Does Credit Expansion Matter for Growth?

What the Data Show

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Abstract

This paper analyses the relationship between expansion of domestic credit to private sector relative to GDP and growth for a sample of 65 less developed countries over a long period, 1980-2006. Using causality tests at various lag-orders we find a strong evidence of mutual causation. We have used alternative dynamic panel data models such as mean group, pooled mean group and dynamic fixed effect. Hausman test suggests dynamic fixed effect model. While the mean group model suggests no relationship in either direction, the other two models show two opposite long-term relationships: credit-to-growth relationship is negative whereas growth-to-credit link is positive.

Key words: financial development, growth, dynamic panel data analysis

JEL Codes: O16, O50, G20, E44

I. Introduction

A developed financial sector is often considered to be a pre-requisite for economic development. Following the discussion of the relationship between money capitalists and industrial capitalists by Karl Marx (Capital Vol. III), Hilferding (1910) examined how banks became important suppliers of credit. He argued that as bank credit increasingly consisted of financing investment projects, banks started to develop a growing interest in the long-term health of industrial borrowers (Schaberg, 1999).

Even before Marx, 'the growth-enhancing view of financial intermediation' was stressed by Hamilton (in 1781), as Levine *et al* (2000, p.35) pointed out. Levine (1997) and Levine *et al* (2000) mentioned the 1873-work of W. Bagehot who stressed the role of financial system in 'igniting industrialization in England through mobilisation of capital'.

In the early last century, we find Schumpeter (1911) to emphasize a positive role for financial services in promoting growth and development. He argued that the services provided by financial intermediaries such as mobilisation of savings, evaluation of projects, management of risks and facilitation of transactions are essential for technological innovation and economic development. The work of Gerschenkron (1962) supported the standpoint of Schumpeter (1911); he examined European industrialization from the mid-19th century to World War I and observed that financial intermediaries played a great role in economic development.

Many economists, however, do not believe that the finance-growth relationship is important, as Levine (1997) commented in the survey of literature in this field: the collection of essays by the 'pioneers in development economics' (in Meier and Seers, 1984) does not mention finance; Stern's (1989) review of development economics does not discuss the financial system even in a section that lists omitted topics; one of the proponents of new growth theory, Lucas (1988) asserts that economists 'badly over-stress' the role of financial factors in economic growth.

In this perspective our study seeks to analyze the current experiences of less developed countries (by which we mean non-OECD countries including Korea and Mexico, excluding Israel and the transitional countries of East Europe), hereafter LDCs. We are concerned with the existence of a meaningful relationship between financial development and growth: the existence of a stable path from a short-run relationship to a long-run relationship. Our contribution to the literature will be to throw a new light to the finance-growth link through a meticulous examination of the short-run and long-run experiences of a large number of individual countries constituting the panel over a long-period (without any missing data) and an aggregation of the country cases through the alternative assumptions concerning the short-run and long-term relationships and the adjustment process from the short-run to the long-run.

In the next section (Section II) we shall discuss in brief some major works in this field and on the basis of this brief survey we shall identify our research questions. Finally in Section III we shall present our findings along with our concluding comments.

II. Financial Development and Growth

Finance-Growth Link: Is it a chicken-egg problem?

Does chicken (say, financial development) precede egg (growth) or does egg precede chicken? In the literature there is no unequivocal answer to this question. Patrick (1966) identified two possible patterns in the casual relationship between financial development and economic growth. One is the 'demand-following' pattern: growth induces an expansion of the financial system; the lack of financial growth is a manifestation of the lack of demand for financial services. As the real side of the economy develops, demands for various new financial services crop up and these are met from the financial side. As Robinson (1952) wrote: 'where enterprise leads, finance follows'.

In the second pattern the expansion of the financial system precedes the demand for its services. Channelling scarce resources from savers to investors the financial sector induces real growth. Patrick (1966) argued that the direction of causality changes in the process of development. In the early stages of development, 'supply-leading' pattern is important. In the later stages, 'the supply-leading impetus gradually becomes less important, and the demand-following financial response becomes dominant' (Patrick, 1966, p.177).

The proposition of Patrick (1966) was supported by Jung (1986); he used some time series data (since the early 1950s till late 1970s) for 56 countries of which 19 are

developed countries, hereafter DCs and observed that LDCs are characterized by the causal direction running from financial to economic development and DCs by the reverse causal direction. The reverse causal direction (from growth to financial development) was noted by Shan *et al* (2001) for a number of DCs and no causal relationship for some DCs.

How Does Financial Development Promote Growth?

There are, however, many scholars who emphasized the uni-directional positive link – from financial development to growth. Cameron et al (1967) pointed out that there are a number of historical instances in which financial institutions played a leading role in the development process. The works of Goldsmith (1969), McKinnon (1973) and Shaw (1973) offered detailed arguments and evidence for the role of finance in promoting long-run growth. They stressed the role of financial repression as manifested in government interventions in the financial sector, such as ceilings on interest rates and directed credit programs, in hampering financial development and thereby reducing rates of capital accumulation and productivity growth. Goldsmith (1969, p.400) argued that the financial superstructure of an economy 'accelerates economic growth and improves economic performance to the extent that it facilitates the migration of funds to the best user, i.e. to the place in the economic system where the funds will yield the highest social return'.

Some growth models in the line of endogenous growth theory (see Greenwood and Jovanovic, 1990 and Bencivenga and Smith, 1991) have explicated the role of services provided by the financial intermediaries. According to these models, the financial

intermediaries gather and analyze information and facilitate better risk sharing among individuals, thus allowing credit to be allocated more efficiently.

Through the survey of the existing literature two distinct channels of finance-led growth were identified by Rousseau and Vuthipadadorn (2005). The first channel stresses the role of intermediaries in allocating resources more efficiently. This ‘‘total factor productivity’’ channel operates through innovative financial technologies that improve informational asymmetries and lead to better project selection and monitoring (King and Levine, 1993). The second ‘‘factor accumulation’’ channel focuses on the spread of the organized finance in the place of self-finance and the resulting improvements in the ability of intermediaries to mobilize otherwise unproductive resources (Gurley and Shaw, 1955; Bencivenga and Smith, 1991; Bell and Rousseau, 2001).

Financial Development Promotes Growth: What the existing studies show

A large number of studies provided an over-whelming support to the proposition that financial development promotes growth. It is beyond the scope of the present study to provide an exhaustive list of studies supporting the proposition. We just mention here some of the major works. The historical evidence in support of the proposition comes from Rousseau and Wachtel (1998): studying the experience of five industrialized countries over the period 1870–1929, they found strong uni-directional links from finance to growth. Fry (1978) provided the support of the proposition from post-Second World War experience of some LDCs: He studied the experience of seven Asian countries such

as India, Korea, Malaysia, Philippines, Singapore, Taiwan and Burma over the period starting from early 1960s to the early 1970s; his pooled time series analysis supported the view that 'financial conditions do influence saving and growth'.

There are many other cross-country studies supporting the positive effect of finance on growth. Gregorio and Guidoti (1995), for example, examined the empirical relationship between growth and financial development, proxied by the ratio between bank credit to the private sector and GDP and found that this proxy is positively correlated within a large cross-country sample. Levine and Zervos (1998), taking a similar cross-country approach, found that the development of banks and stock markets also has a positive effect on growth. Rajan and Zingales (1998) studied a large sample of countries and observed that financial development has a substantial supportive influence on the rate of economic growth.

There are many time-series studies that also supported the findings of cross-section studies. Bell and Rousseau (2001) studied the Indian experience for post-independence period and found that financial intermediaries played a more emphatic role in promoting investment than in increasing total factor productivity. More recently Rousseau and Vuthipadadorn (2005) studied the experience of 10 Asian countries (India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, and Thailand) from 1950 to 2000 and found a strong uni-directional link from finance to investment for most of these countries. They concluded that 'resource mobilization may be the key mechanism at work' and supported the seminal studies of Gerschenkron (1962) and

Cameron *et al* (1967), which emphasized the role of finance in the early stages of economic development.

Aghion *et al* (2005) had a different view, somewhat classical (once reinstated by Milton Friedman and his followers): finance matters in the short-run adjustment process but not in the long-run steady state equilibrium. They developed and tested a Schumpeterian model of cross-country convergence with financial constraints and concluded that 'all countries above some critical level of financial development should converge in growth rate, and that in such countries financial development has a positive but eventually vanishing effect on steady-state GDP'. They empirically verified these propositions through a cross-country growth regression and found a direct effect of financial development on growth convergence.

Case for Financial liberalisation

In view of the importance of finance for economic growth Fry (1980, 1997) argued in favour of financial liberalisation to facilitate the process. Through a series of studies Ross Levine strongly supported financial liberalisation because of its favourable effect on growth (see for example, King and Levine, 1993; Levine, 1997; Levine and Zervos, 1998; Levine *et al* 2000; Beck *et al*, 2000; Levine 2001; Levine 2003). Demetriades and Luintel (1996) studied the experience of India and found a negative effect of financial repression on India's economic growth. In another study, Quinn (1997) showed that the

higher the degree of financial openness (measured by some indices calculated by him), the higher would be the growth rate of a country.

Sceptical View on Finance-to-Growth Positive Link

There are a number of studies which are somewhat sceptical. For instance, Dornbusch and Reynoso (1989) observed through a scatter of points for 84 LDCs that the correlation of growth and financial deepening is not tight. Demetriades and Hussain (1996) found little evidence for an independent influence of financial development on growth for the 16 LDCs they have studied. Arestis and Demetriades (1997) observed that in the case of South Korea, the real rate of interest had a negative effect on output; 'financial repression seems to have worked' favourably on their financial development and growth. This supported the World Bank (1993) project report on 'East Asian Miracle' that states that a 'policy of moderate financial repression at positive interest rates may have boosted aggregate investment and growth' in the High Performing Asian Economies 'by transferring income from depositors, primarily households, to borrowers, primarily firms'. Arestis and Demetriades (1997, p.796), however, pointed out that the same policies followed by India had negative effects as observed by Demetriades and Luintel (1996) and commented that 'the effects of financial liberalisation depend upon the institutional context of the economy in question and, particularly, the existence or otherwise of good governance'.

There are also some theoretical works which suggest a negative effect of financial development on growth (Wijnbergen, 1983; Buffie, 1984). This arises from the possibility that financial intermediaries can compete with domestic firms, which could lead to a credit crunch that lowers investment and productivity.

Research Questions of the Present Study

On the basis of this survey of literature we have identified the following research questions which we would like to re-examine:

Is there any causal relationship between financial development and growth? If the answer is yes, what is the direction of causality? Does the direction of causality runs from finance to growth or does the arrow runs in the opposite direction? What is the nature of the relationship? Does financial development promote growth? Or does it hamper growth? What is the effect of growth on financial development?

In the next section we shall seek answers to these interlinked questions with the aid of a number of alternative dynamic panel data models.

III. Domestic Credit and Growth of the LDCs, 1980-2006

Our Choice of Variables, Sample Selection and Data Source

As a proxy for financial development we shall use only one indicator – credit advanced by banks and other financial intermediaries to the domestic sector (as percentage of GDP), DCBPVTY. It is expected to cover the activities of banks and other financial institutions which are expected to facilitate economic development by easing the credit constraints of the private sector. It is the single most important indicator of financial development (in contrast to M3/GDP ratio and such type of other indicators) which keeps us more focused in our study of the finance-growth link. For growth we shall use the rate of growth of real GDP per capita (PCYG).

The data on PCYG and DCBPVTY are readily available over a long period for a large number of countries from the well-known source of World Bank (World Development Indicators, December 2008, available online). Our choice of panel (years and countries) is based on the availability of data for as many countries/years as possible (without a single missing observation). Thus we have a perfectly balanced sample of 65 countries (the list in Table 3) over a period covering the last two decades of the last century and all the available years of the present decade, 1980-2006 (2007 data are unavailable for many countries of our sample). Our coverage of large time period (with no missing data) is very useful (if not a necessity) for the use of the advanced tools of time-series econometrics in the context of panel data.

Stationarity of the Series: Panel Unit Root Tests

First we have examined the stationarity property of the series. Using a number of tests we find that the financial development indicator (DCBPVTY) is first difference stationary. In level terms this series is observed to be stationary in some tests and non-stationary in other tests. The series on growth rate (PCYG) is stationary irrespective of whether we assume only individual country fixed effects or both fixed effects and trends (Table 1).

Granger Causality Tests

To test whether financial development leads to growth or there is a reverse causality or mutual causation we have undertaken VAR (Vector Auto Regressive) and VEC (Vector Error Correction) Granger Causality tests. The lag-order in each case has been determined with the aid of Lag Exclusion Wald Test (jointly for both variables).

Examining all the cases up to 10 lags we have chosen a 6-lag VAR model on the basis of Wald tests (details are not reported –available on request). Following Toda and Yamamoto (1995) we have also considered a 7-lag order VAR model (6 plus 1 for the possible maximum order of integration of the two series). On both lags, the null hypothesis of no-causality has been rejected at very high levels of significance irrespective of whether the growth rate is the dependent variable or not. That means growth and financial development are related to each other via some kind of mutual

causation. For VEC Granger Causality Test the lag-order is chosen to be 5. Both 5-lag and 6-lag VEC Granger causality tests support this mutual causation. We have also considered all the conceivable lags from 2 to 10 and conducted the VAR and VEC Granger causality tests and found strong evidence in favour of mutual causation. We have observed the unidirectional causality from growth (PCYG) to financial development as measured by DCBPVTY in the 10-lag order VAR causality test and 7, 9 and 10-order VEC causality tests. In all other lag-orders we have observed mutual causation. On the basis of Lag Exclusion Wald Test for each variable separately we have determined the precise lag-structures: (6, 4) for VAR and (5, 3) for VEC models between PCYG and DCBPVTY. Our VAR and VEC causality tests for these lag-structures (with or without addition of one extra lag for possible integration of the series) supported the same mutual causation (details are not reported). There is no evidence of uni-directional causality from financial development to growth; evidently this observation is not sensitive to the choice of lag-orders (from 2 to 10) on the basis of different other criteria.

For a large time dimension of panel data (as we have here), Pesaran and Smith (1995) showed that the traditional procedures for estimation of pooled models, such as the fixed effects, instrumental variables, and generalized method of moments (GMM) 'can produce inconsistent, and potentially very misleading estimates of the average values of the parameters in dynamic panel data models unless the slope coefficients are in fact identical (Pesaran and Shin, 1999, p.622). So to ascertain the nature of the relationships between financial development and growth we shall use the Pesaran-Shin dynamic panel data analysis discussed below.

Long-run and Short-run Relationship between Financial Development and Growth: Dynamic Panel Data Analysis

We postulate a long-run relationship between PCYG and DCBPVTY:

$$(1) \qquad PCYG_{it} = \beta_i . DCBPVTY_{it} + \eta_{it}$$

where i (=1,2,….N) represents groups(countries), t (=1,2,… T) represents periods (years), β_i is the long-run coefficient of DCBPVTY and η_{it} is the error term.

We are interested to know whether there exists a long run impact of DCBPVTY on growth and whether the short-run adjustment dynamics leads to the long-run relationship.

Following Pesaran and Shin (1999) our panel data analysis is based on the following error correction representation:

$$(2)\ \Delta PCYG_{it} = \theta_i (PCYG_{i,t-1} - \beta_i . DCBPVTY_{i,t-1}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta PCYG_{i,t-j} + \sum_{k=0}^{q-1} \psi_{ik} \Delta DCBPVTY_{i,t-k} + \mu_i + \varepsilon_{it}$$

where θ_i is the group-specific error-correcting speed of adjustment term, λ_{ij} and ψ_{ik} are the coefficients of the lagged variables, μ_i is the group-specific effect and ε_{it} is the disturbances term. The existence of a meaningful long-run relationship with a stable adjustment dynamics requires $\theta_i < 0$.

Under this general structure Pesaran and Shin (1999) suggested the Pooled Mean Group (PMG) estimator. It allows intercepts, short-run coefficients and error variances to differ freely across the groups but the long run coefficients are constrained to be the same; that means, $\beta_i = \beta$ for all i while θ_i may differ from group to group. It is an intermediate approach between the two extremes. On one extreme we have dynamic fixed effect estimators (DFE) where intercepts are allowed to vary across the groups and all other parameters and error variances are constrained to be the same. At the other extreme one can estimate separate equations for each group and calculate the mean of the estimates to get a glimpse of the over-all picture. This is called mean group estimator (MG). Pesaran and Smith (1995) showed that MG gives consistent estimates of the averages of parameters. We have used all the three alternative techniques.

Using the STATA ado developed by Blackburne and Frank (2007) we have estimated the equations (1) and (2). On the basis of Lag Exclusion Wald Test for each variable separately we have determined p=6 and q=4. [1] The MG estimate shows neither long-term nor short-term impact of financial development on growth (Table 4). The PMG estimate supports a negative (!) long-term effect of domestic credit to private sector, DCBPVTY on growth, PCYG and there exits a stable adjustment path towards the long-run relationship from the insignificant short-term relationship. The DFE estimate tells the

[1] We have considered a uniform lag-structure for all the countries as the STATA ado used here does not have this option. It is theoretically possible to consider different lag structures for different countries on the basis of some information criteria.

same story. Hausman test supports the PMG vis-à-vis MG and the DFE model vis-à-vis both PMG and MG.

In view of mutual causation between DCBPVTY and PCYG, we have also examined whether financial development as indicated by DCBPVTY depends on growth, PCYG through an appropriate modification of the equations (1) and (2). Here also our MG estimates show no significant relationship. But both PMG and DFE estimates show a significant positive impact of growth on financial development (here also the Hausman test supports the DFE model). In each model, the adjustment path to the long-term relationship is stable but surprisingly the short-term effect of growth on financial development is found to be negative.

Summary of findings and Concluding Observations

Many economists and economic historians argued that financial services play a positive role in promoting growth and development. Their works provided an academic support to the recent move towards financial development through liberalisation and globalization of financial services.

In this perspective we have undertaken a study of a perfectly balanced sample of 65 less developed countries over a long period, 1980-2006. Our analysis did not include all possible indicators of financial development; we considered only domestic credit to private sector (relative to GDP) as the best proxy. The relevant data for the other

indicators are not readily available for a large number of countries over a long period. We did not consider all possible explanatory variables (which are often interlinked creating a problem of estimation) influencing growth as it would reduce our coverage of countries and time period or we would have to allow for missing data. We think that a perfectly balanced sample is very useful (if not a necessity) for our dynamic panel data analysis including tests for panel unit root and Granger causality, and lagged adjustment dynamics. Moreover our methodology to estimate the relationship between financial development and growth takes care of the bias that may follow from omitted variables. Our differencing procedure eliminates the time-invariant country heterogeneity (including the initial condition such as initial per capita GDP often incorporated in the studies of convergence of income across the countries). Allowing for different intercepts (μ_i) in equation (2) takes care of heterogeneous country trends (incorporating the mix of different time-variant factors) that may influence our estimate of the relationships.

Using Panel Granger Vector Autoregression (VAR) and Vector Error Correction (VEC) Granger Causality tests our study finds a strong evidence of mutual causation between financial development and growth. We have observed that financial development, more specifically, domestic credit to private sector (relative to GDP), has no short-term effect on growth; its long-term effect is negative. On the contrary, the long-term effect of growth on domestic credit to private sector is positive while its short-term effect is negative.

To sum up, our study of a panel of 65 countries and 27 years (1980-2006) casts serious doubt on the existence of a long-term as well as a short-term favourable impact of financial development on growth.

Bibliography

Aghion, Philippe, Peter Howitt and David Mayer-Foulkes, 2005, 'The effect of financial development on convergence: theory and evidence,' *Quarterly Journal of Economics,* 120(1): 173-222.

Arestis, Philip and Panicos O. Demetriades, 1997, 'Financial development and economic growth: assessing the evidence,' *The Economic Journal*, 107(May): 783–799.

Beck, Thorsten, Ross Levine and Norman Loayza, 2000,' Finance and the source of growth,' *Journal of Financial Economics,* 58: 261-300.

Bekaert, Geert and Christian Lundblad, 2005, 'Does financial liberalization spur growth,' *Journal of Financial Economics,* 77: 3-55.

Bell, C., and P.L., Rousseau, 2001, 'Post-independence India: a case of finance-led industrialization?,' *Journal of Development Economics*, 65: 153–175.

Bencivenga, V.R., and B.D., Smith, 1991, 'Financial intermediation and endogenous growth,' *Review of Economic Studies*, 58: 195–209.

Blackburne III, Edward F. and Mark W. Frank 2007. 'Estimation of non-stationary heterogeneous panels' *The Stata Journal*, 7(2): 197-208.

Buffie, Edward F., 1984, 'Financial repression, the new structuralists, and stabilization policy in semi-industrialized economies,' *Journal of Development Economics*, 14: 305–322.

Cameron, R.E., Crisp, O., Patrick, H.T., Tilly, R., 1967, *Banking in the Early Stages of Industrialization,* Oxford University Press, New York.

Demetriades, Panicos O. and K.A., Hussein, 1996, 'Does financial development cause economic growth?: Time-series evidence from 16 countries,' *Journal of Development Economics*, 51: 387–411.

Demetriades, Panicos O. and Kul B. Luintel, 1996, 'Financial Development, Economic Growth and Banking Sector Controls. Evidence from India', *The Economic Journal,* 106 (435): 359-374.

Dornbusch, Rudiger and Aejandro Reynoso, 1989, 'Financial factors in economic development,' *American Economic Review*, 79 (2): 204-209.

Fry, J. Maxwell, 1997, 'In favour of financial liberalization,' *The Economic Journal*, 107(May): 754-770.

_____, 1980, 'Saving, investment, growth and the cost of financial repression,' *World Development,* 8 (April): 317-27.

_____, 1978, 'Money and capital or financial deepening in economic development?,' *Journal of Money, Credit and Banking*, 10(4):464-475.

Gerschenkron, A., 1962, *Economic Backwardness in Historical Perspective: A Book of Essays*, Harvard University Press, Cambridge, MA.

Goldsmith, R.W., 1969, Financial *Structure and Development*, Yale University Press, New Haven, CT.

Greenwood, J., and B., Jovanovic, 1990, 'Financial development, growth, and the distribution of income,' Jo*urnal of Political Economy,* 98: 1076–1107.

Gregorio Jose de and Pablo E. Guidoti, 1995, 'Financial development and economic growth,' *World Development,* 23(3): 433-446.

Gurley, J.G., and E.S., Shaw, 1955, 'Financial aspects of economic development,' *American Economic Review, 45*: 515–538.

Hilferding, Rudolph, 1910, *Finance Capital: A Study of the Latest Phase of Capitalist Development,* Routledge, London.

Jung, W.S., 1986, 'Financial development and economic growth: international evidence,' *Economic Development and Cultural Change, 34*: 333–346.

King, R.G., and R., Levine, 1993, 'Finance and growth: Schumpeter must be right,' *Quarterly Journal of Economics, 108*: 717–737.

Levine, Ross, 2003, 'Stock markets liquidity and economic growth: theory and evidence,' in Luigi Paganetto and Edmond S. Phelps (eds), *Finance, Research, Education and Growth*, Palgrave Macmillan, New York.

Levine, Ross, 2001, 'International financial liberalisation and economic growth,' *Review of International Economics*, 9 (4): 688-702.

_____, 1997, 'Financial development and economic growth: views and agenda,' *Journal of Economic Literature*, 35: 688:726.

Levine, Ross, Norman Loayza and Thorsten Beck, 2000, 'Financial intermediation and growth: causality and causes,' *Journal of Monetary Economics, 46*: 31-77.

Levine, Ross and Sara Zervos, 1998, 'Stock markets, banks, and economic growth,' *American Economic Review,* 88 (3): 537-558.

Lucas, Robert E., JR., 1988, 'On the mechanics of economic development,' *Journal of Monetary Economics,* 22 (1): 3-42.

Meier, Gerald M. and Dudley Seers, 1984, *Pioneers in Development*, Oxford University Press, New York.

McKinnon, Ronald I., 1973, *Money and Capital in Economic Development*, Brookings Institution, Washington, DC.

Patrick, H., 1966, 'Financial development and economic growth in underdeveloped countries,' *Economic Development and Cultural Change*, 14, 174-189.

Pesaran, M. H., Y. Shin, and R. P. Smith 1999. 'Pooled mean group estimation of dynamic heterogeneous panels'. *Journal of the American Statistical Association* 94: 621-634.

Pesaran, M. H., and R. P. Smith 1995. 'Estimating long-run relationships from dynamic heterogeneous panels,' *Journal of Econometrics* 68: 79-113.

Rajan, R.G., and L., Zingales, 1998, 'Financial dependence and growth' *American Economic Review*, 88: 559-586.

Quinn, Dennis, 1997, 'The correlates of change in international financial regulation,' *American Political Science Review,* 91(3): 531–51.

Robinson, J., 1952, *The Rate of Interest and Other Essays*, Macmillan, London.

Rousseau, P.L., and P., Wachtel, 1998, 'Financial intermediation and economic performance: historical evidence from five industrialized countries,' *Journal of Money, Credit, and Banking, 30*: 675–678.

Rousseau, Peter L. and Dadanee Vuthipadadorn, 2005, 'Finance, investment, and growth: time series evidence from 10 Asian economies,' *Journal of Macroeconomics*, 27:87-106

Schaberg, Marc, 1999, *Globalisation and the Erosion of National Financial Systems*, Edward Elgar, Aldershot.

Shan, Jordan Z, Alan G. Morris, and Fiona Sun, 2001, 'Financial development and economic growth: an egg-and-chicken problem?,' *Review of International Economics,* 9(3): 443-454.

Schumpeter, J.A., 1911, *The Theory of Economic Development*, Harvard University Press, Cambridge, MA.

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

Stern, Nicholas, 1989, 'The economics of development: a survey,' *Economic Journal,* 99 (397): 597-685.

Toda, H.Y and Yamamoto, T., 1995, 'Statistical Inference in Vector Autoregressions with Possibly integrated Processes,' *Journal of Econometrics*, 66: 225-250.

Wijnbergen, V.S., 1983,' Interest rate management in LDCs,' *Journal of Monetary Economics,* 12: 433–452.

World Bank, 1993, *The East Asian Miracle*, Oxford University Press, New York.

Table 1. Domestic Credit to Private Sector/GDP Ratio (%) and Per Capita GDP: Panel Unit Root Tests

Series/ Test statistics[1]	Level	Level	First difference
Domestic Credit to Private Sector/GDP Ratio (%), DCBPVTY	Individual Effects	Individual Effects and Linear Trend	Individual effects
Levin, Lin & Chu t*	-1.23209 (0.1090)	2.50004 (0.9938)	-21.6078[2] (0)
Breitung t-statistic		2.41672 (0.9922)	
Im, Pesaran and Shin W-statistic	-0.96419 (0.1675)	2.02485 (0.9786)	-23.2981[2] (0)
ADF - Fisher Chi-square	164.759[2] (0.0212)	109.961 (0.8982)	760.589[2] (0)
PP - Fisher Chi-square	129.009 (0.5081)	87.4725 (0.9984)	839.435[2] (0)
Growth of per capita real GDP, PCYG			
Levin, Lin & Chu t*	-17.1450[2] (0)	-13.2429[2] (0)	
Breitung t-statistic		-8.17317[2]	
Im, Pesaran and Shin W-statistic	-19.5251[2] (0)	-19.0268[2] (0)	
ADF - Fisher Chi-square	649.223[2] (0)	586.232[2] (0)	
PP - Fisher Chi-square	705.684[2] (0)	7(0)24.433[2]	

1 Automatic lag length selection based on SIC (Schwarz Information Criterion). For Levin, Lin & Chu t* and Breitung t-statistic, the null hypothesis of unit root assumes common unit root process. For all other test statistics the null hypothesis of unit root assumes individual unit root process. Probabilities are given in parentheses. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

2 The null hypothesis of unit root is rejected at less than 5 % level of significance.

Table 2. Relationship between Growth and Domestic Credit to Private Sector/GDP Ratio (%), 1980-2006: Panel VAR and VEC Granger Causality Tests

	Dependent variable[1]	Excluded Variable[1]	Chi-square	Degree Of Freedom	Probability
VAR Granger Causality/Block Exogeneity Wald Tests					
Lag=2	PCYG	DCBPVTY	27.87419	2	0.0000
	DCBPVTY	PCYG	60.82316	2	0.0000
Lag=3	PCYG	DCBPVTY	60.82316	2	0.0000
	DCBPVTY	PCYG	70.26850	3	0.0000
Lag=4	PCYG	DCBPVTY	23.85495	4	0.0001
	DCBPVTY	PCYG	74.46185	4	0.0000
Lag=5	PCYG	DCBPVTY	22.25926	5	0.0005
	DCBPVTY	PCYG	78.65894	5	0.0000
Lag=6	PCYG	DCBPVTY	22.40176	6	0.0010
	DCBPVTY	PCYG	79.12488	6	0.0000
Lag=7	PCYG	DCBPVTY	18.35589	7	0.0105
	DCBPVTY	PCYG	82.27354	7	0.0000
Lag=8	PCYG	DCBPVTY	16.62992	8	0.0342
	DCBPVTY	PCYG	80.55009	8	0.0000
Lag=9	PCYG	DCBPVTY	17.49223	9	0.0415
	DCBPVTY	PCYG	79.56171	9	0.0000
Lag=10	PCYG	DCBPVTY	16.64347*	10	0.0826
	DCBPVTY	PCYG	76.59189	10	0.0000
VEC Granger Causality/Block Exogeneity Wald Tests					
Lag=2	D(PCYG)	D(DCBPVTY)	16.15774	2	0.0003
	D(DCBPVTY)	D(PCYG)	12.33244	2	0.0021
Lag=3	D(PCYG)	D(DCBPVTY)	15.77599	3	0.0013
	D(DCBPVTY)	D(PCYG)	13.83285	3	0.0031
Lag=4	D(PCYG)	D(DCBPVTY)	17.82323	4	0.0013
	D(DCBPVTY)	D(PCYG)	16.44036	4	0.0025
Lag=5	D(PCYG)	D(DCBPVTY)	19.94079	5	0.0013

	D(DCBPVTY)	D(PCYG)	18.52651	5	0.0024
Lag=6	D(PCYG)	D(DCBPVTY)	18.64264	6	0.0048
	D(DCBPVTY)	D(PCYG)	18.74174	6	0.0046
Lag=7	D(PCYG)	D(DCBPVTY)	12.69665*	7	0.0799
	D(DCBPVTY)	D(PCYG)	19.48785	7	0.0068
Lag=8	D(PCYG)	D(DCBPVTY)	16.19315	8	0.0397
	D(DCBPVTY)	D(PCYG)	23.11643	8	0.0032
Lag=9	D(PCYG)	D(DCBPVTY)	14.47057*	9	0.1065
	D(DCBPVTY)	D(PCYG)	20.72021	9	0.0140
Lag=10	D(PCYG)	D(DCBPVTY)	15.17787*	10	0.1257
	D(DCBPVTY)	D(PCYG)	34.57330	10	0.0001

1 PCYG: Rate of Growth Real GDP per capita;

DCBPVTY: Domestic credit to private sector (% of GDP);

D (.): First difference of the variable mentioned in parentheses.

* Not significant at 5 per cent level; all others are highly significant.

Table 3. Long-run and Short-run Relationships between Growth and Domestic Credit to Private Sector/GDP Ratio (%), 1980-2006: Alternative Dynamic Panel Regression Estimates

Model	Pooled Mean Group, PMG	Mean Group, MG	Dynamic Fixed Effect, DFE	Static Fixed Effect, FE
A. Dependent Variable*[1]*: PCYG				
Long-run Relationship				
DCBPVTY	-.152** (.008)	5.429 (5.973)	-.064** (.014)	-.044** (.012)
Short-run Relationship				
θ_i	-1.011** (.122)	-1.327** (.126)	-.839** (056)	
$\Delta PCYG_{i, t-1}$	.203* (.103)	.42** (.11)	.017 (.05)	
$\Delta PCYG_{i, t-2}$	.14 (.086)	.303** (.094)	.04 (.045)	
$\Delta PCYG_{i, t-3}$	.162* (.065)	.267** (.077)	.071 (.039)	
$\Delta PCYG_{i, t-4}$	.028 (.045)	.1* (.05)	-.009 (.032)	
$\Delta PCYG_{i, t-5}$	.011 (.034)	.039 (037)	-.024 (.025)	
$\Delta DCBPVTY_{i, t}$	-2.587	-1.522	.006	

	(2.867)	(1.828)	(.019)	
$\Delta DCBPVTY_{i, t-1}$	5.225 (4.993)	7.254 (7.051)	-.023 (.019)	
$\Delta DCBPVTY_{i, t-2}$	-1.984 (2.15)	-.859 (.976)	.001 (.018)	
$\Delta DCBPVTY_{i, t-3}$	2.523 (2.5)	3.768 (3.81)	-.002 (.018)	
Constant, μ	5.946** (1.239)	5.337** (1.617)	3.1** (.398)	2.684** (.38)
B. Dependent Variable*[1]*: DCBPVTY				
Long-run Relationship				
PCYG	9.89** (.868)	-8.56 (13.363)	1.759** (.497)	-.318** (.087)
Short-run Relationship				
θ_i	-.081** (.013)	-.295** (.044)	-.197** (.016)	
$\Delta PCYG_{i, t}$	-.81** (.14)	-.703** (.205)	-.449** (.082)	
$\Delta PCYG_{i, t-1}$	-.526** (.137)	-.437** (.197)	-.233** (.074)	
$\Delta PCYG_{i, t-2}$	-.495** (.134)	-.394* (.156)	-.171** (.066)**	
$\Delta PCYG_{i, t-3}$	-.391**	-.285*	-.083	

	(.107)	(.145)	(.057)	
$\Delta PCYG_{i, t-4}$	-.258** (.067)	-.164 (.09)	-.092 (.048)	
$\Delta PCYG_{i, t-5}$	-.073 (.043)	-.006 (.048)	-.052 (.037)	
$\Delta DCBPVTY_{i, t-1}$	.11** (.039)	.184** (.05)	.002 (.027)	
$\Delta DCBPVTY_{i, t-2}$	-.04 (.04)	.025 (045)	.053 (.027)	
$\Delta DCBPVTY_{i, t-3}$	-.04 (.03)	.026 (.036)	.147** (.027)	
Constant, μ'	2.082** (.726)	8.347** (1.988)	5.951** (.578)	31.9** (.111)
Hausman Test Findings[2] [Probability of Chi-Square (1) distribution in first parentheses] A. ***Dependent Variable: PCYG*** MG vis-à-vis PMG – Chi-Square (1) = 0.70 (0.403) [Accept Null => accept efficient PMG] MG vis-à-vis DFE – Chi-Square (1) = 1.58 (0.209) [Accept Null => accept efficient DFE] DFE vis-à-vis PMG – Chi-Square (1) = 12.84 (0.0003) [Reject Null => accept DFE, PMG inconsistent				
B***. Dependent Variable: DCBPVTY*** MG vis-à-vis PMG – Chi-Square (1) = 1.16 (0.282) [Accept Null => accept efficient PMG] MG vis-à-vis DFE – Chi-Square (1) = 1.01 (0.3147) [Accept Null => accept efficient DFE] DFE vis-à-vis PMG – Chi-Square (1) = 76.89 (0) [Reject Null => accept DFE, PMG inconsistent]				

* Significant at 5 per cent level.

** Significant at 1 per cent level.

1 Standard errors in parentheses.

2 The series of tests supports DFE for both cases, A and B.