What are the mechanisms linking financial development and economic growth in Malaysia?

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What are the mechanisms linking financial development and economic growth in Malaysia?

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Abstract

This paper estimates a six-equation model of financial development and economic growth for Malaysia to shed light on the mechanisms linking these two variables. The results indicate that financial development leads to higher output growth via promoting both private saving and private investment. The findings also provide some support for the hypothesis of endogenous financial development and growth models that finance leads to higher growth through improved efficiency of investment. There is evidence that repressionist financial policies, such as interest rate controls, high reserve requirements and directed credit programs, have contributed positively to financial development. However, other direct government interventions in the economy, such as resource allocation through the operation of a broad-based employee provident fund (EPF) scheme and various public investment programs, seem to have impacted negatively on economic development in Malaysia.

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1. Introduction

Every economy requires a sophisticated and efficient financial system to prosper since a healthy financial system is integral to the sound fundamentals of an economy. A more efficient financial system provides better financial services, and this enables an economy to increase its GDP growth rate. Conversely, a weakened financial system spills over unfavourably into the economy. An inadequately supervised financial system may be crisis-prone, with potentially devastating effects. The important role of financial intermediaries and financial markets therefore merits more attention from researchers and policy makers.

Empirical studies on the relationship between finance and growth have been dominated by cross-country studies until recently due to the lack of sufficient time series data for developing countries. These studies have consistently
demonstrated that financial development is an important determinant of economic growth. Although the findings of these studies provide a useful guide on the finance–growth relationship, it is difficult to see how the results can be generalized since such a causal link is largely determined by the nature and operation of the financial institutions and policies pursued in each country (Arestis and Demetriades, 1997; Demetriades and Andrianova, 2004). Against this backdrop, only one country is chosen here as a case study as opposed to the conventional broad comparative examination that involves a much larger sample.\(^2\)

It is interesting to take Malaysia as a case study for this subject for several reasons. Firstly, with rapid economic growth following the industrial transformation that took place in the 1970s and 1980s, Malaysia has evolved in recent years to be a leading country in the developing world. Accompanying this development, there has been a significant improvement in its financial system. While one may wonder how financial development and economic growth are related, little attention has been paid to understanding the evolutionary development process of Malaysia’s financial system. Secondly, Malaysia has a rich history of financial sector reform. Various financial restructuring programs that aim to achieve a better financial system have been launched since the 1970s (Ang, in press-a; Ang and McKibbin, 2007). However, there is little empirical evidence providing policy makers with the necessary information as to whether these reforms have had any impact on the financial system, and hence on economic growth. Thirdly, Malaysia has a relatively good database by the standard of developing countries. This provides an added incentive for the research. The availability of a set of sufficiently long time series data allows for a meaningful time series investigation.

Studies in this field have mainly focused on either testing whether financial development plays a positive role in stimulating economic growth or examining the direction of causality between these two variables. Notwithstanding the limitations of the existing econometric techniques that do not allow the issue of causality to be satisfactorily addressed, a large body of empirical evidence has overwhelmingly shown that financial development has a positive impact on economic growth. While this positive role of finance has become a stylized fact, little attention has been paid to examining the mechanisms that link these two variables. To this end, this paper is an attempt to fill the void. The present study seeks to provide some insight into how financial development and economic growth are related in the context of Malaysia. The central issue is how, and to what extent, improvement in Malaysia’s financial system contributes to the process of economic development. It is hoped that this analysis will add to our understanding of the evolutionary role of financial system, and the interacting mechanisms between financial development and economic growth.\(^3\)

The paper is divided into six sections. Section 2 discusses some conceptual issues in the finance and growth literature. An analytical framework linking financial development and economic growth is provided in Section 3. Section 4 sets out the econometric procedures adopted in this study. Section 5 provides and discusses the findings. Some policy simulations, under the counterfactual condition that financial liberalization is stable, are provided in Section 6. Finally, Section 7 concludes.

2. Conceptual issues

The important role of financial development in the process of economic development has long been recognized in the literature. Schumpeter (1911) contends that entrepreneurs require credit in order to finance the adoption of new production techniques. Banks are viewed as key agents in facilitating these financial intermediating activities and promoting economic development. Hence, well-developed financial systems can channel financial resources to the most productive use. The alternative explanation initiated by Robinsons (1952) suggests that financial development does not lead to higher economic growth. Instead, financial development responds passively to economic growth as a result of higher demand for financial services. When an economy expands, households and firms demand more financial services. In response to this increased demand, more financial institutions, financial products and services emerge, thereby leading to expansion of financial systems.

The notable early works on finance and development along the Schumpeterian lines include Gurley and Shaw (1955), Goldsmith (1969) and Hicks (1969). They argue that development of a financial system is crucially important

2. For the other individual country case studies, see, e.g., Demetriades and Luintel (1996), Thangavelu and Ang (2004), Ang (in press-b) and Ang and McKibbin (2007). These studies mainly focus on testing the Granger causal relationship between financial development and economic growth. See Ang (in press-c) for a detailed survey of these studies.
3. While testing the mechanisms that link financial development and economic growth is conducted at the aggregate level in the present study, as highlighted by one of the referees, it would also be interesting to perform the analysis at the industry-level using disaggregated data.
in stimulating economic growth. Under-developed financial systems retard economic growth. The policy implication of this view points to the importance of formulating policies aimed at expanding the financial system in order to foster growth. This includes creating more financial institutions, and providing a greater variety of financial products and services, etc., in order to generate a positive effect on the saving–investment process, and hence on economic growth. However, this view had little impact on development policy making in the early post-war decades, partly because it was not presented in a “formal” manner, and partly because of the dominant influence of the Keynesian “financial repressionist” ideology.

In the 1970s, the applicability of the Keynesian view to analyzing the role of financial intermediaries and financial markets in the development process was challenged by McKinnon (1973) and Shaw (1973). The McKinnon model, which was further developed and popularized by its followers (e.g., Fry, 1988; Kapur, 1976; Pagano, 1993), assumes that investment in a typical developing economy is mostly self-financed. Given its lumpy nature, investment cannot materialize unless sufficient saving is accumulated in the form of bank deposits. Such a complementary role between money and physical capital is termed the “complementarity hypothesis”. On the other hand, the “debt-intermediation” view presented by Shaw (1973) postulates that financial intermediaries promote investment and raise output growth through borrowing and lending. These two arguments suggest that an increased level of financial development, which can be the outcome of financial liberalization, will lead to higher output growth.

With the evolution in the growth literature in the 1980s, more complex types of financial development models incorporating financial institutions into endogenous growth models emerged in the early 1990s (see Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; Saint-Paul, 1992; King and Levine, 1993b; Pagano, 1993). Various techniques, such as externalities and quality ladders, were employed to model financial intermediation explicitly rather than taking it for granted as in the McKinnon–Shaw framework. These models support the finance-led argument by demonstrating that financial development reduces informational frictions and improves resource allocation efficiency.

Although the positive role of financial development is clear, it can also have a negative influence on economic growth. Kindleberger (1978) put forward that the instability of expectation and asset speculation regarding over-leveraged situations can have severe negative consequences for an economy. Psychological factors stimulate excessive speculative behaviour (mania) when some events change the economic circumstances. In the presence of a weak banking system, a snap in confidence (panic) can cause the economy to enter a crisis (crash). According to Minsky’s (1991) “financial instability hypothesis”, an economy naturally progresses from a robust financial structure to a fragile financial structure. Economic booms encourage the adoption of a riskier behaviour. This will transform the economy to a boom phase fuelled by speculative economic activities. Such an over-leveraged situation provides conditions for a crisis caused by events that induce firms to default on their loan repayments. Consequently, higher financial costs and lower income can both lead to higher delinquency rates. When bankruptcies kick in, the economy can enter a state of economic recession. On the empirical front, the results of Eichengreen and Arteta (2000), based on a sample of 75 emerging markets for the period 1975–1997, indicate that rapid domestic credit growth is one of the key determinants of emerging market banking crises. Using annual data for 34 countries from 1960 to 1999, Borio and Lowe (2002) show that sustained rapid credit growth, combined with large increases in asset prices, seem to increase the probability of an episode of financial instability.

In principle, an improvement in the financial systems can affect economic growth via two channels: the capital accumulation channel and the total factor productivity (TFP) channel. The first channel, also known as the quantitative channel, is rather straightforward. Economic growth depends on capital accumulation through both domestic and foreign capital investment. To mobilize savings and channel them to capital accumulation, an efficient financial system is essential. In this way, financial development and economic growth are linked. The TFP channel, which is referred to as the qualitative channel, suggests that an efficient financial system facilitates the adoption of modern technology to boost development of the knowledge- and technology-intensive industries, through the provision of efficient credit facilities and other financial services. Testing whether these two channels are operative in the Malaysian economy is the central focus of this paper.

3. Analytical framework

As noted earlier, there are good reasons to believe that financial development and economic growth may be strongly inter-related. Hence, it is natural to use a system approach in modelling the relationship between financial development and economic growth. The specification of a system of equations is an attempt to deal with the issues of endogeneity
bias discussed earlier. The use of this approach also allows the examination of a variety of channels that can impact on the relationship between finance and growth. It provides a key step towards a better understanding of the interactions between these two variables.

Six equations, i.e., financial development, private saving, private investment, foreign direct investment, saving–investment correlation, and aggregate output are used to form the basis of this model. The proposed model specification is a simple framework that provides some insight into the complex channels that link financial development and economic growth. Each equation is formulated based on a theoretical model, and augmented to take into account the relevant structural and institutional features of the Malaysian economy.

3.1. Financial development

As highlighted earlier, expansion of the financial system may be induced by higher per capita income due to increased demand for financial services. This is based on Robinsons (1952) hypothesis that more financial institutions, financial products and services will emerge in response to greater demand for financial services when an economy expands. As such, wealthier economies have a greater demand for financial services and are more able to afford a costly financial system. This implies that the level of real economy activity crucially affects financial development.

The McKinnon–Shaw framework suggests that interest rate controls, particularly interest rate ceilings, may distort the economy in several ways. First, it may discourage entrepreneurs from investing in high risk but potentially high-yielding investment projects. Second, financial intermediaries may become more risk averse and offer preferential lending to established borrowers. Third, borrowers who obtain their funds at relatively low cost may prefer to invest only in capital intensive projects. McKinnon (1973) and Shaw (1973) argue in favour of liberalizing the financial sector by way of removing interest rate controls and allowing the market to determine its own credit allocation in order to deepen the financial systems. However, some counter arguments suggest that liberalizing interest rates may not necessarily lead to higher financial development. For instance, with deposit insurance, the absence of interest rate control may result in overly risky lending behaviour among banks (Villanueva and Mirakhor, 1990; McKinnon and Pill, 1997). Stiglitz (1994) contends that interest rate restraints may lead to higher financial saving in the presence of good governance in the financial system. 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 increasing the depth of the financial systems. Hence, the theoretical impact of a change in interest rates on financial development is unclear.

It is widely recognized that financial liberalization is an integral part of financial development. The McKinnon–Shaw school of thought proposes that government restrictions on the operation of the financial system, such as an interest rate ceiling, directed credit programs and high reserve requirements, may hinder financial development. This may in turn affect the quality and quantity of investments and retard development in the financial systems. However, there is empirical evidence indicating that financial liberalization can induce destabilization in the financial systems and trigger financial crises (see Diaz-Alejandro, 1985; Villanueva and Mirakhor, 1990). For example, the implementation of financial liberalization programs by Latin American countries in the 1970s had resulted in a number of bank failures and other bankruptcies. Interest rate soared and the financial systems in these countries were severely undermined. Therefore, in principle, it appears that financial liberalization can either induce financial fragility or deepen the financial systems.

The empirical specification of the steady-state equation for financial development in Eq. (1) draws upon the theoretical considerations discussed above. $\alpha$’s are the long-run elasticities of financial development ($FD_t$) with respect to real output ($GDP_t$), real interest rates ($RI_t$) and the extent of financial liberalization ($FL_t$). $\alpha_1$ is expected to carry a positive sign where as the expected signs of $\alpha_2$ and $\alpha_3$ are ambiguous.

$$ FD_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 RI_t + \alpha_3 FL_t + \epsilon_t \quad (1) $$

The specification for the private saving function is derived using the Life Cycle model (henceforth, LCM) augmented with certain key macroeconomic features of Malaysia. According to the LCM, one of the key determinants
of saving is the growth rate of per capita income (Modigliani and Brumberg, 1954; Modigliani, 1966). As income grows, the life earnings and consumption of each successive age group will be larger than the preceding group. If each successive age group is aiming for a higher level of consumption in retirement, the aggregate saving of those working relative to those not earning income would increase. Therefore, saving will tend to rise with income growth.

The LCM focuses on income growth, with little attention paid to the role of income level. This is based on the assumption that households are forward looking, and therefore base their savings decision on lifetime income rather than current income. However, this assumption may not be applicable to a developing country like Malaysia. As Modigliani (1993) notes, the portion of population that lives at subsistence level may find it too burdensome to set aside additional resources now for future consumption. Therefore, for countries with low per capita income, saving tends to rise with the level of income. For this reason, both income growth and income level are taken into consideration in the analysis.

In the life cycle setting, it is necessary to take age structure into account. Individuals will have negative saving when they are young and when they are old, whereas positive saving occurs during their productive years. That is, saving follows a hump-shaped pattern over an individual’s lifetime. Hence, higher age dependency in the population tends to reduce saving. However, as highlighted in an important study by Horioka (1997), it is essential to segregate age dependency into young age dependency and old age dependency, since they each may have a different bearing on the behaviour of saving.

Another important determinant of saving implied by the LCM is real interest rates. Whether saving responds positively or negatively to real interest rates depends on the relative magnitude of the substitution and income effects. Higher interest rates may induce more saving due to the higher price of present consumption relative to the future price (substitution effects); but it may also reduce saving if the individual is a net lender (income effects). These two effects may offset each other and therefore the net impact of real interest rates on saving depends on the relative strength of these opposing forces.

A key limitation of the LCM is the assumption that individuals are able to make rational decisions in developing a lifetime plan of consumption and saving. However, in practice, many workers are unable to enter retirement with sufficient financial resources (Lesnoy and Leimer, 1985). In fact, this was the main reason for the introduction of the social security program — Employee Provident Fund (EPF) in Malaysia.4 The importance of social security on the behaviour of saving has been highlighted in an early study by Friedman (1957), and later formally incorporated into the analysis of the LCM by Feldstein (1974) and Munnell (1976). They argue that through the ability to provide income during retirement, the presence of a sound social security framework effectively reduces the amount of saving during the working years. This is because if savers perceive they will receive high pension benefits at the point of retirement, they will tend to reduce the amount saved during their working lives, weakening the precautionary motive for saving.

Although the rationale that higher social security benefits tend to lower the savings rate is clear, some counter-arguments have also been proposed in the literature. As Cagan (1965) argues, participation in a social security program has an educational effect, which increases the awareness of savers about the importance of saving for their old age. Similarly, Feldstein (1974) postulates that social security can increase saving by inducing early retirement. This expands the span of retirement years and therefore increases the need for more saving during the working life in order to achieve a targeted level of retirement income.

Financial development can induce more saving via two channels. First, the incentives to save may increase with the proliferation of financial instruments, which can satisfy the diverse needs and portfolio preference of various savers. Therefore, willingness to save may depend on the degree of sophistication of the financial system (Goldsmith, 1969; Park, 1994). The second argument is based on Shaw’s (1973) financial intermediation view, which postulates that the existence of a sophisticated financial system facilitates the intermediation between savers and investors. More intermediation between savers and investors enhances the incentives to save since an efficient financial system effectively reduces risk and information costs, which can increase net real returns of savers and positively affect saving.

The Ricardian Equivalence hypothesis of Barro (1974) proposes that an increase in government saving will have no effect on total saving, since it will be met by an equal reduction in private saving. That is, when the government runs a

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4 The EPF was set up in 1951, serving as a nation-wide old age retirement scheme for the employees. Under this scheme, both employees and employers are required to contribute to the provident fund to provide the employees retirement benefits. Contributors get back their contributions plus the accumulated returns at the point of retirement. Currently, the scheme requires a mandatory contribution of 12% on employees’ income by the employers and 11% by the employees.
budget deficit, the private sector will respond by saving more to offset this undesirable effect on future generations. Hence, any change in public saving will be fully offset by an equal change in private saving. Accordingly, the real private saving (PRS) equation can be formulated as:

$$PRS_t = \beta_0 + \beta_1 PGDP_t + \beta_2 RI_t + \beta_3 YAG_t + \beta_4 OAG_t + \beta_5 FD_t + \beta_6 PEN_t + \beta_7 PUB_t + u_t$$  (2)

The effects of per capita real private income (PGDP), financial development (FD), and old age dependency ratio (OAG) are expected to be positive whereas the impacts of young age dependency ratio (YAG), real exchange rate (RER), and real public saving (PUB) are assumed to be negative. How real interest rates (RI) and expected benefits of EPF saving (PEN) influence on real private saving cannot be determined a priori.

3.3. Private investment

The private investment function is derived from the neoclassical framework with appropriate modifications. The neoclassical model of investment, pioneered by Jorgenson (1963), postulates that output levels and the user cost of capital are the two key determinants of investment. In particular, private investment varies positively with output but negatively with the user cost of capital.

The neoclassical model of investment is based upon the restrictive assumption that capital markets are frictionless and finance is easily available. 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. Financial constraints are particularly important for a developing country like Malaysia, which has undertaken a series of financial liberalization programs aimed at reforming and deepening its financial sector.

Investment may be adversely affected by economic uncertainty (Villanueva and Mirakhor, 1990). If investments are irreversible, firms are more prone to delay or abandon investment projects in an uncertain economic environment. Postponing investment until the future becomes more certain may generate opportunity costs whereas forgoing an investment project results in a loss of initial outlays. As such, less capital accumulation will occur in a highly uncertain economic environment.

It is a widely accepted view that public investment may be complementary to private investment in developing countries through the provision of infrastructural support (Sundararajan and Thakur, 1980; Blejer and Khan, 1984). This can 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 (Blejer and Khan, 1984; Aschauer, 1989).

$$PRI_t = \chi_0 + \chi_1 GDP_t + \chi_2 COC_t + \chi_3 BC_t + \chi_4 UNC_t + \chi_5 PUB_t + \epsilon_t$$  (3)

The specification given in Eq. (3) provides a characterization of the relationship between private investment and its determinants. The parameters \(\chi_1, \chi_2, \ldots, \chi_5\) are the long-run elasticities of real private investment (PRI) with respect to real output (GDP), real user cost of capital (COC), real bank credit (BC), macroeconomic uncertainty (UNC), and real public investment (PUB), respectively. We expect \(\chi_1\) and \(\chi_2\) to be positive, \(\chi_3\) and \(\chi_4\) to be negative, but the sign of \(\chi_5\) is uncertain.

3.4. Foreign direct investment (FDI)

In the FDI literature, GDP growth (GRO), financial development (FD), trade openness (OPE), and real exchange rate (RER) have been identified as the key determinants of FDI inflows. Among them, the role of the host country’s growth prospect in attracting FDI is particularly important for a high-growth economy such as Malaysia. A rapidly growing economy provides better opportunities for profit-making compared to a retarded economy (Lim, 1983). The growth rate of an economy therefore resembles the level of attractiveness of the host country.

A more developed and efficient financial system is postulated to have a positive effect on FDI. The provision of more credit facilities allows firms to purchase new machines, adopt new technology, and hire better skilled managers.
and labours. The level of financial development also captures the agglomeration effect that relates to the concentration of business and professional services since foreign investors resort to domestic financial institutions to carry out financial transactions (Deichmann et al., 2003).

A country’s level of trade openness is another important factor determining FDI since most investment projects initiated by MNCs are often related to the tradable sector. Removing trade barriers, which would give rise to a higher degree of trade openness, is likely to have a positive influence on inward FDI (Fedderke and Romm, 2006). This aspect is of particular relevance to Malaysia since its economy has always maintained a relatively open foreign trade regime.

If informational imperfections present in the capital markets, a lower value of the domestic currency would lead to higher FDI inflows (Froot and Stein, 1991). This is because a depreciated currency value would result in higher relative wealth position of foreign investors and hence lower the relative cost of capital, allowing them to make a significantly larger investment in terms of the domestic currency. Eq. (4) provides the empirical specification of the FDI equation. Except for $\delta_4$, which is expected to have a negative sign, all parameters are expected to have positive signs.

$$F DI_t = \delta_0 + \delta_1 G RO_t + \delta_2 F D_t + \delta_3 O P E_t + \delta_4 R E R_t + \nu_t$$

(4)

3.5. The saving–investment correlation

The previous discussions have highlighted that financial development may affect both saving and investment decisions. An understanding of the correlation between saving and investment is crucial given that higher capital accumulation necessitates more saving, which can be mobilized domestically or obtained from foreign countries. The correlation provides some indication about the amount of domestic resources being translated into capital accumulation, and therefore evidence of whether financial development impacts on economic growth through the quantitative channel. Accordingly, the relationship between domestic saving, $(S/Y)_t$, and investment rates, $(I/Y)_t$, can be characterized as:

$$(I/Y)_t = \phi_0 + \phi_1 (S/Y)_t + \psi_t$$

(5)

3.6. Aggregate output

The growth model draws upon the standard neoclassical model, augmented with financial development. In this way, financial development is assumed to affect growth via the productivity channel. The rationale for this specification is simple: if financial development affects economic development solely through the factor accumulation channel, financial development should not be expected to appear significantly in the augmented neoclassical growth model, since it is already captured in physical capital stocks.

Capital stocks are decomposed into private and public capital stocks. The segregation of total capital stocks is important since private and public capital stocks may have different effects on output expansion, as highlighted by Aschauer (1989) and Holtz-Eakin (1994). Private capital stocks, which arise from investment in the private sector such as machinery and equipment, are likely to have a positive role to play in enhancing growth through the adoption of new technologies in the production process. Aschauer (1989) argues that public sector capital, such as infrastructure, may complement private sector capital and therefore contribute positively to output expansion. However, if the public sector is associated with waste and inefficiency, this may affect the quality of public infrastructure, thereby retarding output growth. Hence, how public capital stocks affect real output is ambiguous.

The above theoretical considerations lead to formulation of the empirical specification of the real output equation given as follows:

$$GDP_t = \pi_0 + \pi_1 PR K_t + \pi_2 PUK_t + \pi_3 LF_t + \pi_4 F D_t + \theta_t$$

(6)

where $\pi$’s are the parameters of the long-run elasticities of real output (GDP$_t$) with respect to real private capital stock (PRK$_t$), real public capital stock (PUK$_t$), labour force (LF$_t$) and financial development (FD$_t$). $\pi_1$ and $\pi_3$ are expected to be positive whereas $\pi_2$ is expected to be negative. The sign of $\pi_4$ is ambiguous due to the contradictory views of McKinnon–Shaw and Kindleberger–Minsky.
4. Econometric methodology

The objective of our empirical estimation is to provide estimates of the long-run relationship and the short-run dynamics for the above equations. The cointegration test draws upon the Autoregressive Distributed Lag (ARDL) bounds approach of Pesaran et al. (2001). Pesaran and Shin (1998) show 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 \( I(1) \). The ARDL model can be formulated as:

\[
\Delta X_t = a_0 + b_0 X_{t-1} + \sum_{j=1}^{k} b_j \text{DET}_{j,t-1} + \sum_{i=0}^{p} c_{oi} \Delta X_{t-i} + \sum_{i=0}^{p} \sum_{j=1}^{k} c_{ji} \text{DET}_{j,t-i} + \varepsilon_t
\]  

where \( p \) is the lag length and \( \text{DET}_i \), is a vector of \( k \) determinants of \( X_t \). Two separate statistics are employed to ‘bounds test’ for the existence of a long-run relationship in Eq. (7): 1) an \( F \)-test for the joint significance of coefficients on lagged levels terms \((H_0: b_0 = b_1 = \ldots = b_k = 0)\), and 2) a \( t \)-test for the significance of the coefficient associated with \( X_{t-1} \) \((H_0: b_0 = 0)\). 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 long-run estimates are derived using two estimators: the unrestricted error-correction model (UECM) and dynamic ordinary least squares (DOLS) estimator. The UECM approach of Inder (1993) involves estimating the long-run parameters by incorporating adequate dynamics into the specification to avoid omitted lagged variable bias, as shown in Eq. (8).

\[
X_t = d_0 + \sum_{j=1}^{k} d_j \text{DET}_{j,t} + \sum_{i=0}^{p} e_i \Delta X_{t-i} + \sum_{i=0}^{p} \sum_{j=1}^{k} f_{ji} \text{DET}_{j,t-i} + v_t
\]

Inder (1993) shows that in this framework, the problems of endogeneity bias are minimal and relatively unimportant in many situations. If endogeneity is a concern, an instrumental variable (IV) technique can be used to correct for simultaneity bias. To do this, we follow the approach of Bewley (1979) by using the first lags of the variables as instruments for the current differenced terms to obtain valid standard errors so that proper inferences can be drawn.

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) and has been shown to perform well in finite samples. This feature is particularly appealing given the small sample size used in the present study. Based on Monte Carlo evidence, Stock and Watson (1993) show that DOLS outperforms a number of alternative estimators of long-run parameters, including those proposed by Engle and Granger (1987), Johansen (1988), Phillips and Hansen (1990) and Phillips (1991). 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, as shown in Eq. (9). By doing so, it corrects for potential endogeneity problems and small sample bias, and provides estimates of the cointegrating vector which are asymptotically efficient.

\[
X_t = d_0 + \sum_{j=1}^{k} d_j \text{DET}_{j,t} + \sum_{i=-p}^{p} e_i \Delta X_{t-i} + \sum_{i=-p}^{p} \sum_{j=1}^{k} f_{ji} \text{DET}_{j,t-i} + v_t
\]

\(^5\) The Johansen VECM approach is not appropriate in this context since it focuses on cases in which the underlying variables are \( I(1) \). In the presence of a mix of \( I(0) \) and \( I(1) \) variables such as the present case, the implementation of this technique becomes more onerous. While such a system-based approach removes endogeneity bias, the results may be highly sensitive to the choice of lag length. Given the small sample used in this study, insufficient degrees of freedom to choose the optimal number of lags is a major concern for implementing this technique. The sample size constraint also renders other system-based estimators such as seemingly-unrelated regressions (SUR) inappropriate.
The long-run model for $X_t$ can be obtained from the reduced form solution of Eqs. (8) and (9) by setting all differenced terms of the regressors to be zero, i.e., $e_i = f_j = 0$, as shown in Eq. (10). Next, the error-correction term (ECT) can be obtained by taking $X_t - d_0 - d_1 \text{DET}_1 - d_2 \text{DET}_2 - \cdots - d_k \text{DET}_k$ 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. Hendry’s (1995) general-to-specific modelling 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.

$$X_t = d_0 + d_1 \text{DET}_{1,t} + d_2 \text{DET}_{2,t} + \cdots + d_k \text{DET}_{k,t}$$  \hspace{1cm} (10)

Data sources and discussion of variable construction are given in the Data Appendix. All the above specifications include two dummy variables to account for the impact of the global economic recession in 1985 and the 1997–98 Asian financial crisis. The private investment specification also takes into consideration of the racial riots in 1969. A step dummy and a slope dummy are used for the period 1998–2003 to account for the adoption of the capital control regime in the saving–investment correlation equation.

5. Results

Three unit root tests are used to assess the order of integration of the variables. The Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) test the null of a unit root against the alternative of stationarity, while the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests the null of stationarity against the alternative of a unit root. The results, which are available upon request, show that none of the variables appears to be integrated at an order higher than one, allowing legitimate use of the ARDL bounds procedure.

To perform the ARDL bounds test, a conditional ECM is estimated with one and two lags for each model. In view of a small sample, the optimal lag length is chosen by the Schwarz’s Bayesian Information Criterion (SBC). Table 1 gives the $F$- and $t$-statistics for the ARDL bounds test. Ascertaining the existence of a cointegrating relationship between the variables requires satisfying both the $F$- and the $t$-tests. The results indicate that the null hypothesis that there exists no long-run relationship in each equation is rejected at the 10% significance level.

Table 2A and B provide the results of the long-run estimates based on the UECM and DOLS procedures, respectively. The short-run estimates obtained by these two procedures are reported in Table 3A and B. In general, these two approaches give very similar results, suggesting that the estimated results are quite robust to different estimators. Based on the choice of the lag length reported in Table 1, the estimation begins with either one or two lags and the insignificant terms are systematically dropped. As is evident, most variables enter the long-run equations significantly at the 5% level. The signs and magnitudes of the coefficients appear reasonable.

6 The estimation has also considered the inclusion of a deterministic time trend in the specification, but in all cases the time trend appears to be statistically insignificance. This seems to suggest that including unnecessary trend term may result in a loss of power, as pointed out earlier by Doornik et al. (1998) and Hubrich et al. (2001).
The regression results for the short-run equations show several desirable statistical features. The coefficients on ECT, which measures the speed of adjustment back to the long-run equilibrium value, are statistically significant at the 1% level and correctly signed, i.e., negative, implying an error-correction mechanism exists in all models. In all cases, the speed of adjustment suggests the economy takes less than 2.5 years to achieve long-run equilibrium whenever there is a deviation from the long-run steady state. Most of the regression specifications fit remarkably well and pass the diagnostic tests against non-normal residuals, serial correlation, heteroskedasticity, and autoregressive conditional heteroskedasticity, at the 5% level of significance. Structural stability of the models is examined using the CUSUM and CUSUM of squares tests on the recursive residuals. In all equations, the test statistics are generally within the 5% confidence interval band, suggesting that the estimated equations are somewhat stable over the sample period. The actual and predicted series of each equation are also compared. In all cases, the predicted series track the actual series very closely over time.7

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Since we are mainly interested in how the variables are related in the long-run, the remaining discussion focuses on the results based on the long-run estimates. The results in the financial development equation show that real output and real interest rates positively affect the level of financial development. However, an increase in the extent of financial liberalization seems to be harmful for development of the Malaysian financial system.

The next four equations provide useful insight into testing the validity of the capital accumulation channel. The findings indicate that both private saving and FDI depend positively on financial development. Similarly, the results from the private investment equation suggest that investment decisions in the private sector are stimulated by an increase in bank credit. Clearly, these findings have established that savings behaviour and investment decision are critically influenced by the level of financial development. Finally, the results reported in the saving–investment correlation equation reveal that domestic saving and investment rates are moving together closely over time. Thus, it can be inferred that the capital accumulation channel, through which financial development can impact on economic growth, is present for the Malaysian experience.

In the aggregate output equation, a neoclassical growth model was adopted to shed some light on whether financial development leads to output expansion through raising efficiency gains. The results show that financial development has a great potential role to play in stimulating growth by facilitating the adoption of new technology, providing some support for the validity of the TFP channel. The results also suggest that private capital stocks exert a positive impact on output expansion, a finding confirming the presence of the capital accumulation channel found earlier. Therefore, the empirical analyses presented above have provided evidence that both the quantitative and qualitative channels are operative in Malaysia.

In addition, the results also highlight several important points, which are summarized below. Firstly, on the whole, the results are in line with the arguments put forward by Schumpeter (1911) that financial development leads to higher economic growth by providing entrepreneurs credit for the adoption of new production techniques. The evidence is also

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7 The results of CUSUM and the comparison of actual and predicted series are not reported here to conserve space. They are available upon request.
### A: Short-run dynamics of the model estimated by UECM

**Financial development:**

\[ \Delta F_{D,t} = 0.044^{**} - 0.447E_{CT,t}^{**} - 0.366F_{L,t}^{**} - 0.010R_{I,t-1} \]

\[ \chi_2^{\text{normal}}(2) = 2.378; \chi_2^{\text{serial}}(1) = 0.223; \chi_2^{\text{arch}}(1) = 1.273; \chi_2^{\text{white}} = 5.076 \]

**Private saving:**

\[ \Delta P_{R,t} = -0.011 - 0.825E_{CT,t}^{**} + 0.011(D_{I,t}^{**} - 6.846Y_{AG,t}^{**} - 6.846D_{OAG,t}^{**} - 1.798D_{PEN,t}^{**} - 0.09D_{PUS,t}^{**} + 7.75D_{YAG,t}^{**} - 63.992) \]

\[ \chi_2^{\text{normal}}(2) = 0.797; \chi_2^{\text{serial}}(1) = 0.858; \chi_2^{\text{arch}}(1) = 0.297; \chi_2^{\text{white}} = 16.519 \]

**Private investment:**

\[ \Delta P_{I,t} = 0.022 - 0.429E_{CT,t}^{**} + 4.478D_{GDP,t}^{**} + 0.236D_{BC,t}^{**} + 0.015D_{UNC,t}^{**} - 7.511D_{GDP,t}^{**} - 0.499D_{BC,t}^{**} - 0.498D_{COC,t}^{**} - 0.259D_{BC,t}^{**} \]

\[ \chi_2^{\text{normal}}(2) = 1.076; \chi_2^{\text{serial}}(1) = 1.205; \chi_2^{\text{arch}}(1) = 4.415; \chi_2^{\text{white}} = 16.382 \]

**Foreign direct investment:**

\[ \Delta F_{D,t} = 0.011 - 0.796E_{CT,t}^{**} + 2.208D_{OE,t}^{**} + 0.056D_{GRO,t}^{**} - 0.047D_{GRO,t}^{**} \]

\[ \chi_2^{\text{normal}}(2) = 2.265; \chi_2^{\text{serial}}(1) = 3.603; \chi_2^{\text{arch}}(1) = 3.947; \chi_2^{\text{white}} = 17.119 \]

**Saving–investment correlation:**

\[ (I/Y, I/Y) = -0.002 - 0.461E_{CT,t}^{**} + 0.269\Delta(S/Y)_{0.03} + 0.704\Delta(D_{BC,t})^{**} + 0.360\Delta(I/Y)_{t-2}^{**} - 0.281\Delta(I/Y)_{t-1}^{**} + 0.361\Delta(D_{BC,t})^{**} + 0.259\Delta(S/Y)_{0.03}^{**} + 0.047\Delta(D_{BC,t})^{**} + 0.498\Delta(D_{BC,t})^{**} \]

\[ \chi_2^{\text{normal}}(2) = 0.575; \chi_2^{\text{serial}}(1) = 0.454; \chi_2^{\text{arch}}(1) = 1.237; \chi_2^{\text{white}} = 10.109 \]

**Aggregate output:**

\[ \Delta GDP = -0.044 - 0.661E_{CT,t}^{**} + 0.817\Delta PRK^{**} + 0.691\Delta PUK^{**} + 0.049\Delta F_{D,t} - 0.489\Delta PRK^{**} + 0.632\Delta PUK^{**} \]

\[ \chi_2^{\text{normal}}(2) = 4.963; \chi_2^{\text{serial}}(1) = 0.537; \chi_2^{\text{arch}}(1) = 3.555; \chi_2^{\text{white}} = 14.046 \]

### B: Short-run dynamics of the model estimated by DOLS

**Financial development:**

\[ \Delta F_{D,t} = 0.013 - 0.445E_{CT,t}^{**} - 0.384F_{L,t}^{**} - 0.011D_{RL,t} \]

\[ \chi_2^{\text{normal}}(2) = 2.539; \chi_2^{\text{serial}}(2) = 1.071; \chi_2^{\text{arch}}(1) = 0.015; \chi_2^{\text{white}} = 5.451 \]

**Private saving:**

\[ \Delta P_{R,t} = 0.026 - 0.838E_{CT,t}^{**} + 0.010D_{RL,t} - 7.318\Delta(Y_{AG,t}^{**} - 54.992\Delta OAG^{**} - 1.721D_{PEN,t}^{**} - 0.095D_{PUS,t}^{**} + 7.867\Delta Y_{AG,t}^{**} - 65.909\Delta OAG^{**} \]

\[ \chi_2^{\text{normal}}(2) = 0.125; \chi_2^{\text{serial}}(1) = 0.231; \chi_2^{\text{arch}}(1) = 0.721; \chi_2^{\text{white}} = 14.891 \]

**Private investment:**

\[ \Delta P_{I,t} = 0.114 - 0.468E_{CT,t}^{**} + 4.501\Delta GDP^{**} + 0.264\Delta BC^{**} - 0.015D_{UNC,t}^{**} + 2.561\Delta GDP^{**} - 0.566\Delta BC^{**} - 0.529\Delta COC^{**} - 0.70^{**} \]

\[ \chi_2^{\text{normal}}(2) = 3.758; \chi_2^{\text{serial}}(1) = 1.314; \chi_2^{\text{arch}}(1) = 4.601; \chi_2^{\text{white}} = 10.066 \]

**Foreign direct investment:**

\[ \Delta F_{D,t} = 0.001 - 0.602E_{CT,t}^{**} + 2.227\Delta OPE^{**} - 0.028D_{GRO,t}^{**} \]

\[ \chi_2^{\text{normal}}(2) = 75.123; \chi_2^{\text{serial}}(1) = 1.289; \chi_2^{\text{arch}}(1) = 1.497; \chi_2^{\text{white}} = 4.434 \]

**Saving–investment correlation:**

\[ (I/Y, I/Y) = -0.008 - 0.381E_{CT,t}^{**} + 0.677\Delta(D_{BC,t})_{0.03} + (S/Y)_{t-1}^{**} + 0.253\Delta(I/Y)_{t-1}^{**} + 0.238\Delta(I/Y)_{t-2}^{**} - 0.238\Delta(I/Y)_{t-2}^{**} - 0.471D_{BC,t} - 0.259\Delta(S/Y)_{0.03}^{**} \]

\[ \chi_2^{\text{normal}}(2) = 1.042; \chi_2^{\text{serial}}(1) = 0.256; \chi_2^{\text{arch}}(1) = 1.790; \chi_2^{\text{white}} = 5.723 \]

**Aggregate output:**

\[ \Delta GDP = -0.027 - 0.614E_{CT,t}^{**} + 0.807\Delta PRK^{**} - 0.715\Delta PUK^{**} + 0.035\Delta F_{D,t} - 0.489\Delta PRK^{**} + 0.619\Delta PUK^{**} \]

\[ \chi_2^{\text{normal}}(2) = 4.141; \chi_2^{\text{serial}}(1) = 0.009; \chi_2^{\text{arch}}(1) = 4.243; \chi_2^{\text{white}} = 13.289 \]

Notes: The regressions for the short-run dynamic models are based on a conditional ECM. \( \chi_2^{\text{normal}}(2) \) refers to the Jarque–Bera statistic of the test for normal residuals, \( \chi_2^{\text{serial}}(1) \) and \( \chi_2^{\text{arch}}(2) \) are the Breusch–Godfrey LM test statistics for no first and second order serial correlation, respectively, and \( \chi_2^{\text{white}} \) is the Engle’s test statistic for no autoregressive conditional heteroskedasticity, and \( \chi_2^{\text{white}} \) denotes the White’s test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.
consistent with the view of Gurley and Shaw (1955), Goldsmith (1969) and Hicks (1969) that financial development stimulates economic growth through increasing financial intermediating activities.

Secondly, the results also lend some support to Robinsons (1952) view that economic development leads to an improvement in the financial system. These two points suggest that financial development and economic growth in Malaysia show a bi-directional causality pattern, providing some support for our argument to adopt a system approach in modelling the finance–growth relationship. The results also support the endogenous financial development and growth theory, which postulates a feedback relationship in the finance–growth nexus.

Thirdly, the results do not provide a full support for the McKinnon–Shaw financial liberalization thesis. On the one hand, real interest rates have a positive impact on development of the financial system, suggesting that the elimination of interest rate controls may promote financial development. On the other hand, when considering the joint influence of all financial sector policies (including interest rate controls, reserve and liquidity requirements, and directed credit programs), financial liberalization appears to have a negative effect on financial development. Hence, the improvement in the Malaysian financial sector does not appear to have been retarded by the repressionist policies imposed on the financial system. This may be due to the presence of a sound institutional framework in Malaysia, which has enabled the repressionist policies to be carried out effectively, and thereby exerts a favourable effect on the financial system.

Fourthly, it appears that public sector investment is not complementary to private sector investment. Instead, public investment is found to have a crowding out effect on private investment. In line with this finding, the results in the aggregate output equation highlight that capital accumulation in the public sector appears to have an undesirable effect on output expansion. Hence, the results seem to imply that the public sector in Malaysia has a limited role to play in stimulating private sector investment and boosting economic growth. This may be partly due to the introduction of the New Economic Policy (NEP) in 1970, which has resulted in much resource being allocated to the less efficient sectors that do not generate the most productive gains.8

Fifthly, Malaysia’s saving rate has been very high. This high saving record is partly due to the presence of a forced saving scheme in the form of a broad-based EPF, which constitutes a significant proportion of the total saving. Such a forced saving scheme involves the shifting of a large amount of funds from the private sector to the public sector. Given that the public sector is less efficient, this implies that EPF saving may have an adverse impact on economic growth.

Finally, Asian financial crisis is found to be irrelevant in the evolution of financial sector development, the saving and investment decision making process in the private sector, as well as the production of aggregate output.

6. Policy simulations

An interesting finding emerging from this analysis is that financial liberalization has a negative impact on financial sector development, implying that economic growth would be retarded if financial restraints imposed on the financial

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8 In response to the May 1969 riot, the NEP was instituted in 1970 to improve inter-ethnic relations through the eradication of poverty. Specifically, this twenty-year program aimed to expand the corporate shareholding, employment and education opportunities of the native Malays so they would be able to improve their standard of living. The NEP then became the key reference for the formulation of economic development policies, remaining in place for the next two decades and beyond.
system are relaxed. As shown in Fig. 1, financial liberalization has been quite stable prior to 1970. A lesser extent of financial liberalization (or greater financial repression) is observed from 1971 onwards, with the introduction of various financial sector policies. Therefore, we simulate the model under the counterfactual condition that a stable financial liberalization has continued to exist after 1970.

The simulation exercise compares a baseline simulation for the model using actual values of the financial liberalization index with the counterfactual simulation which assumes that the financial liberalization index follows a steady path after 1970. A fluctuation of less than 2.5% around the 1970 value is assumed for the counterfactual values after 1970. Fig. 2 shows that, on average, the growth rate of GDP associated with the stable financial liberalization path is lower than the level associated with the actual path. With stable financial liberalization, average growth rate is reduced by about 0.2%. Both UECM and DOLS procedures yield very similar results. It can also be seen that a stable financial liberalization path is associated with higher growth volatility, particularly during the post crisis period. Hence, the results seem to imply that some extent of financial repression helps promote stable economic growth in Malaysia.

7. Concluding remarks

This study adopts an in-depth case study approach to address the key issues in the financial development literature in order to inform appropriate analytical as well as policy debates. It is motivated by the concern that the results from cross-country studies, while useful in detecting general empirical regularities for further analysis, are unable to capture and account for the complexity of the financial environments and economic histories of each individual country.

The results show that financial development has a significant positive impact on economic growth in Malaysia via both the quantitative and qualitative channels. A key policy implication that emerges from the results is that it is critical for the government to develop the financial sector since financial deepening facilitates mobilization of saving, private capital formation, and long-term economic growth. A sound financial system instills confidence among savers so that resources can be effectively mobilized to increase productivity in the economy. To this end, a credible and reliable support system is indispensable to ensure the smooth-functioning of the financial system. The results also highlight that the financial constraints imposed on the Malaysian financial system seem to have helped deepening the financial system. Since the success of financial sector policies may depend on the effectiveness of the institutions that implement them, it is critical to ensure that sound institutional quality is always in place.

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See Ang and McKibbin (2007) for more description of the financial sector policies imposed on the Malaysian financial system.
Appendix A. Data Appendix

Annual data for the period 1960–2003 are used in the estimation. The data have been collected from various sources. Most data are directly obtained or compiled from domestic sources, including Economic Reports of the Ministry of Finance Malaysia, Yearbook of Statistics of the Department of Statistics Malaysia, Annual Reports of Bank Negara Malaysia (Central Bank of Malaysia, henceforth BNM), Money and Banking in Malaysia (1994) of BNM, Quarterly Bulletin of BNM and Monthly Statistical Bulletin of BNM. Some data series are also obtained from the international sources, such as World Development Indicators (2005) and International Financial Statistics (2005). Some of the data used in this study are not directly observable from the available sources. For instance, private saving, macroeconomic uncertainty, user costs of capital, etc., can not be directly obtained from the above-mentioned sources. In these cases, the data are derived by proxies using the appropriate conversion procedures. Except for real interest rates, GDP growth rate and the user cost of capital, where some of the observations are in negative values, all variables are expressed in natural logarithms in the estimation.

Following the standard practice in the literature, financial development (FD) is defined as the ratio of bank credit to the private sector to GDP (see, e.g., King and Levine, 1993a; Thangavelu and Ang, 2004; Ang and McKibbin, 2007). We use the method of principal component analysis to provide a summary measure of financial liberalization (FL). Nine series are collected for this purpose. Six are interest rate controls, including 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. These policy controls are translated into dummy variables, which take the value of 1 if a control is present and 0 otherwise. The remaining three policies are directed credit programs, statutory reserve ratio, and liquidity ratio, measured in percentages. Real interest rate (RI) is defined as the 12-month commercial banks deposit interest rate minus the current inflation rate.

Malaysia does not have directly estimated saving data. Public saving in this study (PUB) refers to total public sector current surpluses or deficits, or government revenue minus operating expenditure plus non-financial public enterprise surpluses. Private saving (PRS) is derived by taking gross national saving (GNS) minus PUB. These saving variables are measured in real terms using the GDP deflator. Young dependency ratio (YAG) is population with ages 0–14 to working-age population with ages 15–64, whereas old age dependency ratio (OAG) is defined as population with ages 65 and above over the working population age. The cumulative contributions of employee provident funds relative to income are used to measure the expected benefit of pension saving (PEN).

Private investment (PRI) and public investment (PUB) are measured by gross fixed private capital formation and gross fixed public capital formation, respectively. They are expressed in real terms using gross capital formation deflator. The measure of the user costs of capital (COC) considers the price of capital input (measured by the deflator of gross capital formation), the financing cost of capital good (proxied by commercial banks’ average lending rates), the inflation rate, the rate of depreciation (assumed to be constant at 5%), and the rate of corporate income taxes. The availability of bank credit (BC) is measured by changes in commercial bank lending to the private sector in real terms. The measure of macroeconomic uncertainty (UNC) is obtained by taking the three-year moving average deviation of the change in output between two periods.

FDI, represents the net inflows of investment to acquire a lasting interest in an enterprise operating in the Malaysian economy. It is expressed in 1987 prices using the gross fixed capital formation deflator. GRO, is the annual growth rate of GDP. Trade openness (OPE) is defined as the sum of exports and imports over GDP. The real exchange rate (RER) is defined as NER × Pd/Pf, where NER, is domestic currency per U.S. dollar, Pf is the foreign price level (proxied by the U.S. GDP deflator), and Pd is the domestic price level (measured by domestic GDP deflator).

The initial capital stocks are provided by Department of Statistics (1965, p.16), and the remaining capital stocks (Kt) are computed using the standard perpetual inventory model by assuming the depreciation rate to be 5%. Private capital stocks (PRK) and public capital stocks (PUK) are obtained by using the average shares of private and public fixed capital formation in total fixed capital formation, over the period 1960–2003, as the basis of segregation. Labour force (LF) is defined as all individuals who are willing to supply labour for the production of goods and services.

References