MONASH University
Business and Economics

Department of Economics

issn 1441-5429

Discussion paper 07/08

PRIVATE INVESTMENT AND FINANCIAL SECTOR POLICIES IN DEVELOPING COUNTRIES

James B. Ang♦

ABSTRACT:

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

Keywords: Private investment; financial sector policies; India; Malaysia.
JEL classification: E22; O16; O53

♦ Department of Economics, Monash University, 900 Dandenong Road, Caulfield East Vic 3145.

PRIVATE INVESTMENT AND FINANCIAL SECTOR POLICIES IN DEVELOPING COUNTRIES

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 systems (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 policies affects private investment provides some insight into the costs and benefits associated with each component of financial reforms.

This study is related to several strands of literature. One has explored the determinants of private investment for developing countries (e.g., Greene and Villanueva, 1991; Athukorala and Sen, 2002; Serven, 2003; Guimaraes and Unteroberdoerster, 2006; Kinkyo, 2007). Another strand has attempted to examine the impact of financial sector reforms on macroeconomic variables such as private saving, productivity of capital, or financial deepening in developing economies (e.g., Demetriades and Luintel, 1996b, 1997; Demetriades, Devereux and Luintel, 1998; Bandiera, Caprio, Honohan and Schiantarelli, 2000; Ang and McKibbin, 2007; Ang, 2008a, b). 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 a change in the cost of capital after liberalization. However, unlike theirs, our focus is on the role of financial sector policies in determining private investment.

This paper aims to complement the above studies, and 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 individual country. By analyzing case studies, the econometric findings of this project can be related to the prevailing institutional structure, and therefore inform academic as well as policy debate.

Several interesting features emerge from a comparative analysis of the economies of India and Malaysia. Firstly, both are high growth developing economies with British common law origins. Secondly, Malaysia was one of several economies severely hit by the 1997-98 Asian financial crisis while the economy of 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 decline has emanated predominantly from private investment whereas public investment has been significantly boosted as part of the crisis management program. However, it is not clear whether such government pump-priming efforts will be sustainable in the long run. Consequently, this disappointing trend in private investment has become a major concern in the economic policy debate in the crisis-affected Asian countries (see, e.g., Guimaraes and Unteroberdoerster, 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 in the financial system much later in 1991. Surprisingly, the financial liberalization path pursued in each country is remarkably similar despite their different starting points. Both countries have followed the conventional recommendations of a gradual reform approach for interest rate liberalization and reserve and liquidity requirements reduction. However, quite apart from these liberalization 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 financial sector development. In India, the ratio of private credit to GDP has increased from just 9 percent in 1960 to 45 percent in 2005. During the same period, this indicator of financial development increased significantly from just 7 percent to 117 percent in Malaysia. Finally, both India and Malaysia have a relatively good database by the standards of developing countries, providing an added incentive for the 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, by assuming that firms optimize their investment levels with respect to a

quadratic loss function. 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 analyses 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 in the last section.

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 percent of total central government revenue during the period 1980-85 (see Giovannini and De Melo, 1993). Furthermore, several interest rate controls were implemented in the late 1980s. A series of comprehensive financial sector reform policies were undertaken in 1991 as part of the broader economic reform. It was aimed at changing the entire orientation of India's financial development strategy from its position of a financially repressed system to that of a more open, market-type system. Since then, interest rates were gradually liberalized and reserve and liquidity requirements significantly reduced so that the market could 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 free allocation of resources.

Turning to Malaysia, the Central Bank of Malaysia has actively pursued interest rate liberalization, with the objective of developing a more market-driven financial system. The Bank followed a gradual approach in interest rate reforms, beginning in the 1970s by cautiously liberalizing interest rates. The major phase of interest rate 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 was taking place. In the 1980s, the Malaysian financial sector underwent a radical transformation along with

expansion in the economy. The upshot of this transformation 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 that year, at least 50 percent of total lending made by banks had to be advanced to the native Malay community. The requirement was reduced to 20 percent in the following year, and then adjusted upward to 30 percent in 1996. These financial sector policies, liberalization or repression, and the development that follows, can have a significant impact on the evolution of private investment activities in Malaysia.

3. Analytical Framework

3.1 The neoclassical investment model

The neoclassical investment model of Jorgenson (1963) postulates that the desired capital stock depends on the level of output and 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:

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

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, *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.[1]

3.2 Modifications and Extensions

(a) 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 (Sundararajan and Thakur, 1980; Blejer and Khan, 1984). 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

[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.

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 (Blejer and Khan, 1984; Aschauer, 1989). Therefore, the impact of public investment on private investment is theoretically indeterminate.

(b) 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 cost of capital. Under repressed financial systems, however, firms do not have access to 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 and 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, and results in more funds intermediated in the market (see, e.g., Ang and 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 component of the reform programs. 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 policies implemented. Analysis performed at the disaggregated level also helps identify an appropriate mix of financial liberalization and repressionist policies that is 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 both in terms of 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 the 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 markets, 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 (Villanueva and Mirakhor, 1990; McKinnon and Pill, 1997).

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 systems, 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 systems, which enable more investment activity to be carried out. In a similar vein, Honohan and Stiglitz (2001) argue that interest rate ceiling can effectively reduce reckless banking competition and allow for differential rewards of different 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 will be desirable to impose higher reserve requirements. Their model also shows that financial liberalization will not increase capital formation since savings in the formal sector translate into lower investment than savings in the informal sector due to the 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 of 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 the 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 policies on private investment is theoretically ambiguous. The above 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 price 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 (π_t^e) is constructed using contemporaneous percentage change in the GDP deflator, the depreciation rate (δ_t) is assumed to be constant at 10%, and P_t is the GDP deflator.

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 asset in government securities at below-market interest rates. For Malaysia, DCP_t is measured by the priority sector target lending rate of the native Malay community.[2] 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 follow the approach of Demetriades and Luintel (1996b, 1997) by using 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 percent, 21 to 40 percent, and more than 40 percent, respectively, of total bank loan.

To provide a measure of the interest rate restraints (IRR_t), we collect a number of interest rate repressionist policies imposed on the Indian and Malaysian financial systems. In principle, these interest rate policy variables can be used individually in the empirical specification in order to assess the effectiveness of each policy. However, this may give rise to some econometric problems due to the small samples used in this study. Moreover, the underlying policy variables may be highly correlated since the central banks may jointly impose some of these controls. One solution to these problems is to reduce the number of policy variables to just one summary measure, reflecting their joint influence (Demetriades and Luintel, 1996a; Demetriades, Devereux and Luintel, 1998).

Since we want to summarize the interest rate policy variables to obtain an overall measure of interest rate restraint, the method of principal component analysis seems to be a natural choice. It is a systematic and sophisticated way of examining the patterns of relationship among the variables, with the objective of summarizing the information content of several observed variables into a handful of representative principal components. The method involves computing the linear combinations of the original variables that capture their maximum variance. These components can capture a large proportion of the variance in the original variables and can therefore serve the same purpose as the full set of original variables, but in a much more succinct manner. The various principal components are uncorrelated to each other. Therefore, given its conciseness, this approach sufficiently deals with the problems of multicollinearity and over-parameterization.

[2] Although priority loans are also extended to other sectors such as agriculture, manufacturing, small and medium size 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 rate to other priority sectors are not available on a consistent basis.

Specifically, we collect six series of interest rate repressionist policies for each country. 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.

The results of the principal component analysis are presented in the Appendix. In Table A1, the eigenvalues for India indicate that the first principal component explains about 39.5 percent of the total variation, the second principal component explains another 28.7 percent and so on. The first principal component is computed as a linear combination of the six interest rate policy measures with weights given by the first eigenvector. In empirical applications it is quite common to use only the first principal component (see, e.g., Bandiera, Caprio, Honohan and Schiantarelli, 2000). However, in this case, the use of only the first principal component will leave 60.5 percent of the variations in the original series unaccounted for. As such, the absence of a large dominant principal component prompts us to consider all principal component series in order to obtain a more comprehensive measure of interest rate restraints. We use the percentages of variance as the weights to compute the index. The resulting indices are positively and significantly correlated with all underlying variables for both India and Malaysia, providing some evidence that they are reasonable indicators for the extent of interest rate restraints.[3]

5. Estimation Techniques

5.1. 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 Eq. (2). The actual level of private investment (I_t) differs from that of the desired level (I_t^*) due to the costs associated with

[3] We have also attempted to use alternative measures of interest rate restraints such as the first principal component and simple arithmetic mean. Interestingly, these three measures are strongly correlated with correlation coefficients of greater than 0.98. We therefore believe that the results will be robust to the use of any of these measures.

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:

$$\underset{I_t}{\text{Min}} \; E_t \left\{ \sum_{t=1}^{\infty} \delta^t \left[a(I_t - I_t^*)^2 + b(I_t - I_{t-1})^2 - 2c(I_t - I_{t-1})(I_t^* - I_{t-1}^*) \right] \mid \Omega_t \right\} \qquad (3)$$

where δ^t is the discount factor which takes a value between 0 and 1, and Ω_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 costs of rapidly changing the level of private investment. The last term is included due to Hendry and von Ungern-Sternberg (1981), who argue the penalty is reduced if firms move in the correct direction, i.e., towards 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 associated with investment decision making, conditional upon all available information Ω_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 leads to the following Euler condition:

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

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

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

So that:

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

After some manipulation, we obtain:

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

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

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

where *g* is the drift term. Then substituting Eq. (8) into Eq. (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 (ΔI_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 a developing country. Although equilibrium investment I_t^* is unobservable, Eq. (9) can be estimated by using the steady-state private investment equation in Eq. (2).

5.2 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 Eq. (9) with appropriate modifications, and replacing the long-run equilibrium level of private investment with the variables in Eq. (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, 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 (1998) 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. 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 Eq. (10): 1) an *F*-test for the joint significance of coefficients on lagged levels terms of the conditional ECM ($H_0 : \beta_0 = \beta_1 = ... = \beta_k = 0$), 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. The above ARDL model 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 (1998).

5.3 Alternative estimators

To provide for robustness checks, the private investment 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-different current terms to correct for endogeneity bias. Next, the short-run effects are removed by defining $\tilde{I}_t = I_t - \hat{\alpha}_0 - \sum_{j=1}^{k} \hat{\beta}_j DET_{j,t} - \sum_{i=0}^{p} \hat{\gamma}_i \Delta I_{t-i} - \sum_{i=0}^{p} \sum_{j=1}^{k} \hat{\delta}_j \Delta DET_{j,t-i}$. 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 full-modified unrestricted error-correction model (FM-UECM), thus adequately deals with omitted lag variables bias, and 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. This estimator is asymptotically equivalent to the maximum likelihood estimator of Johansen (1988). Based on 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 Eq. (11), except that appropriate lead terms are included to correct for potential endogeneity problems and small sample bias, and 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 $I_{t-1} - \alpha_0 - \beta_1 DET_{1,t-1} - ... - \beta_k DET_{k,t-1}$ 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

6.1. 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 Kwiatkowiski-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 available upon request, show that all variables appear to be either stationary, i.e. *I*(0), or integrated at order one, i.e., *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.

Table 1: Cointegration tests

	India		**Malaysia**	
	$p=1$	$p=2$	$p=1$	$p=2$
A. Test statistics				
ARDL bounds test (Pesaran, Shin and Smith 2001)	6.436***	4.142**	4.507***	4.080**
ECM test (Banerjee, Dolado and Mestre, 1998)	-5.894***	-4.761**	-4.968**	-4.603**
B. Model selection criteria				
AIC	-1.676	-1.576	-1.316	-1.684
SBC	-0.903	-0.535	-0.473	-0.548
C. Diagnostic checks				
χ^2_{NORMAL}	1.611 (0.446)	0.388 (0.823)	6.531** (0.038)	0.257 (0.879)
χ^2_{SERIAL}	2.971* (0.084)	1.782 (0.181)	9.681*** (0.002)	3.490* (0.062)

χ^2_{ARCH}	2.395 (0.121)	3.149 (0.175)	0.328 (0.567)	0.187 (0.665)
χ^2_{RESET}	2.015 (0.155)	3.246* (0.071)	5.707** (0.016)	0.007 (0.934)

Notes: *p* is the lag length. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin and Smith (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 10%, 5% and 1% critical value bounds for the *t*-test are (-2.57, -4.04), (-2.86, -4.38) and (-3.43, -4.99), respectively. χ^2_{NORMAL} refers to the Jarque-Bera statistic of the test for normal residuals, χ^2_{SERIAL} is the Breusch-Godfrey LM test statistic for no first order serial relationship, χ^2_{ARCH} is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and χ^2_{RESET} is the Ramsey's test statistic for no functional misspecification. Numbers in parentheses indicate *p*-values. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.

Next, to perform cointegration tests on the private investment equation, we regress the conditional error-correction model in Eq. (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, the 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 five percent significance level 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 five percent significance level. We therefore follow this lag structure in the remaining analyses.

6.2. 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. Specifically, the long-run elasticity of real private investment with respect to real output is found to be 1.329 for India. A similar elasticity value of 1.323 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.

An increase in the real user cost of capital leads to a contraction in real private investment in India, but such an effect is found to be insignificant in Malaysia. Specifically, a one percent increase in real user cost of capital will result in a 0.068 percent 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 these policy changes are likely to be permanent.

Table 2: ARDL estimate of the private investment equation

	India		**Malaysia**	
	Coefficient	*p*-value	Coefficient	*p*-value
A. The long-run relationship **(Dep. = $\ln I_t$)**				
Intercept	-4.546***	0.000	-8.792***	0.000
$\ln GDP_t$	1.329***	0.000	1.323***	0.000
$\ln COC_t$	-0.068***	0.008	0.009	0.767
$\ln PUB_t$	0.024	0.739	0.269***	0.000
DCP_t	-0.011	0.707	-0.021***	0.001
IRR_t	0.001*	0.066	0.001	0.244
RLR_t	-0.006**	0.010	0.045***	0.000
B. The short-run dynamic model **(Dep. =$\Delta \ln I_t$)**				
Intercept	-0.050	0.134	0.030	0.449
ECT_{t-1}	-0.312***	0.001	-0.787***	0.000
$\Delta \ln GDP_t$	1.001*	0.055	1.663***	0.000
$\Delta \ln COC_t$	-0.063**	0.010		
$\Delta \ln PUB_t$			0.520***	0.000
ΔDCP_t			-0.005***	0.009
ΔRLR_t			0.038***	0.000
$\Delta \ln COC_{t-1}$	-0.063**	0.011		
C. Diagnostic checks	**Test-statistic**	***p*-value**	**Test-statistic**	***p*-value**
χ^2_{NORMAL}	1.342	0.511	0.028	0.986

χ^2_{SERIAL}	0.076	0.782	0.509	0.475
χ^2_{ARCH}	0.024	0.875	1.703	0.191
χ^2_{RESET}	2.323	0.127	1.424	0.232

Notes: see previous table.

As regards public investment, the long-run elasticity is found to be significant only in Malaysia, with a long-run elasticity of 0.269. 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 one percentage point increase in the measure of the extent of directed credit programs decreases real private investment by about 0.02 percentage 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 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 significant effect on private investment in India, although its magnitude is negligible. To the extent that the interest rate restraints imposed on the Indian financial system have a mild effect in encouraging investment activities in the private sector, 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. However, this effect is found to be statistically insignificant in Malaysia, at the conventional levels of significance.

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 0.045 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.

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 on ECT_{t-1}, which measure the speed of adjustment back to the long-run equilibrium value, are statistically significant at the one percent level and correctly signed, i.e., 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 31 percent every year to restore equilibrium when there is a shock to the steady-state relationship. The speed of adjustment is found to be much faster in Malaysia, at a rate of about 79 percent 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.

6.3. 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 1 shows that the statistics generally lie within or on the five percent confidence interval bands, suggesting no structural instability in the residuals of the private investment equations for both India and Malaysia.

Figure 1: Plots of CUSUM and CUSUM of squares recursive residuals

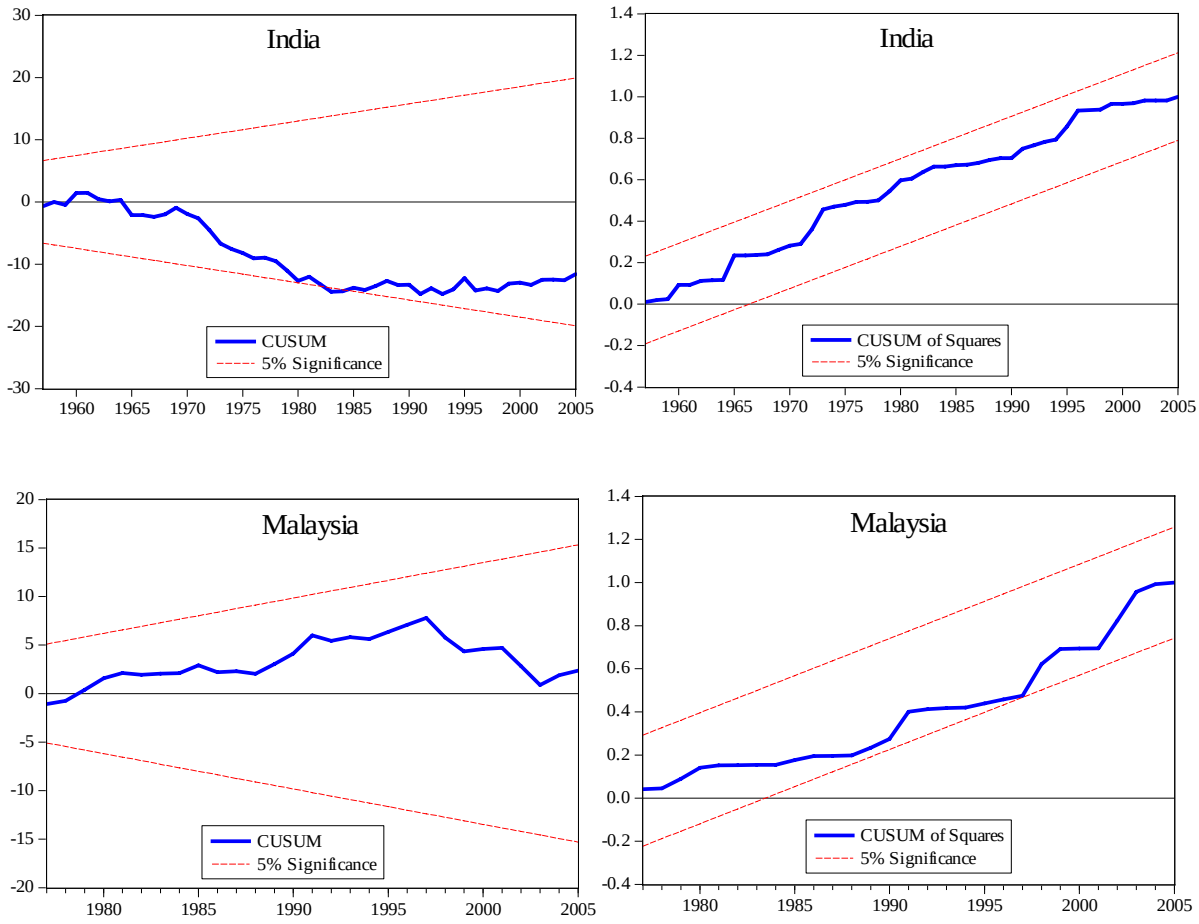
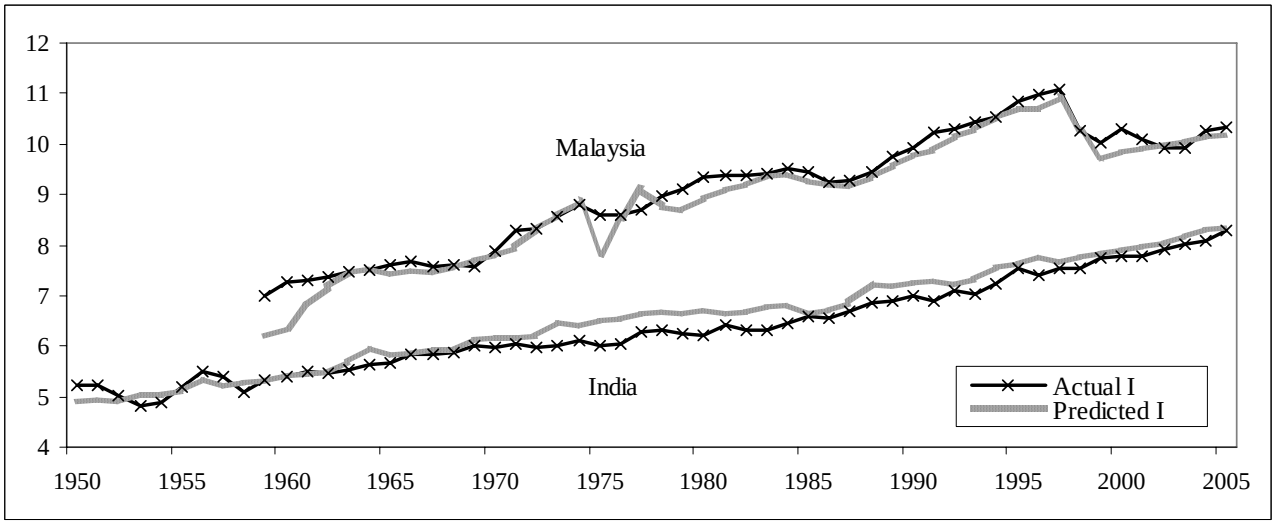


Figure 2 shows the actual and predicted levels of private investment. Predicted ln*It* is the long-run (static) equilibrium levels of private investment, which are constructed based on the long-run estimates reported in panel A of Table 2. It is evident that the predicted series track the actual series very closely over time for both models, suggesting that the private investment model is very well fitted.

Figure 2: Actual and predicted private investment series (in natural logarithms)



6.4. 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 five percent 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 estimated using ARDL, directed credit programs in India are likely to exert a negative effect on private investment. This result is more plausible given that much of the directed loans have gone to large farmers (Hanson, 2001) or increase capital intensity of production (Binswanger and Khandker, 1992), which are not necessary pro-growth in nature. In the case of Malaysia, the only disparity noted is that the index of interest rate restraints becomes statistically significant at the one percent level when the model is estimated using DOLS. The short-run results are, in general, in line with their long-run counterparts. The results are robust to a series of diagnostic checks reported in panel C.

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

	India		**Malaysia**	
	FM-UECM	*DOLS*	*FM-UECM*	*DOLS*
A. The long-run equilibrium level relationship **(Dep. = lnI_t)**				
Intercept	-4.708***	-5.096***	-7.571***	-8.675***
	(0.000)	(0.000)	(0.000)	(0.000)
lnGDP_t	1.324***	1.490**	1.235***	1.228***
	(0.000)	(0.000)	(0.000)	(0.000)
lnCOC_t	-0.075***	-0.046**	0.041	0.053
	(0.000)	(0.021)	(0.181)	(0.198)
lnPUB_t	0.068	-0.112**	0.235**	0.353***
	(0.284)	(0.033)	(0.015)	(0.000)
DCP_t	-0.041*	-0.043*	-0.009***	-0.019***
	(0.076)	(0.094)	(0.002)	(0.000)
IRR_t	0.001*	0.001**	0.001	0.002***
	(0.065)	(0.019)	(0.914)	(0.003)
RLR_t	-0.005**	-0.004**	0.044***	0.051***
	(0.012)	(0.017)	(0.000)	(0.000)
B. The short-run dynamic model **(Dep. =∆lnI_t)**				
Intercept	-0.052	-0.061*	-0.119***	-0.101***
	(0.124)	(0.087)	(0.002)	(0.007)
ECT_{t-1}	-0.293***	-0.313***	-0.712***	-0.806***
	(0.001)	(0.001)	(0.000)	(0.000)
∆lnGDP_t	0.961*	0.924*	1.771***	1.585***
	(0.066)	(0.076)	(0.000)	(0.002)
∆lnCOC_t	-0.064**	-0.060**		
	(0.010)	(0.015)		
∆lnPUB_t			0.433***	0.635***
			(0.001)	(0.000)
ΔDCP_t				-0.005**

				(0.034)
ΔRLR_t			0.039***	
			(0.000)	
$\Delta \ln COC_{t-1}$	-0.062**	-0.065***	-0.035*	-0.041***
	(0.013)	(0.009)	(0.067)	(0.000)
C. Diagnostic checks				
χ^2_{NORMAL}	1.875	0.642	0.219	1.142
	(0.391)	(0.725)	(0.896)	(0.564)
χ^2_{SERIAL}	0.013	0.053	1.008	0.090
	(0.906)	(0.817)	(0.315)	(0.763)
χ^2_{ARCH}	0.009	0.112	0.269	3.014
	(0.921)	(0.737)	(0.603)	(0.082)
χ^2_{RESET}	2.099	1.435	2.012	2.118
	(0.147)	(-0.231)	(0.156)	(0.145)

Notes: Numbers in parentheses indicate *p*-values.

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 remain 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 in which their rich histories in financial sector reforms provide an ideal ground for further analysis.

We examined the determinants of real private investment in an autoregressive distributed lag framework, paying particular attention to the 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 presence of directed credit controls, appear to have retarded private investment in both India and Malaysia. However, against 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, this effect is 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. This is probably due to the presence of a better quality of institutions in Malaysia. As highlighted by Honohan and Stiglitz (2001), financial restraints are more likely to work

well in environments with strong regulatory capacity. In sum, our results tend to support the proposition that some form of financial restraints may help stimulating 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 reforms separately in the analysis of investment behavior.

References

Ang, J.B. "Are Financial Sector Policies Effective in Deepening the Malaysian Financial System?" *Contemporary Economic Policy, forthcoming*, 2008a.

____. *Financial Development and Economic Growth in Malaysia*. London: Routledge, forthcoming, 2008b.

Ang, J.B. and McKibbin, W.J. "Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia." *Journal of Development Economics*, 2007, 84(1), pp. 215-233.

Aschauer, D.A. "Does Public Capital Crowd Out Private Capital?" *Journal of Monetary Economics*, 1989, 24(2), pp. 171-188.

Athukorala, P.-c. and Sen, K. *Saving, Investment, and Growth in India*. Oxford and New York: Oxford University Press, 2002.

Bandiera, O.; Caprio, G., Jr; Honohan, P. and Schiantarelli, F. "Does Financial Reform Raise or Reduce Saving?" *Review of Economics and Statistics*, 2000, 82(2), pp. 239-263.

Banerjee, A.; Dolado, J. and Mestre, R. "Error-correction Mechanism Tests for Cointegration in a Single-equation Framework." *Journal of Time Series Analysis*, 1998, 19(3), pp. 267-283.

Bencivenga, V.R. and Smith, B.D. "Deficits, Inflation, And The Banking System In Developing Countries: The Optimal Degree Of Financial Repression." *Oxford Economic Papers*, 1992, 44(4), pp. 767-790.

Bewley, R. "The Direct Estimation of the Equilibrium Response in a Linear Dynamic Model." *Economics Letters*, 1979, 3, pp. 357-361.

Binswanger, H. and Khandker, S. "The Impact of Formal Finance on the Rural Economy of India." *World Bank Policy Research Working Paper Series No. 949*, 1992.

Blejer, M.I. and Khan, M.S. "Government Policy and Private Investment in Developing Countries." *International Monetary Fund Staff Papers*, 1984, 31(2), pp. 379-403.

Callen, T.S.; Hall, S.G. and Henry, S.G.B. "Manufacturing Stocks: Expectations, risks and Co-integration." *Economic Journal*, 1990, 100(402), pp. 756-772.

Chibber, A. and Shafik, N. "Does Devaluation Hurt Private Investment? The Indonesian Case," Chibber, A., Dailami, M. and Shafik, N. (Ed), In: *Reviving Private Investment in Developing Countries.* Amsterdam: Elsevier Science Publishers, 1992, 99-124.

Courakis, A.S. "Constraints on Bank Choices and Financial Repression in Less Developed Countries." *Oxford Bulletin of Economics and Statistics*, 1984, 46(4), pp. 341-370.

Demetriades, P.O.; Devereux, M.P. and Luintel, K.B. "Productivity and Financial Sector Policies: Evidence from South East Asia." *Journal of Economic Behavior and Organization*, 1998, 35(1), pp. 61-82.

Demetriades, P.O. and Luintel, K.B. "Banking Sector Policies and Financial Development in Nepal." *Oxford Bulletin of Economics and Statistics*, 1996a, 58(2), pp. 355-372.

____. "Financial Development, Economic Growth and Banker Sector Controls: Evidence from India." *Economic Journal*, 1996b, 106(435), pp. 359-374.

____. "The Direct Costs of Financial Repression: Evidence from India." *Review of Economics and Statistics*, 1997, 79(2), pp. 311-320.

Emran, S.; Shilpi, F. and Alam, I. "Economic Liberalization and the Price Response of Aggregate Private Investment: Time Series Evidence from India." *Canadian Journal of Economics*, 2007, 40(3), pp. 914-934.

Fry, M.J. *Money, Interest, and Banking in Economic Development*. Baltimore and London: Johns Hopkins University Press, 1995.

Gennotte, G. and Pyle, D. "Capital Controls and Bank Risk." *Journal of Banking and Finance*, 1991, 15(4-5), pp. 805-824.

Giovannini, A. and De Melo, M. "Government Revenue from Financial Repression." *American Economic Review*, 1993, 83(4), pp. 953-963.

Greene, J. and Villanueva, D. "Private Investment in Developing Countries: An Empirical Analysis." *International Monetary Fund Staff Papers*, 1991, 38(1), pp. 33-58.

Guimaraes, R.F. and Unteroberdoerster, O. "What's Driving Private Investment in Malaysia?: Aggregate Trends and Firm-Level Evidence " *IMF Working Paper No. 06/190*, 2006.

Guncavdi, O.; Bleaney, M.F. and McKay, A. "Financial Liberalisation and Private Investment: Evidence from Turkey." *Journal of Development Economics*, 1998, 57(2), pp. 443-455.

Hall, R.E. and Jorgenson, D.W. "Tax Policy and Investment Behavior: Reply and Further Results." *American Economic Review*, 1969, 59(3), pp. 388-401.

Hanson, J.A. "Indonesia and India: Contrasting Approaches to Repression and Liberalization," Caprio, G., Honohan, P. and Stiglitz, J.E. (Ed), In: *Financial Liberalization: How Far, How Fast?* Cambridge: Cambridge University Press, 2001, 31-62.

Hellmann, T.F.; Murdock, K.C. and Stiglitz, J.E. "Deposit Mobilisation Through Financial Restraint," Hermes, N. and Lensink, R. (Ed), In: *Financial Development and Economic Growth: Theory and Experiences from Developing Countries.* London: Routledge, 1996, 219-246.

____. "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?" *American Economic Review*, 2000, 90(1), pp. 147-165.

Hendry, D.F. and von Ungern-Sternberg, T. "Liquidity and Inflation Effects on Consumers' Expenditure," Deaton, A.S. (Ed), In: *Essays in the Theory and Measurement of Consumer Behavior (In Honour of Sir Richard Stone).* Cambridge: Cambridge University Press, 1981, 237-260.

Honohan, P. and Stiglitz, J.E. "Robust Financial Restraint," Caprio, G., Honohan, P. and Stiglitz, J.E. (Ed), In: *Financial Liberalization: How Far, How Fast?* Cambridge: Cambridge University Press, 2001, 31-62.

Inder, B. "Estimating Long-Run Relationships in Economics: A Comparison of Different Approaches." *Journal of Econometrics*, 1993, 57(1-3), pp. 53-68.

Johansen, S. "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control*, 1988, 12(2/3), pp. 231-254.

Jorgenson, D.W. "Capital Theory and Investment Behavior." *American Economic Review Papers and Proceedings,*, 1963, 53(2), pp. 247-259.

Kim, D. and Santomero, A.M. "Risk in Banking and Capital Regulation." *Journal of Finance*, 1988, 43(8), pp. 1219-1233.

Kinkyo, T. "Explaining Korea's Lower Investment Levels After the Crisis." *World Development*, 2007, 35(7), pp. 1120-1133.

McKinnon, R.I. *Money and Capital in Economic Development*. Washington, D.C.: Brookings Institution, 1973.

McKinnon, R.I. and Pill, H. "Credible Economic Liberalizations and Overborrowing." *American Economic Review*, 1997, 87(2), pp. 189-193.

Nickell, S. "Error Correction, Partial Adjustment and All That: An Expository Note." *Oxford Bulletin of Economics and Statistics*, 1985, 47(2), pp. 119-129.

Odedokun, M.O. "International Evidence on the Effects of Directed Credit Programmes on Efficiency of Resource Allocation in Developing Countries: The Case of Development Bank Lendings." *Journal of Development Economics*, 1996, 48(2), pp. 449-460.

Pesaran, M.H. and Shin, Y. "An Autoregressive Distributed-Lag Modelling Approach to Cointegration Analysis," Strom, S. (Ed), In: *Econometrics and Economic Theory in the Twentieth Century: The Ragnar Frisch Centennial Symposium.* Cambridge: Cambridge University Press, 1998, 371-413.

Pesaran, M.H.; Shin, Y. and Smith, R.J. "Bounds Testing Approaches to the Analysis of Level Relationships." *Journal of Applied Econometrics*, 2001, 16(3), pp. 289-326.

Pradhan, B.K.; Ratha, D.K. and Sarma, A. "Complementarity between Public and Private Investment in India." *Journal of Development Economics*, 1990, 33(1), pp. 101-116.

Schmidt-Hebbel, K. and Muller, T. "Private Investment Under Macroeconomic Adjustment in Morocco," Chibber, A., Dailami, M. and Shafik, N. (Ed), In: *Reviving Private Investment in Developing Countries.* Amsterdam: Elsevier Science Publishers, 1992, 125-158.

Schwarz, A.M. "How Effective Are Directed Credit Policies in the United States? A Literature Survey." *The World Bank Policy Research Working Paper Series No.: 1019*, 1992.

Serven, L. "Real-Exchange-Rate Uncertainty and Private Investment in LDCs." *Review of Economics and Statistics*, 2003, 85(1), pp. 212-218.

Shafik, N. "Modeling Private Investment in Egypt." *Journal of Development Economics*, 1992, 39(2), pp. 263-277.

Shaw, E.S. *Financial Deepening in Economic Development*. New York: Oxford University Press, 1973.

Sims, C.A. "Output and Labour Input in Manufacturing." *Brookings Papers in Economic Activity*, 1974, 3, pp. 695-735.

Stiglitz, J.E. "The Role of the State in Financial Markets," Bruno, M. and Pleskovic, B. (Ed), 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.* Washington, D.C.: World Bank, 1994, 19-52.

Stiglitz, J.E. and Weiss, A. "Credit Rationing in Markets with Imperfect Information." *American Economic Review*, 1981, 71(3), pp. 393-410.

Stock, J.H. and Watson, M.W. "A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems." *Econometrica*, 1993, 61(4), pp. 783-820.

Sundararajan, V. and Thakur, S. "Public Investment, Crowding Out, and Growth: A Dynamic Model Applied to India and Korea." *International Monetary Fund Staff Papers*, 1980, 27(4), pp. 814-855.

Taylor, L. *Structuralist Macroeconomics: Applicable Models for the Third World*. New York: Basic Books, 1983.

van Wijnbergen, S. "Stagflationary Effects of Monetary Stabilization Policies: A Quantitative Analysis of South Korea." *Journal of Development Economics*, 1982, 10(2), pp. 133-169.

Villanueva, D. and Mirakhor, A. "Strategies for Financial Reforms: Interest Rate Policies, Stabilisation and Bank Supervision in Developing Countries." *International Monetary Fund Staff Papers*, 1990, 37(3), pp. 509-536.

Yaron, J.; Benjamin, M. and Charitonenko, S. "Promoting Efficient Rural Financial Intermediation." *World Bank Research Observer*, 1998, 13(2), pp. 147-170.

Appendix: Principal component analysis

Table A1: The interest rate restraints index for India

	Principal component					
	1	2	3	4	5	6
Eigenvalues	2.370	1.722	1.010	0.489	0.266	0.143
% of variance	0.395	0.287	0.168	0.081	0.044	0.024
Cumulative %	0.395	0.682	0.850	0.932	0.976	1.000
	Eigenvector					
Variable	1	2	3	4	5	6
FDR_t	-0.552	0.262	0.281	0.034	0.060	-0.737
DRC_t	-0.544	-0.173	-0.267	0.344	0.623	0.311
DRF_t	-0.416	-0.477	0.172	0.301	-0.672	0.167
FLR_t	-0.176	0.287	-0.860	-0.034	-0.362	-0.124
LRC_t	-0.151	-0.617	-0.169	-0.719	0.118	-0.194
LRF_t	-0.415	0.459	0.230	-0.522	-0.112	0.529

Notes: FDR_t = fixed deposit dummy, DRC_t = deposit rate ceiling dummy, DRF_t = deposit rate floor dummy, FLR_t = fixed lending dummy, LRC_t = lending rate ceiling, and LRF_t = lending rate floor.

Table A2: The interest rate restraints index for Malaysia

	Principal component					
	1	2	3	4	5	6
Eigenvalues	3.171	1.135	0.853	0.561	0.206	0.075
% of variance	0.528	0.189	0.142	0.093	0.034	0.012
Cumulative %	0.528	0.718	0.860	0.953	0.988	1.000
	Eigenvector					
Variable	1	2	3	4	5	6
PSR_t	-0.491	0.024	0.125	-0.570	0.249	-0.596
PIR_t	-0.360	0.485	-0.418	0.522	-0.231	-0.368
MIL_t	0.440	0.155	0.593	0.100	-0.414	-0.499
MAL_t	-0.295	0.631	0.542	0.030	0.186	0.431
MID_t	0.329	0.518	-0.384	-0.608	-0.303	0.124
MAD_t	0.491	0.273	-0.129	0.148	0.766	-0.243

Notes: PSR_t = maximum lending rate for priority sector, PIR_t = policy intervention rate, MIL_t = minimum lending rate, MAL_t = maximum lending rate, MID_t = minimum deposit rate, and MAD_t = maximum deposit rate.