$ .

The above can be estimated by OLS since Pesaran and Shin (1999) have shown that the OLS estimators of the short-run parameters are consistent and the ARDL-based estimators of the long-run coefficients are super-consistent in small sample sizes. Moreover, precise estimates of long-run parameters and valid *t*-statistics can be obtained even in the presence of endogenous explanatory variables. Hence, valid inferences on the long-run parameters can be made using standard normal asymptotic theory. The main advantage of this approach is that it can be applied to the model regardless of whether the underlying variables are  $I(0)$  or  $I(1)$ . Specifically, two separate statistics are employed to test for the existence of a long-run relationship in Eqn. (10): (1) an *F*-test for the joint significance of coefficients on lagged levels terms of the conditional ECM ( $H_0 : \beta_0 = \beta_1 = \dots = \beta_k = 0$ ) and (2) a *t*-test for the significance of the coefficient associated with  $I_{t-1}$  ( $H_0 : \beta_0 = 0$ ). The test for cointegration is provided by two asymptotic critical value bounds when the independent variables are either  $I(0)$  or  $I(1)$ . The lower bound assumes all the independent variables are  $I(0)$ , and the upper bound assumes they are  $I(1)$ . If the test statistics exceed their respective upper critical values, the null is rejected and we can conclude that a long-run relationship exists. This approach also provides a convenient step

to derive the long-run estimates and short-run dynamics for the private investment function, as detailed in Pesaran and Shin (1999).<sup>6</sup>

(c) *Alternative estimators*

To provide some robustness checks, the private investment function is also estimated using two alternative long-run estimators, namely the fully modified unrestricted error-correction model (FM-UECM) and the dynamic ordinary least squares (DOLS) estimator. The UECM estimator of Inder (1993) involves estimating the long-run parameters by incorporating adequate dynamics into the steady-state specification to avoid omitted lagged variable bias, as given in the following equation:

$$I_t = \alpha_0 + \sum_{j=1}^k \beta_j DET_{j,t} + \sum_{i=0}^p \gamma_i \Delta I_{t-i} + \sum_{i=0}^p \sum_{j=1}^k \delta_{ji} \Delta DET_{j,t-i} + \varepsilon_t. \quad (11)$$

However, this approach may not be asymptotically optimal given that it takes no account of the possible endogeneity of the underlying variables. In view of this, we follow Bewley (1979) by using the instrumental variable technique to correct the standard errors so that valid inference can be drawn. Specifically, lagged level variables are used as the instruments for the first-differenced current terms to correct for endogeneity bias. Next, the short-run effects are removed by defining  $\tilde{I}_t = I_t - \hat{\alpha}_0 - \sum_{j=1}^k \hat{\beta}_j DET_{j,t} - \sum_{i=0}^p \hat{\gamma}_i \Delta I_{t-i} - \sum_{i=0}^p \sum_{j=1}^k \hat{\delta}_{ji} \Delta DET_{j,t-i}$ . The fully modified estimator is then obtained by employing the Phillips–Hansen non-parametric corrections to the regression of  $\tilde{I}_t$  on a constant and  $\sum_{j=1}^k \beta_j DET_{j,t}$ . The resulting estimator, known as fully modified unrestricted error-correction model (FM-UECM), thus adequately deals with omitted lag variables bias. Inder (1993) has shown that it is asymptotically optimal, even in the presence of endogenous explanatory variables.

The key advantage of the DOLS procedure of Stock and Watson (1993) is that it allows for the presence of a mix of  $I(0)$  and  $I(1)$  variables in the cointegrated system. Based on

Table 1. *Cointegration tests*

	India		Malaysia	
	<i>p</i> = 1	<i>p</i> = 2	<i>p</i> = 1	<i>p</i> = 2
<i>A. Test statistics</i>				
ARDL bounds test (Pesaran <i>et al.</i> , 2001)	6.411***	4.135**	4.581***	4.174**
ECM test (Banerjee <i>et al.</i> , 1998)	-5.885***	-4.789**	-5.007***	-4.702**
<i>B. Model selection criteria</i>				
AIC	-1.678	-1.575	-1.325	-1.697
SBC	-0.905	-0.535	-0.482	-0.562
<i>C. Diagnostic checks</i>				
$\chi^2_{NORMAL}$	1.555 (0.459)	0.406 (0.816)	6.608** (0.037)	0.288 (0.867)
$\chi^2_{SERIAL}$	2.841* (0.092)	2.285 (0.131)	9.845*** (0.002)	3.505* (0.061)
$\chi^2_{ARCH}$	2.295 (0.129)	3.151* (0.076)	0.319 (0.572)	0.211 (0.646)
$\chi^2_{RESET}$	2.014 (0.156)	3.189* (0.074)	5.673** (0.017)	0.006 (0.939)

Notes: *p* is the lag length. The test statistics of the bounds tests are compared against the critical values reported in Pesaran *et al.* (2001). The estimation allows for an unrestricted intercept and no trend. The 10%, 5%, and 1% critical value bounds for the *F*-test are (2.12, 3.23), (2.45, 3.61), and (3.15, 4.43), respectively. The respective critical value bounds for the *t*-test are (-2.57, -4.04), (-2.86, -4.38), and (-3.43, -4.99).  $\chi^2_{NORMAL}$  refers to the Jarque–Bera statistic of the test for normal residuals,  $\chi^2_{SERIAL}$  is the Breusch–Godfrey LM test statistic for no first-order serial relationship,  $\chi^2_{ARCH}$  is the Engle test statistic for no autoregressive conditional heteroskedasticity, and  $\chi^2_{RESET}$  is the Ramsey test statistic for no functional misspecification. Numbers in parentheses indicate *p*-values.

\* Indicates 10% level of significance.

\*\* Indicates 5% level of significance.

\*\*\* Indicates 1% level of significance.

Monte Carlo evidence, Stock and Watson (1993) show that DOLS outperforms a number of alternative estimators of long-run parameters. It has also been shown to perform well in finite samples. This feature is particularly appealing given the small samples used in the present study. The estimation involves regressing one of the  $I(1)$  variables on the remaining  $I(1)$  variables, the  $I(0)$  variables, leads ( $p$ ), and lags ( $-p$ ) of the first difference of the  $I(1)$  variables, and a constant. Its specification is similar to that of Eqn. (11), except that appropriate lead terms are included to correct for potential endogeneity problems and small sample bias, and they provide estimates of the cointegrating vector which are asymptotically efficient. The long-run private investment model can be obtained from the reduced form solution by setting all differenced terms of the regressors to zero.

Finally, to provide an analysis for the short-run dynamics, we obtain the error-correction term (ECT) by taking  $I_{t-1} - \alpha_0 - \beta_1 DET_{1,t-1} - \dots - \beta_k DET_{k,t-1}$  to formulate an error-correction model. The ECT captures the evolution process on the variable of concern by which agents adjust for prediction errors made in the last period. The general-to-specific modeling approach is adopted to derive a satisfactory short-run dynamic model. This involves testing down the general model by successively eliminating statistically insignificant regressors and imposing data acceptable restrictions on the parameters to obtain the final parsimonious dynamic equation. In order to test the robustness of the results, all estimations are subject to various diagnostic tests.

## 6. RESULTS

### (a) *Integration and cointegration analyses*

We begin our analysis by employing three unit root tests to assess the order of integration of the underlying variables—the Augmented Dickey–Fuller (ADF), Phillips–Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests. The ADF and PP test the null of a unit root against the alternative of stationarity whereas the KPSS tests the null of stationarity against the alternative of a unit root. The results, which are not reported here to conserve space but are available upon request, show that all variables appear to be either stationary, that is,  $I(0)$ , or integrated at order one, that is,  $I(1)$ . Given that none of the variables appears to be integrated at an order higher than one, this allows legitimate use of the proposed cointegration procedures.

Next, to perform cointegration tests on the private investment equation, we regress the conditional error-correction model in Eqn. (10) by allowing for up to two lags. To ascertain the existence of a level relationship between the variables, this requires satisfying both the  $F$ - and the  $t$ -tests. Table 1 gives the  $F$ -statistics for the ARDL bounds tests,  $t$ -statistics for the ECM test, Akaike's and Schwarz's Bayesian Information Criteria, denoted by AIC and SBC, respectively, and several diagnostic test statistics.

The results indicate the null hypothesis that there exists no level private investment equation is rejected at the conventional levels of significance for both countries, irrespective of the lag length, providing strong support for the existence of a long-run relationship between private investment and its determinants. No evidence of cointegrating is found when other variables are used as the dependent variables. Both AIC and SBC point to a simpler dynamic structure for India but a richer dynamic specification of two lags is preferred for Malaysia. Following this dynamic structure suggested by

the model selection criteria, we do not find any evidence of non-normality, serial correlation, autoregressive conditional heteroskedasticity, and functional misspecification at the 5% significance level. We therefore follow this lag structure in the remaining analyses.

### (b) *The effect of financial sector policies on private investment*

Table 2 presents the results for the private investment model estimated using the ARDL estimator. It is evident that real output enters the long-run private investment equation significantly with the expected sign in both countries. Hence, the results are both economically and statistically significant. Specifically, the long-run elasticity of real private investment with respect to real output is found to be 1.322 for India. A similar elasticity value of 1.266 is obtained for Malaysia. The finding that aggregate demand is a crucial determinant of private investment is consistent with the empirical evidence of Blejer and Khan (1984) for a group of 24 developing countries, Chibber and Shafik (1992) for Indonesia and Shafik (1992) for Turkey, and in particular, Athukorala and Sen (2002) for India, and Guimaraes and Unteroberdoerster (2006) for Malaysia.<sup>7</sup>

The coefficient of the real user cost of capital is found to be both economically and statistically significant for India, but such an effect is found to be insignificant in Malaysia.<sup>8</sup> Specifically, a 1% increase in real user cost of capital will result in a 0.081% reduction in real private investment in India. The finding of a small effect of real user cost of capital is in line with the results of Schmidt-Hebbel and Muller (1992) for Morocco and Guncavdi, Bleaney, and McKay (1998) for Turkey. This implies that increases in investment incentives may have to be very large to induce a significant increase in private capital formation. The results underscore the importance of providing adequate investment incentives to stimulate investment in the private sector. Thus, the predictions of the neoclassical investment model are supported by the Indian data. On the other hand, the results for Malaysia suggest that investment incentive has no role to play in stimulating capital formation in the private sector. Thus, changes in prices that affect investment incentives seem to be ineffective in stimulating private investment in Malaysia. This is likely to be the case if investors require more time to be convinced that the policy changes are likely to be permanent.

With regard to public investment, the long-run elasticity is found to be significant only in Malaysia, with a coefficient of 0.333. This result confirms the hypothesis of complementarity between private and public investment. The finding of a crowding-in effect from government investment is in line with a majority of studies, including Aschauer (1989) for the United States, Greene and Villanueva (1991) for 23 developing countries, and Shafik (1992) for Egypt. However, such an effect is found to be insignificant for India. Public spending on infrastructure and human capital formation is likely to crowd in private investment whereas other types of public investment tend to have the reverse effect. It is probable that these opposing forces exactly offset each other, leaving little net effect of public investment on private investment in India.

The empirical results show a negative and significant effect of directed credit programs in private sector capital formation in Malaysia. In particular, a 1% point increase in the measure of the extent of directed credit programs decreases real private investment by about 0.02% points. This finding is consistent with the McKinnon–Shaw thesis, pinpointing the importance of allowing for free allocation of resources in the economy in order to revive the private investment slumps experienced



Table 2. ARDL estimate of the private investment equation

	India		Malaysia	
	Coefficient	p-Value	Coefficient	p-Value
<i>A. The long-run relationship (Dep. = <math>\ln I_t</math>)</i>				
Intercept	-4.705***	0.000	-8.752***	0.000
$\ln GDP_t$	1.322***	0.000	1.266***	0.000
$\ln COC_t$	-0.081***	0.003	0.014	0.598
$\ln PUB_t$	0.072	0.387	0.333***	0.001
$DPC_t$	-0.034	0.254	-0.022***	0.000
$IRR_t$	0.002*	0.072	0.003*	0.058
$RLR_t$	-0.006**	0.032	0.048***	0.000
<i>B. The short-run dynamic model (Dep. = <math>\Delta \ln I_t</math>)</i>				
Intercept	-0.023	0.298	-0.005	0.884
$ECT_{t-1}$	-0.859***	0.000	-0.839***	0.000
$\Delta \ln GDP_t$	1.037**	0.012	1.539***	0.001
$\Delta \ln COC_t$	-0.063***	0.001		
$\Delta \ln PUB_t$			0.613***	0.000
$\Delta DPC_t$			-0.006***	0.005
$\Delta RLR_t$			0.039***	0.000
$\Delta \ln COC_{t-1}$	-0.044**	0.023		
	Test-statistic	p-Value	Test-statistic	p-Value
<i>C. Diagnostic checks</i>				
$\chi^2_{NORMAL}$	0.462	0.793	0.013	0.942
$\chi^2_{SERIAL}$	0.299	0.584	0.076	0.783
$\chi^2_{ARCH}$	0.799	0.371	2.947	0.086*
$\chi^2_{RESET}$	0.077	0.781	1.253	0.263

Notes: See previous table.

\* Indicates 10% level of significance.

\*\* Indicates 5% level of significance.

\*\*\* Indicates 1% level of significance.

by Malaysia since the Asian financial crisis. The results also imply that the allocation of credit to priority sectors has reduced funds available to other sectors and resulted in a displacement of investment projects with potentially higher returns. Our results corroborate the findings of Odedokun (1996) and Yaron, Benjamin, and Charitonenko (1998), who have found a negative effect of directed credit policies. However, an insignificant effect is found for India, based on the results provided by the ARDL estimator.

The results also suggest that interest rate restraints have a positive and statistically significant effect on private investment in both countries, although its magnitude is negligible. To the extent that the interest rate restraints imposed on the financial systems have some effects in encouraging private investment activity, the results tend to support the neostructuralists arguments of van Wijnbergen (1982) and Taylor (1983) that interest controls may increase the flow of credit to the private sector. On the other hand, higher reserve and liquidity requirements tend to discourage private capital formation in India, but its influence is found to be positive in Malaysia. The magnitude of the coefficients is found to be -0.006 and 0.048 in India and Malaysia, respectively. The results for India support the view of the neostructuralists and McKinnon-Shaw school that higher reserve and liquidity requirements constitute a leakage in the intermediation process, and this reduces the volume of loanable funds. The results for Malaysia, on the other hand, are more in line with the proposition of Courakis (1984) that higher reserve requirements increase the profit-maximization deposit rate and hence the volume of loanable funds.<sup>9</sup>

Turning to the short-run dynamics, the regression results for the conditional ECM of  $\Delta \ln I_t$  reported in panel B of Table 2

show several interesting features. All coefficients are statistically significant at the conventional levels. In first-differenced form, the variables have expected signs, consistent with the results reported in the long-run model. The coefficients of  $ECT_{t-1}$ , which measure the speed of adjustment back to the long-run equilibrium value, are statistically significant at the 1% level and correctly signed, that is, negative. This implies that an error-correction mechanism exists in both countries so that the deviation from long-run equilibrium has a significant impact on the growth rate of real private investment. Private investment in India adjusts at about 82% every year to restore equilibrium when there is a shock to the steady-state relationship. The speed of adjustment is found to be slightly slower in Malaysia, at a rate of about 76% every year. Finally, the Asian financial crisis dummy is found to be statistically insignificant and has the wrong sign for Malaysia. It is therefore dropped from the estimation.

### (c) Robustness checks

The results reported in panel C of Table 2 show that the regression specifications fit remarkably well and pass the diagnostic tests against non-normal residuals, serial correlation, autoregressive conditional heteroskedasticity, and functional misspecification. The structural stability of the private investment equation is examined using the cumulative sum (henceforth, CUSUM) and CUSUM of squares tests on the recursive residuals. The CUSUM test is able to detect systematic changes in the regression coefficients whereas the CUSUM of squares test is able to detect sudden changes from the constancy of the regression coefficients. Figure 2 shows that the statistics generally lie within the 5% confi-

dence interval bands, suggesting no structural instability in the residuals of the private investment equations for both India and Malaysia.

Figure 3 shows the actual and predicted levels of private investment. Predicted  $\ln I_t$  is the long-run (static) equilibrium levels of private investment, which are constructed based on the long-run estimates reported in panel A of Table 2. It is evident that the predicted series track the actual series very closely over time for both models, suggesting that the data fit the private investment model well.<sup>10</sup>

(d) *Alternative estimators*

The sensitivity of the results is further assessed using the FM-UECM procedure and the DOLS approach. The results presented in Table 3 are, by and large, consistent with those obtained using the ARDL estimator. However, a few discrepancies have been noted. First of all, the coefficient on public investment becomes negative and statistically significant at the 5% level when the private investment equation for India is estimated using DOLS. This finding corroborates the results of Pradhan, Ratha, and Sarma (1990) for the Indian experience. A similar finding is obtained for the measure of directed

credit programs in India when the model is estimated using both the FM-UECM and DOLS procedures. Thus, in contrast to the earlier results that found no significant effect of directed credit programs, these programs are likely to exert a negative effect on private investment in India. The short-run results are, in general, consistent with their long-run counterparts. The results are robust to a series of diagnostic checks reported in panel C.

(e) *Alternative specifications of investment function*

Our findings so far suggest that private investment is strongly influenced by financial sector policies. While a reduction in these policy variables may reflect the relaxation of borrowing constraints in the domestic banking sector, these measures do not consider funds raised from the stock markets and foreign financial capital inflows. To address this concern, we consider two other indicators of credit constraints: portfolio investment ( $POR_t$ ) and issue of new securities ( $SEC_t$ ). Furthermore, we also capture the effect of macroeconomic uncertainty ( $UNC_t$ ), given that less capital accumulation is likely to occur in a highly uncertain economic environment. We use the conditional variance from a GARCH(1,1)

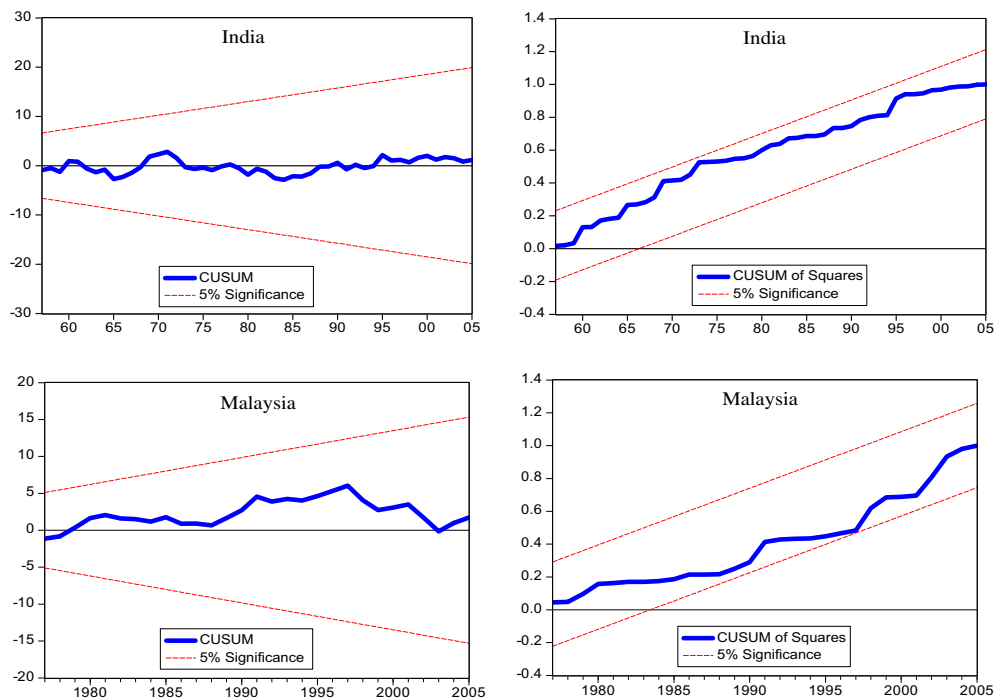


Figure 2. Plots of CUSUM and CUSUM of squares recursive residuals.

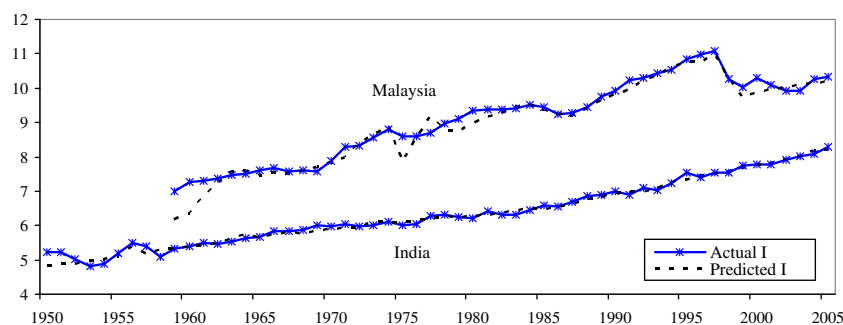


Figure 3. Actual and predicted private investment series (in natural logarithms).

Table 3. FM-UECM and DOLS estimate of the private investment equation

	India		Malaysia	
	FM-UECM	DOLS	FM-UECM	DOLS
<i>A. The long-run equilibrium level relationship (Dep. = <math>\ln I_t</math>)</i>				
Intercept	-4.718*** (0.000)	-5.113*** (0.000)	-7.569*** (0.000)	-8.659*** (0.000)
$\ln GDP_t$	1.328*** (0.000)	1.494*** (0.000)	1.233*** (0.000)	1.229*** (0.000)
$\ln COC_t$	-0.076*** (0.000)	-0.046** (0.019)	0.041 (0.181)	0.052 (0.208)
$\ln PUB_t$	0.067 (0.301)	-0.114** (0.032)	0.236** (0.015)	0.351*** (0.000)
$DCP_t$	-0.042* (0.071)	-0.045* (0.084)	-0.009*** (0.002)	-0.019*** (0.000)
$IRR_t$	0.001* (0.061)	0.001** (0.021)	0.001 (0.878)	0.004*** (0.003)
$RLR_t$	-0.005** (0.011)	-0.004** (0.018)	0.044*** (0.000)	0.051*** (0.000)
<i>B. The short-run dynamic model (Dep. = <math>\Delta \ln I_t</math>)</i>				
Intercept	0.014 (0.521)	0.003 (0.893)	-0.066* (0.063)	-0.076** (0.037)
$ECT_{t-1}$	-0.868*** (0.000)	-0.766*** (0.000)	-0.698*** (0.000)	-0.816*** (0.000)
$\Delta \ln GDP_t$	1.028** (0.012)	0.924** (0.037)	1.731*** (0.000)	1.513*** (0.003)
$\Delta \ln COC_t$	-0.061*** (0.002)	-0.049** (0.017)		
$\Delta \ln PUB_t$			0.403*** (0.001)	0.641*** (0.000)
$\Delta DCP_t$				-0.005** (0.019)
$\Delta RLR_t$			0.038*** (0.000)	0.041*** (0.000)
$\Delta \ln COC_{t-1}$	-0.044** (0.022)	-0.056*** (0.008)	-0.036* (0.066)	
<i>C. Diagnostic checks</i>				
$\chi^2_{NORMAL}$	0.405 (0.816)	3.364 (0.186)	0.497 (0.779)	1.266 (0.531)
$\chi^2_{SERIAL}$	0.264 (0.607)	1.443 (0.229)	0.606 (0.436)	0.042 (0.837)
$\chi^2_{ARCH}$	0.959 (0.327)	1.043 (0.791)	0.312 (0.576)	3.501* (0.061)
$\chi^2_{RESET}$	0.152 (0.697)	3.549* (0.059)	1.978 (0.159)	1.961 (0.161)

Notes: Numbers in parentheses indicate p-values.

\* Indicates 10% level of significance.

\*\* Indicates 5% level of significance.

\*\*\* Indicates 1% level of significance.

specification of the rate of inflation (measured by GDP deflator) as the proxy for macroeconomic uncertainty (see Serven, 2003). The consideration of these additional factors provides alternative specifications of the private investment function, and therefore serves as further robustness checks of the results regarding the influence of financial sector policy on private investment.

Columns 1–3 in Table 4 report how private investment in India responds to changes in short-term financial inflows, funds raised from capital markets, and uncertainty, respectively. The coefficients of these variables are found to have both economically and statistically significant impact on private investment. Similar results are found for Malaysia (see columns 4–6).

Importantly, our main findings with regard to how private investment responds to each type of financial policies remain largely unaltered, except that the coefficient of  $DCP_t$  now becomes statistically insignificant for India. On the whole, we conclude that our findings are quite robust to these alternative specifications.

(f) Further discussion of the results

How could the above results be interpreted within the specific context of India and Malaysia? Firstly, our results suggest that directed credit programs tend to retard investment activity in the private sector. These findings are highly plausible for

Table 4. Alternative specifications of private investment function

	India			Malaysia		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-4.642*** (0.000)	-4.483*** (0.000)	-4.603*** (0.000)	-7.774*** (0.000)	-6.856*** (0.000)	-7.189*** (0.000)
$\ln GDP_t$	1.515*** (0.000)	1.413*** (0.000)	1.456*** (0.000)	0.703*** (0.001)	1.165*** (0.000)	1.158*** (0.000)
$\ln COC_t$	-0.027* (0.065)	-0.032** (0.029)	-0.037* (0.051)	-0.201*** (0.006)	0.014 (0.519)	0.019 (0.359)
$\ln PUB_t$	-0.258** (0.015)	-0.108** (0.050)	-0.159** (0.011)	0.886*** (0.000)	0.279*** (0.003)	0.283*** (0.001)
$DCP_t$	0.007 (0.703)	0.006 (0.735)	-0.001 (0.975)	-0.024*** (0.000)	-0.017*** (0.001)	-0.007* (0.072)
$IRR_t$	0.001** (0.033)	0.001* (0.085)	0.003*** (0.000)	0.010*** (0.000)	0.002* (0.098)	0.004*** (0.004)
$RLR_t$	-0.002* (0.067)	-0.007*** (0.000)	-0.007*** (0.000)	0.054*** (0.000)	0.050*** (0.000)	0.051*** (0.000)
$POR_t$	0.389* (0.097)			0.689* (0.052)		
$SEC_t$		0.387** (0.046)			0.051** (0.050)	
$UNC_t$			-0.001* (0.078)			-0.012*** (0.007)

Notes: The estimates are obtained using the DOLS estimator. Only long-run results are reported. Portfolio investment flows ( $POR_t$ ) include shares and bond issues purchased by foreign investors. Securities ( $SEC_t$ ) are issues of new capital by the corporate sector. Data for  $POR_t$  and  $SEC_t$  are available only from 1970 onwards. These variables are expressed in real terms using the gross capital formation deflator.

\* Indicates 10% level of significance.

\*\* Indicates 5% level of significance.

\*\*\* Indicates 1% level of significance.

India. Due to the nationalization of banks in 1969, allocation of credit is mainly performed by government banks, which are often less efficient and subject to political interference. These credit allocation programs, which function mainly as a set of transfer programs, are found to have little impact on agricultural growth and productive capacity (Hanson, 2001). Moreover, although the allocation of credit under the direction of the central bank has benefited some farmers and small traders by allowing them to have adequate access to finance, this may have also discouraged household saving and hence reduced funds available for investment. As such, our results advise in favor of a policy of deregulation in the financial system by way of reducing the requirements for direct lending in order to boost private investment activity.

In the case of Malaysia, a series of directed credit programs pertaining to the native Malay community were implemented from 1975, following the institution of the New Economic Policy (NEP) in 1970.<sup>11</sup> Although credit allocation by the government may have succeeded in bringing the native Malays into business, it is unable to promote the development of an independent Malay entrepreneur class since they are mainly concerned with maintaining individual links with political patrons (see Crouch, 1996). Gomez (1990) also reports similar findings that state involvement in business has contributed little to the development of productive activities. Instead, it has resulted in the transfer of paper wealth from one company to another in the interests of the politically well-connected few. Moreover, Searle (1999) concludes that while government intervention has not created new sources of entrepreneurship that contribute to the economy, these interventions have fostered more rent-seeking activities which are harmful for generating higher capital formation in the private sector. Our results therefore point to the importance of eliminating these distortionary policies so that funds can be allocated efficiently to fuel private investment.

Secondly, our results indicate that interest controls have a positive effect on stimulating private investment activity in both countries, and that the impact is found to be stronger in Malaysia. These findings are not surprising given that the deregulation of lending rates may increase the costs of borrowing and the removal of deposit interest floors may discourage private saving. The extent of interest rate restraints in India rose sharply following the direct intervention of the Reserve Bank of India in the setting of interest rates in 1963. Despite these regulations, the ratio of M3 to GDP increased significantly from 24% to 51% during the period 1963–88. This process of financial deepening was much quicker than many other developing countries during the same period, and reflected a high propensity to save and confidence in the banking system. Given India's closed capital account regime, high saving mobilization has provided ample cheap domestic resources to facilitate private investment. Moreover, the imposition of interest rate ceilings from the 1960s to 1980s also ensured that entrepreneurs who lacked funding were able to obtain credit at a reasonably low cost.

The finding that interest rate restraints in Malaysia tend to have a larger effect on private investment compared to India is intriguing and invites more discussion. In the presence of good governance, savers may perceive policies restricting interest rates as aimed at stabilizing the financial system. This may lead to increased saving mobilization, which allows more intermediating activity to be carried out (Honohan & Stiglitz, 2001; Stiglitz, 1994). To the extent that Malaysia has more independent central banking governance and better quality institutions compared to India, its interest controls are likely to have a relative larger positive effect on private investment.

Although the legal system in India was originally based on the British model that emphasizes protection of property rights, India ended up with a much less effective institutional framework since the legal system was modified in a way that benefited the small number of Europeans that settled in and ran the economy (Mishkin, 2006).

Finally, our results suggest that higher reserve and liquidity requirements have a detrimental effect on private investment in India but the reverse is found in Malaysia. In India, high reserve requirements before liberalization have provided the Reserve Bank of India with funds to buy government securities at low cost, leaving insufficient funds to finance private investment. However, a significant reduction in the ratios of reserve and liquidity requirements after the liberalization has greatly facilitated private capital formation, which has contributed to a private investment-led boom in the economy during the 1990s. Therefore, it appears that lowering these requirements can provide significantly more loanable funds, enabling more investment activity to be carried out.

However, the experience of Malaysia is somewhat different given that reducing these requirements has been found to have undesirable consequences for private capital formation. Although in general one may expect an increase in reserve and liquidity requirements to be associated with credit rationing, this is not always the case given that reserve requirements may be used as a monetary tool to manage economic conditions, and therefore do not necessarily reflect the extent of financial repression. Following a surge in portfolio capital inflows in the 1980s and early 1990s, Malaysia increased the reserve requirement ratios significantly from 3.5% to 13.5% during the period 1986–96 in order to reduce the impact of monetary expansion associated with central bank purchases of foreign exchange (see, e.g., Reinhart & Reinhart, 1999). As our results have shown, these massive capital inflows have led to a significant increase in private investment. Hence, it is plausible for higher reserve requirements to be associated with more private capital formation, although the underlying reasons for this are not entirely clear.

## 7. CONCLUSIONS

Many developing countries have reformed their financial systems over the last few decades. While an increased level of financial integration has generally been observed across the world, how financial reform policies impact on private investment remains relatively unknown. Against this backdrop, this paper attempts to assess the effects of several types of financial sector policies, including directed credit programs, interest rate controls, and reserve and liquidity requirements, on the evolution of private investment. The private investment model is tested based on the experience of two fast growing developing economies whose rich histories in financial sector reforms provide ideal grounds for further analysis.

We examined the determinants of real private investment in an autoregressive distributed lag framework, paying particular attention to testing for a long-run cointegrating relationship between the variables under consideration. Employing the ARDL bounds and the ECM cointegration techniques, the empirical evidence showed a significant steady-state relationship between private investment and its determinants. After documenting these basic cointegration results, we derived the long-run estimates using several estimators. The key qualitative aspects of the results are fairly insensitive to the choice of estimators.

The results suggest that financial repressionist policies, in the form of significant directed credit controls, appear to have retarded private investment in both India and Malaysia. However, contrary to the financial liberalization thesis, interest rate restraints appear to be an effective device in stimulating private investment in both countries. While high reserve and liquidity requirements tend to have an undesirable effect on private investment in India, they are found to be favorable in Malaysia.

Overall, the results for India seem to provide more support for the financial liberalization thesis. On the contrary, the results for Malaysia tend to provide more support for

the financial repressionist ideology. As highlighted by Honohan and Stiglitz (2001), financial restraints are more likely to work well in environments with strong regulatory capacity. This is consistent with the observation that Malaysia has lower corruption and better law and order compared to India. In sum, our results tend to support the proposition that some form of financial restraint may stimulate private investment. The study highlights that since financial sector policies may have different effects on private investment, it is important to consider each component of financial sector reform separately in the analysis of investment behavior.

## NOTES

1. Although the Tobin's Q model is also widely adopted in the literature, this model is not suitable in the current context due to the lack of reliable stock market time series data for both India and Malaysia.

2. This is consistent with the assumption used by Nehru and Dhareshwar (1993). We have also used higher depreciation rates of 7% and 10%, but the results do not differ significantly.

3. Although priority loans are also extended to other sectors such as agriculture, manufacturing, small- and medium-sized enterprises, and individuals (for housing loans), the Malay community is the largest beneficiary group under this program. We focus only on the latter since data for target lending rates to other priority sectors are not available on a consistent basis.

4. Our measure of directed credit programs and the actual share of directed credit in total credit show a high correlation structure of 0.9. The results are insensitive to the choice of the measure but the former is preferred since it is an established approach in the literature (see, e.g., Demetriades and Luintel, 1997).

5. Although ideally one would prefer to use the standardized variables, the same set of interest dummy variables could not be considered here since different types of interest rate controls have been implemented in these two countries.

6. The level of relationship is estimated using an ARDL model with  $(k + 1)$  variables, where the orders of the model are chosen by searching across the  $(p + 1)^{k+1}$  ARDL models using the SBC criterion.

7. Our coefficients of real output have slightly larger magnitudes but they are broadly in line with those reported by Athukorala and Sen

(2002) for India (1.24) and Guimaraes and Unteroberdoerster (2006) for Malaysia (1.03), where figures in the parentheses indicate the coefficients.

8. Following Guncavdi *et al.* (1998) and Emran *et al.* (2007), we have also considered the ratio of user cost of capital to wages in the manufacturing sector as an alternative measure. However, the coefficients of this relative cost of capital measure are found to be statistically insignificant for both countries.

9. We have also considered the overall effect that financial sector policies have on private investment. This aggregate measure is obtained by the first principal component of  $DCP_t$ ,  $IRR_t$ , and  $RLR_t$ . However, the coefficient of this variable turns out to be statistically insignificant. Our mixed findings regarding the effects of financial policies on private investment indeed highlight the importance of considering each component of these policies separately in order to avoid aggregation bias.

10. Our estimation results may be subject to the presence of structural breaks. To address this concern, we have included the following in the regressions:  $d \times \ln GDP_t$ ,  $d \times \ln COC_t$ , and  $d \times \ln PUB_t$ , where  $d$  equals 1 from 1991 onwards for India and from 1978 onwards for Malaysia.  $d$  is set to be zero before the liberalization dates. All these interaction terms turn out to be statistically insignificant, providing some support for the view that our results are not distorted by the regime shifts that have occurred following the liberalization episodes.

11. This policy was aimed at expanding the corporate shareholding, employment, and education opportunities of the native Malays so that they would be able to improve their standards of living.

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