Financial development and economic growth: convergence or divergence?

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Abstract

This study tests for convergence in financial development and economic growth by incorporating the interaction between the real and financial sectors into an otherwise traditional test for convergence. The results show strong evidence for conditional convergence. Middle- and high-income countries conditionally converge to parallel growth paths not only in per-capita GDP, but also in financial development. The mutually reinforcing relationship between financial development and economic growth is stronger in the early stage of economic development, and this relationship diminishes as sustained economic growth gets under way. As such, low-income countries with a relatively well-developed financial sector are more likely to catch up to their middle- and high-income counterparts, and those with a relatively under-developed financial sector are more likely to be trapped in poverty. This finding explains the observed "great divergence" between poor and rich countries. Another finding is that, while human capital is more important to growth in the early stage of economic development, economic freedom becomes more important in the later stage.

Keywords: financial development; economic growth; convergence; divergence

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1. Introduction

Comparisons of performance across countries are central to answering many of the questions on factors leading to economic growth. Are the low-income countries catching up to the high-income ones and, if so, how quickly and by what means? Economists and policy makers have expressed profound interest in the issue of whether best-performing countries can maintain their lead in the future. The standard neo-classical growth models [i.e., Solow (1956), Ramsey (1928), Samuelson (1958), and their descendants] imply that each country should converge on to its own steady-state growth path at a predictable rate.

Based on empirical results from past studies that suggest a positive relationship between financial development and economic growth, a country's level of financial development appears to be a central factor underlying conditional convergence.[1] There are two distinct views of the finance-growth nexus in traditional development economics. The first view suggests that the increase in the demand for financial services resulting from economic growth is the major driving force behind the development of the financial sector. This mechanism is stressed in the work of

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[1] For instance, the cross-country growth regressions run by King and Levine (1993a), and Levine and Zervos (1998), show that the level of financial activities and the development of banks and stock markets have a positive effect on growth. A theoretical model proposed by Aghion *et al.* (2004) predicts that the growth rate of any country with more than some critical level of financial development will converge to the growth rate of the world technology frontier, and that all other countries will have a strictly lower long-run growth rate.

Robinson (1952, p. 86). The second view, proposed by Schumpeter (1911), Goldsmith (1969), McKinnon (1973), and Shaw (1973), emphasizes a proactive role for financial services in promoting economic growth. In this view, differences in the quantity and quality of the services provided by financial institutions could partly explain why countries grew at different rates. Multivariate time-series analysis is a standard approach employed by past studies to examine the causal relationship between financial development and economic growth. However, the results have been largely mixed.[2]

Without ruling out either one of the above two schools of thought, the relationship between financial development and economic growth is considered to be an interactive one in this study. Consequently, the steady-state growth paths of financial development and per-capita GDP are supposed to be simultaneously determined. In this study, therefore, the convergence in financial development and economic growth is examined on a system-of-equation basis. The objective of this study is to test for convergence in financial development and economic growth by incorporating the interaction between the real and financial sectors into an otherwise

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[2] For instance, Jung (1986) found bi-directional causality in most cases. Demetriades and Hussein (1996) found little support to the view that finance is a leading sector in the process of economic development. They found, however, considerable evidence for bi-directional causality and some evidence for reverse causation. Rousseau and Wachtel (1998) found strong uni-directional links from financial development to economic growth. Bell and Rousseau (2001) found that financial intermediaries played an emphatic role in promoting investment.

traditional test for conditional convergence. The results suggest that the mutually reinforcing relationship between financial development and economic growth is stronger in the early stage of economic development, and that this relationship diminishes as sustained economic growth gets under way. As such, poor countries with a relatively well-developed financial sector are more likely to catch up to their middle- and high- income counterparts.

The remainder of this article is organized as follows: In Section 2, the interdependence of financial development and economic growth is formulated. This is followed by Section 3 in which the data is described; and Section 4 in which the results of convergence tests are presented. Conclusions are drawn in the final section.

2. Empirical Formulation

The two schools of thought have sharply differing perspectives on the causal relationship between financial development and economic growth. One suggests that the increase in the demand for financial services resulting from economic growth is the major driving force behind financial development [Robinson (1952, p. 86)].[3] In this study, the following first-order difference equation is designated to capture the causal effect of economic growth on financial development:

$$g_{Xt} = \ln X_{t+1} - \ln X_t = \alpha_1 + \beta_{11} \ln X_t + a_{12} \ln Y_t + \varepsilon_{1t},$$

[3] As Demetriades and Hussein (1996) have pointed out, support for this view can be found in the work of Friedman and Schwartz (1963) on the demand for money.

or,

$$\ln X_{t+1} = \alpha_1 + a_{11} \ln X_t + a_{12} \ln Y_t + \varepsilon_{1t}, \tag{1}$$

where $a_{11} = 1 + \beta_{11}$, X_t is a measure of financial development, and Y_t is real per-capita GDP. Equation (1) is a standard approach in the literature for testing conditional convergence if Y_t is taken as exogenous. If $0 < |a_{11}| < 1$, X_t is dynamically stable around a path with a trend growth rate the same as that of Y_t and with a height depending on the level of Y_t.

Another school of thought proposed by Schumpeter (1911), Goldsmith (1969), McKinnon (1973), and Shaw (1973), emphasizes a proactive role for financial development in promoting economic growth. Proponents of this view argue that differences in the quantity and quality of services provided by financial institutions could partly explain why countries grew at different rates. In particular, two distinct channels of finance-led growth have emerged in the literature, namely, the channels of "total factor productivity" and "factor accumulation." The channel of "total factor productivity" operates through innovative financial technologies that ameliorate informational asymmetries and lead to the better selection and monitoring of investment projects [Townsend (1979), King and Levine (1993b) and Baier *et al.* (2004)]. In addition, the improved risk sharing after financial liberalization should lower the cost of equity capital and increase investment, which has a positive impact of economic growth [Bekaert and Harvey (2000), Bekaert *et al.* (2001), Bekaert *et al.* (2002a), and Bekaert *et al.* (2005)]. The channel of "factor accumulation" focuses on the spread of organized finance in place of self-finance, which improves the ability of intermediaries to mobilize otherwise unproductive resources and helps firms to overcome project indivisibilities [Gurley and Shaw (1955), Bencivenga and Smith (1991), Rousseau (1999), Xu (2000), and Bell and Rousseau (2001)]. Similar to equation (1), the following first-order difference equation is designated to capture the causal effect of financial development on economic growth.

$$\ln Y_{t+1} = \alpha_2 + a_{21} \ln X_t + a_{22} \ln Y_t + \varepsilon_{2t}, \qquad (2)$$

where $a_{22} = 1 + \beta_{22}$. If X_t is taken as exogenous and $0 < |a_{22}| < 1$, Y_t is dynamically stable around a path with a trend growth rate the same as that of X_t and with a height depending on the level of X_t.

X_t in equation (1) and Y_t in equation (2) are no longer exogenous if the relationship between X_t and Y_t is an interactive one. Let b_1 and b_2 be the two characteristic roots of equations (1) and (2). Whether countries will converge to parallel growth paths in X_t and Y_t hinges solely on the values of b_1 and b_2. Ruling out the case of $|b_1| = |b_2| = 1$, the system as a whole is convergent if and only if $|b_1| < 1$ and $|b_2| < 1$, and it is divergent otherwise. Clearly, the dynamics of $\ln X_t$ and $\ln Y_t$ are determined not only by a_{11} and a_{22}, but also by the term $a_{12}a_{21}$ that captures the interaction between the two time paths. Indeed, $a_{11} \leq 1$ and $a_{22} \leq 1$ are neither necessary nor sufficient for X_t and Y_t to be dynamically stable.

3. Measurement and Data

As Demirguc-Kunt and Levine (1996a, 1996b) have pointed out, research on the ties between financial development and economic growth focuses almost exclusively on financial intermediaries for two major reasons. First, central and commercial banks compose the vast majority of the financial systems of developing countries. Second, statistics on central and commercial banks are readily available, but there was little data on stock markets in developing countries until recently. Although the development of stock markets is not the focus of this study, countries with better-developed stock markets usually also have better-developed banks and nonbank financial intermediaries [Demirguc-Kunt and Levine (1996a)]. In common with past studies [see, for example, Demetriades and Hussein (1996), Levine *et al.* (2000), Xu (2000), Aghion *et al.* (2004), and Rousseau and Vuthipadadorn (2005)], financial development is represented by the level of financial intermediation, which has two alternative measures, namely credits allocated to the private sector ($X_t = CRT_t$) and quasi-money ($X_t = QM_t$). CRT_t are credits issued by both depository and non-depository institutions, which excludes those allocated to the public sector because those allocated to the private sector normally yield higher returns and are more likely to reflect fluctuations in the level of intermediated finance [Xu (2000), and Rousseau and Vuthipadadorn (2005)].[4] QM_t is the difference between broad money and narrow money (M2-M1). Narrow money is subtracted because the currency component of M2 is not generally intermediated through the banking system.

In this study, CRT_t, QM_t, and Y_t are all expressed in real per-capita terms and were obtained from the 2004 version of the International Monetary Fund's International Financial Statistics (IFS). There are 57 countries in the sample running from 1967-2001. 13 of them are categorized by IFS as "industrial countries," 20 of them as developing countries in Africa, 11 of them as developing countries in Asia, and 13 of them as developing countries in the western hemisphere (including Latin America). The countries included in the sample are listed in Panel (a) of Table 1. A balanced set of panel data was created from the sample, which was then evenly divided into seven time blocks. The means [Panel (b)] and standard deviations [Panel

[4] There are some alternative measures used in the literature, such as the total liquid liabilities of the financial system, and the ratio of the assets of commercial banks divided by the assets of commercial banks plus the assets of central banks. As argued by Levine *et al.* (2000), however, these alternative measures have some shortcomings. For instance, the measure based on liquid liabilities that include deposits of one financial intermediary in another may involve double-counting, and the measure based on banks' assets may not accurately reflect the amount of financial services produced. Therefore, CRT_t is considered by Levine *et al.* (2000) to be a "preferred indicator."

(c)] of CRT_t, QM_t, and Y_t in each time block are provided in Table 1.

** insert Table 1 here **

Panel (b) suggests that the countries experienced tremendous economic growth and financial development. However, the gaps between these countries were widening rapidly as indicated by the increasing standard deviations reported in Panel (c). In fact, this finding of "great divergence" between rich and poor countries has been observed in many other studies. Although many studies show that a large group of rich and middle-income countries have been converging to parallel growth paths over the past 50 years, the gap between these countries as a whole and the very poorest countries as a whole has continued to widen.[5] Although there has not been any study on convergence in the rate of financial development, a similar finding is expected if the real and financial sectors are interdependent.

4. Test for Conditional Convergence

A large body of classical macroeconomic literature has tested for the convergence in

[5] For instance, the proportional gap in per-capita GDP between Mayer-Foulkes' (2002) richest and poorest convergence groups grew by a factor of 2.6 between 1960 and 1995, and the proportional gap between Maddison's (2001) richest and poorest groups grew by a factor of 1.75 between 1950 and 1998. The long-run data provided no strong evidence of convergence for those nations that should have been able to rapidly assimilate industrial technology [De Long (1988)]. Quah (1996, 1997) explained the occurrence of this "great divergence" by a cross-section distribution polarized into twin peaks of rich and poor.

real per capita GDP among countries, beginning with Baumol (1986) and extending through Barro (1991), Mankiw *et al.* (1992), and Barro and Sala-i-Martin (1995). In the present study, convergence in per-capita GDP and financial intermediation is tested in two ways – a test for absolute convergence and a test for conditional convergence. To filter out short-term fluctuations, the yearly sample is divided into time blocks with h-intervals, for h = 5, 7 and 10. The values of $\ln X_t$ and $\ln Y_t$ were computed in three alternative ways – the average values at overlapping intervals, the average values at non-overlapping intervals, and the end-of-period values at non-overlapping intervals. As such, the robustness of the results to different values of h, to a certain extent, reflects how sensitive the results are to the lag structure of the growth equations. If h = 5, for instance, the overlapping intervals are 1967-1971, 1971-1975, …, 1995-2001 (with a dummy variable for 1995-2001 because of additional years), and the non-overlapping intervals are 1967-1971, 1972-1976, …, 1997-2001. The overlapping and non-overlapping intervals for h = 7 and 10 are defined similarly.

Absolute convergence in economic growth and financial development has been tested but the results provide no evidence for absolute convergence because one of the characteristic roots is significantly larger than one. Since the literature has already demonstrated the absence of absolute convergence across countries, the detail empirical results of this test are not reported in this paper.

To test for conditional convergence in economic growth and financial development, equations (1) and (2) were estimated by dynamic panel GMM with fixed effect [see Bierens (2004) for the details of estimation procedures].[6] Since the steady-state growth paths of Y_t and X_t are simultaneously determined by equations (1) and (2), convergence in Y_t and X_t cannot be judged from the convergence coefficients a_{11} and a_{22} alone if $a_{12}a_{21} \neq 0$. Indeed, the whole system converges if and only if $|b_1|$ < 1 and $|b_2|$ < 1, where b_1 and b_2 are the characteristic roots of equations (1) and (2).

This fixed-effect model is designated to capture cross-country differences in economic conditions, such as saving rate, population growth rate [Solow (1956), Ramsey (1928) and Samuelson (1958)], and the degree of openness to cross-border trade [e.g., O'Rourke and Williamson (2005)], which determine the steady-state growth paths of per-capita GDP. Similarly, the steady-state growth path of financial intermediation is likely to be affected by some country-specific institutional characteristics, such as creditor rights, enforcement, accounting standards, bankruptcy laws, liberalization of the equity market, the availability of different forms of financing, and the degree of openness to capital flows [see, for instance, Levine *et al.*

[6] The software used is EasyReg International written by Bierens (2004).

(2000), Booth *et al.* (2001), Bekaert *et al.* (2002b) and Rajan and Zingales (2003)], which are captured by the fixed effect model. The results for h = 5 are reported in Table 2.[7]

**insert Table 2 here **

The results in Table 2 are further sub-divided into three model specifications, namely, overlapping intervals, non-overlapping intervals and end-of-period intervals. CRT_t and QM_t were used as two alternative measures for the level of financial intermediation. However, Table 2 reports the results from the former measure only because the results from the latter measure are similar. The means and standard errors of the two characteristic roots, b_1 and b_2, were estimated by the method of Monte Carlo simulation based on the sample variance-covariance matrix of a_{11}, a_{12}, a_{21} and a_{22}. Table 2 provides strong evidence for conditional convergence. First, both a_{12} and a_{21} are significantly positive in all model specifications, which suggests a bi-directional link between economic growth and financial development. This bi-directional relationship between finance and growth is similar to the findings of Jung (1986) and Demetriades and Hussein (1996). In addition, the two characteristic roots are both significantly smaller than unity in all model specifications. This finding supports the existence of conditional convergence among countries in economic

[7] The results for h = 7 and 10 are similar, which can be obtained from the author on request.

growth and financial development. This is also consistent with past studies' findings of evidence for increasing financial integration among countries [Goetzmann *et al.* (2001), Lothian (2002) and Volosovych (2005)]. Moreover, Bekaert and Harvey (1998) argued that financial integration has a positive effect on growth in emerging markets by lowering the cost of capital in these markets. The significantly positive coefficient for $\ln CRT_t$ in the economic growth equation implies that the steady-state growth path of per-capita GDP to which a country converges is positively related to its level of financial development. On the other hand, the significantly positive coefficient for $\ln Y_t$ in the equation of financial development implies that per-capita GDP has a positive effect on the steady-state growth path of financial development. In other words, countries converge to parallel growth paths in economic growth and financial development while the real and financial sectors reinforce each other.

To further examine the convergence characteristics of countries at different stages of economic development, a split-sample analysis was conducted and the results are presented in Table 3. The whole sample was split into three sub-samples of high-income countries (the top third), middle-income countries (the middle third), and low-income countries (the bottom third) based on per-capita GDP in the initial period.

** insert Table 3 here **

The results of estimation for h = 5, 7 and 10 are reported in Panels (a), (b) and (c) of

Table 3, respectively. $\ln X_t$ and $\ln Y_t$ were calculated based on end-of-period values. CRT_t measures the level financial intermediation in all specifications. Other model specifications are not reported here because they produced similar results.

Similar to Table 2, the estimated coefficients a_{12} and a_{21} are both significantly positive in Table 3, which implies the presence of interdependent growth paths for per-capita GDP and financial intermediation in all income-groups. However, the coefficients a_{12} and a_{21} estimated from the split-sample analysis appear with a substantial amount of variations across the three sub-samples. While the estimated a_{12} and a_{21} are both significantly larger than unity in the low-income sub-sample, they are both significantly smaller than unity in the high-income sub-sample. The middle-income sub-sample is somewhere in between. Consistent with Patrick's (1966) argument and Aghion's (2004) empirical findings, these estimates clearly show that the relationship between economic growth and financial development is related to the stage of economic development of a country – the mutually reinforcing relationship between economic growth and financial development diminishes as sustained economic growth gets under way. This is similar to the findings of Aghion *et al*. (2004) that financial development has a positive but eventually vanishing effect on steady-state per-capita GDP relative to the frontier.[8]

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[8] Unlike the finding of Aghion *et al* (2004), however, the effect of financial development on economic

Although the hypothesis of conditional convergence in economic growth and financial development is supported in the high- and middle-income sub-samples [except for column 2 in Panel (b)], this hypothesis is not supported in the low-income sub-sample. For the low-income countries, divergence is evidenced because both characteristic roots are significantly larger than unity.

The above results reveal that countries above some critical levels of per-capita GDP and financial development should converge to parallel growth paths. As the mutually reinforcing relationship between economic growth and financial development does not diminish until sustained economic growth gets under way, the low-income countries tend to diverge in their paths of economic growth and financial development. In other words, poor countries with a relatively well-developed financial sector tend to experience a faster growth in both per-capita GDP and financial development, and are more likely to catch up to their middle- and high-income counterparts. The very poorest countries with a relatively

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growth in this study does not "vanish" for the rich countries because the direct effect a_{21} remains significantly positive in all model specifications. The interaction analysis of Aghion *et al* (2004) has also been experimented with in this study by examining the effects of financial development and initial output on the convergence of output growth, i.e., $\beta_y + \beta_{xy}\ln CRT + 2\beta_{yy}\ln Y$, in a fixed effect model. While the estimate for β_{yy} is not significantly different from zero, the estimates for β_y and β_{xy} are both significantly negative, which implies that conditional convergence in economic growth depends positively on the level of financial development. However, this finding is not directly comparable to that in Table 4 because the conditional convergence as indicated by β_y and β_{xy} is evaluated on a single-equation basis.

under-developed financial sector tend to experience a slower growth in both per-capita GDP and financial development, and are more likely to be trapped in poverty. This phenomenon can be interpreted as evidence that the very poorest countries are trapped in a vicious cycle – an under-developed financial sector prevents a poor country from taking full advantage of financial services to promote economic growth on the one hand, and slow economic growth does not generate enough demand for financial services required for financial development on the other. The "poverty trap" created by this vicious cycle is a plausible explanation for the "great divergence" that has been observed between rich and poor countries. Evidence for divergence among poor countries can also be found in the work of Evrensel (2002). With reference to Evrensel's (2002) study, all countries in the low-income sub-sample have received more than one type of "structural adjustment programs" offered by the IMF during the sample period. Evrensel (2002) found that the major economic indicators, such as domestic credit creation and budget deficit, of these poor countries were not significantly affected by IMF's conditionality prescribing fiscal and monetary discipline, and that these countries entered a new program in a worse macroeconomic condition than before when successive inter-program periods are considered.

Two important explanations offered by the literature for cross-country differences in growth rates are: the production approach based on the work of Solow

(1956) and the institutional approach represented by the work of North (1990) and Landes (1998). To incorporate these important factors into the test for conditional convergence, equations (1) are (2) were re-estimated with three additional conditioning variables, namely, physical capital per worker (PC_t), human capital per worker (HC_t), and Economic Freedom of the World Index (EFW_t). PC_t and HC_t were taken from Baier *et al*. (2002) at 10-year intervals. EFW_t was taken from *Economic Freedom of the World*: *2003 Annual Report* [Gwartney and Lawson (2003)] at 5-year intervals. The findings suggest that physical capital has a significantly positive impact on the steady-state growth paths of per-capita GDP and financial development, while the impact of human capital is not significantly different from zero. Moreover, economic freedom has a positive impact on the steady-state growth paths of per-capita GDP and financial development in the absence of physical and human capital. However, the impact of economic freedom becomes insignificant when physical and human capital are also included.

Similar to Table 3, a split-sample analysis was conducted. The sample was divided into only two groups, namely, high-income (top half) and low-income (bottom half) groups, due to the small sample size. The coefficients of PC_t, HC_t and EFW_t are respectively defined as d_{11}, d_{12} and d_{13} in the financial development equation, and d_{21}, d_{22} and d_{23} in the economic growth equation. The results are presented in Table 4.

** insert Table 4 here **

Two findings deserve mention. First, economic freedom has a significantly positive effect on the steady-state growth paths of per-capita GDP and financial development for high-income countries, but this effect is insignificant for the low-income countries. This finding is consistent with some results from past studies showing that the level of economic freedom at the beginning of the growth period does not contribute significantly to explaining growth [see, for instance, Gwartney *et al*. (1999), Haan and Sturm (2000), Adkins *et al*. (2002)].[9] Second, human capital has a positive effect on the steady-state growth path of financial development for the low-income countries, but this effect is insignificant for the high-income countries. In other words, poor countries with a lower level of per-capita human capital tend to have a lower growth path of financial development in the steady state.[10] However, a reverse of causality is evidenced by the findings from this study: the coefficient for human capital (d_{22}) is insignificant in the output growth equation, but an increase in

[9] Some other studies, such as Easton and Walker (1997), Dawson (1998), Heckelman and Stroup (2000), and Scully (2002), found that the initial level of economic freedom is positively related to growth.

[10] This finding is consistent with that of Jamison and Lau (1982) and Psacharopoulos (1985), who showed that private rates of return to education are generally lower in developed countries than in developing ones. Galor and Zeira (1993) suggest that financial development matters for growth only because it facilitates investment in schooling.

human capital can indirectly raise the steady-state growth path of per-capita GDP by facilitating a higher growth path of financial development in the steady state.

5. Concluding Remarks

This study tests for convergence in financial development and economic growth by incorporating the interaction between the real and financial sectors into an otherwise traditional test for convergence. The results show strong evidence for conditional convergence. For middle- and high-income countries, conditional convergence is found not only in economic growth, but also in financial development. The results also suggest that the mutually reinforcing relationship between financial development and economic growth is stronger in the early stage of economic development, and that this relationship diminishes as sustained economic growth gets under way. As such, low-income countries with a relatively well-developed financial sector are more likely to catch up to their middle- and high-income counterparts, and poor countries with a relatively under-developed financial sector are less likely to catch up. This finding provides a plausible explanation for the "great divergence" that has been observed in the rates of economic growth between rich and poor countries.

An alternative explanation for divergence is the long-lasting cross-country differences in the rates of technological progress. For instance, Easterly and Levin

(2001) estimated that about 60% of the cross-country variation in growth rates of per-capita GDP is attributable to differences in productivity growth. Similar findings have been obtained by Klenow and Rodriguez-Clare (1997) and Feyrer (2001). However, these findings are puzzling when one takes into account the possibility of international technology transfers and the “advantage of backwardness” [Gerschenkron (1952)]. In this study, the finding that financial development has a positive impact on the steady-state economic growth may resolve this puzzle. As mentioned by Aghion *et al.* (2004), financial constraints prevent poor countries from taking full advantage of technology transfers and cause them to diverge from the growth rate of the world frontier. In particular, financial constraints created by an under-developed financial market may prevent poor countries from adopting new technologies because R&D, or investment in general technologies, are necessary inputs to the process of technology transfer [Cohen and Levinthal (1989)]. One way to verify this possible relationship is to examine the effect of financial development on the intensity of technology transfers. Based on the findings of this study, financial development and technology transfers are expected to be positively related when the country is in the early stage of financial development, and this relationship may diminish as the country grows beyond a certain critical level of financial development.

References

Adkins, L.C., Moomaw, R.L., and Savvides, A. (2002), 'Institutions, freedom, and technical efficiency', *Southern Economic Journal*, 69, 92-108.

Aghion, P., Howitt, P., and Mayer-Foulkes, D. (2004), 'The effect of financial development on convergence theory and evidence', NBER working paper 10358.

Baier, S.L., Dwyer Jr., G.P., and Tamura, R. (2002), 'How important are capital and total factor productivity for economic growth?', working paper 2002-2a, Federal Reserve Bank of Atlanta.

Baier, S.L., Dwyer Jr., G.P., and Tamura, R. (2004), 'Does opening a stock exchange increase economic growth?', *Journal of International Money and Finance*, 23, 311-331.

Bekaert, G. and Harvey, C.R. (1998), 'Capital markets: An engine for economic growth', *Brown Journal of World Affairs*, 5(1), Winter/Spring, 33-53.

Bekaert, G. and Harvey, C.R. (2000), 'Foreign speculators and emerging equity markets', *Journal of Finance*, 55, 565-614.

Bekaert, G., Harvey, C.R., and Lumsdaine, R.L. (2002a), 'Dating the integration of world equity markets', *Journal of Financial Economics*, 65, 203-247.

Bekaert, G., Harvey, C.R., and Lumsdaine, R.L. (2002b), 'The dynamics of emerging market equity flows', *Journal of International Money and Finance*, 21, 295-350.

Bekaert, G., Harvey, C.R., and Lundblad, C. (2001), 'Emerging equity markets and economic development', *Journal of Development Economics*, 66, 465-504.

Bekaert, G., Harvey, C.R., and Lundblad, C. (2005), 'Does financial liberalization spur growth?', *Journal of Financial Economics*, 77, 3-55.

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

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

Bierens, H.J. (2004), http://grizzly.la.psu.edu/~hbierens/EASYREG.HTM, Pennsylvania State University.

Booth, L., Aivazian, V., Demirguc-Kunt, A., and Maksimovic, V. (2001), 'Capital structures in developing countries', *Journal of Finance*, LVI(1), 87-130.

Cohen, W.M. and Daniel A.L. (1989), 'Innovation and Learning: the two faces of R&D', *Economic Journal*, 99, 569-596.

Dawson, J.W. (1998), 'Institutions, investment, and growth: New cross-country and panel data evidence', *Economic Inquiry*, 36, 603-619.

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

Demirguc-Kunt, A. and Levine, R. (1996a), 'Stock markets, corporate finance, and economic growth: An overview', *World Bank Economic Review*, 10(2), 223-239.

Demirguc-Kunt, A. and Levine, R. (1996b), 'Stock market development and financial intermediaries: Stylized facts', *World Bank Economic Review*, 10(2), 201-321.

Easterly, W. and Levine, R. (2001), 'It's not factor accumulation: Stylized facts and growth models', *World Bank Economic Review*, 15, 177-219.

Easton, S.T. and Walker, M.A. (1997), 'Income, growth and economic freedom', *American Economic Review*, 87(2), 328-332.

Evrensel, A.Y. (2002), 'Effectiveness of IMF-supported stabilization programs in developing countries', *Journal of International Money and Finance*, 21, 565-587.

Feyrer, J. (2001), 'Convergence by parts', unpublished manuscript, Brown University.

Friedman, M. and Schwartz, A.J. (1963), *A Monetary History of the United States*. Princeton University Press.

Fuller, W.A. (1996), *Introduction to Statistical Time Series* (2nd Ed.). New York: John Wiley

Galor, O. and Zeira, J. (1993), ‘Income distribution and Macroeconomics’, *Review of Economic Studies*, 60, 35-52.

Gerschenkron, A. (1952), ‘Economic backwardness in historical perspective’, in: Bert F. Hoselitz (eds), *The Progress of Underdeveloped Areas*. University of Chicago Press: Chicago.

Goetzmann, W.N., Li, L., and Rouwenhorst, G.K. (2001), ‘Long-term global market correlations’, NBER working paper 8612.

Goldsmith, R.W. (1969), *Financial structure and development*. Yale University Press: New Haven, CT.

Gurley, J.G. and Shaw, E.S. (1955), ‘Financial aspects of economic development’, *American Economic Review*, 45, 515-538.

Gwartney, J.D., Lawson, R.A., and Holcombe, R.G. (1999), ‘Economic freedom and the environment for economic growth’, *Journal of Institutional and Theoretical Economics*, 155(4), 1-21.

Gwartney, J.D. and Lawson, R.A. (2003), *Economic Freedom of the World: 2003 Annual Report*. Fraser Institute: Vancouver.

Haan, J. de and Sturm, J. (2000), ‘On the relationship between economic freedom and economic growth’, *European Journal of Political Economy*, 16(2), 215-241.

Heckelman, J.C. and Stroup, M.D. (2000), ‘Which economic freedoms contribute to growth?’, *Kyklos*, 53(4), 527-544.

Jamison, D. and Lau, L. (1982), *Formal Education and Economic Efficiency*. Johns Hopkins University Press: Baltimore, MD.

Jung, W.S. (1986), ‘Financial development and economic growth: International evidence’, *Economic Development and Cultural Change*, 34, 333-346.

King, R.G. and Levine, R (1993a), ‘Finance and growth: Schumpeter must be right’, *Quarterly Journal of Economics*, 108, 717-737.

King, R.G. and Levine, R (1993b), 'Finance, entrepreneurship, and growth', *Journal of Monetary Economics*, 32, 513-542.

Klenow, P.J. and Rodriguez-Clare, A. (1997), 'The neo-classical revival in growth economics: Has it gone too far?', in: Ben Bernanke and Julio Rotemberg (eds), *NBER Macroeconomics Annual*. MIT Press: Cambridge, MA.

Landes, D.S. (1998), *The Wealth and Poverty of Nations: Why Some are so Rich, and Sore so Poor*. W.W. Norton: New York.

Levine, R., Loayza, N., and Beck, T. (2000), 'Financial intermediation and growth: Causality and causes', *Journal of Monetary Economics*, 46, 31-77.

Levine, R. and Zervos, S. (1998), 'Stock markets, banks, and economic growth', *American Economic Review*, 88, 537-558.

Lothian, J.R. (2002), 'The internationalization of money and finance and the globalization of financial markets', *Journal of International Money and Finance*, 21, 699-724.

Maddison, A. (2001), *The World Economy: A Millennial Perspective*. Development Centre Studies. OECD: Paris.

Mayer-Foulkes, D. (2002), 'Global divergence', *Documento de Trabajo del CIDE*, SDTE 250, Division de Economfa.

McKinnon, R.I. (1973), 'Money and capital in economic development', Brookings Institution, Washington, DC.

North, D.C. (1990), *Institutions, Institutional change, and Economic Performance*, Cambridge University Press: Cambridge.

O'Rourke, K. and Williamson, J.G. (2005), 'From Malthus to Ohlin: Trade, industrialization and distribution since 1500', *Journal of Economic Growth*, 10, 5-34.

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

Psacharopoulos, G. (1985), ‘Return to education: A further international update and implication’, *Journal of Human Resources*, XX, 583-604.

Rajan, R.G. and Zingales, L. (2003), ‘The great reversals: the politics of financial development in the twentieth century’, *Journal of Financial Economics*, 69, 5-50.

Ramsey, F.P. (1928), ‘A mathematical theory of saving’, *Economic Journal*, 38, 543-559.

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

Rousseau, P.L. (1999), ‘Finance, investment, and growth in Meiji-era Japan’, *Japan and the World Economy*, 11, 185-198.

Rousseau, P.L. and Vuthipadadorn, D. (2005), ‘Finance, investment, and growth: Time series evidence from 10 Asian economies’, *Journal of Macroeco*nomics, 27, 87-106.

Rousseau, P.L. and Wachtel, P. (1998), ‘Financial intermediation and economic performance: Historical evidence from five industrialized countries’, *Journal of Money, Credit, and Banking*, 30(4), 657-678.

Samuelson, P.A. (1958), ‘An exact consumption-loan model of interest with or without the social contrivance of money’, *Journal of Political Economy*, 66, 467-482.

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

Scully, G. (2002), ‘Economic freedom, government policy, and the trade-off between equity and economic growth’, *Public Choice*, 113(1-2), 77-96.

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

Solow, R. (1956), ‘A contribution to the theory of economic growth’, *Quarterly Journal of Economics*, 70, 65-94.

Townsend, R.M. (1979), ‘Optimal contracts and competitive markets with costly state verification’, *Journal of Economic Theory*, 21, 265-293.

Xu, Z. (2000), 'Financial development, investment, and economic growth', *Economic Inquiry*, 38(2), 331-344.

Volosovych, V. (2005), 'Measuring financial market integration over the long run: Is there the U-shape?', working paper, University of Houston.

List of Tables

Table 1: Summary statistics

Panel (a): List of countries in the sample

Bottom third	**Middle third**	**Top third**
Benin	Algeria	Australia
Burkina Faso	Congo, Rep.	Canada
Burundi	Costa Rica	Denmark
Cameroon	Cote d'Ivoire	Gabon
Central African Republic	Dominican Republic	Iceland
Ethiopia	Ecuador	Jamaica
India	El Salvador	Japan
Indonesia	Guatemala	Libya
Kenya	Guyana	Mexico
Mali	Haiti	New Zealand
Nepal	Honduras	Norway
Niger	Korea, Rep.	Singapore
Nigeria	Malaysia	South Africa
Pakistan	Malta	Sweden
Rwanda	Mauritius	Switzerland
Senegal	Morocco	Trinidad and Tobago
Sierra Leone	Myanmar	United Kingdom
Sri Lanka	Paraguay	United States
Thailand	Philippines	Venezuela, RB

Notes: Countries are divided in three groups based on real per-capita GDP in 1967-1971. Total number of countries is 57.

Panel (b): Mean (US dollar)

Time block	Y_t	CRT_t	QM_t
1967-1971	2384.365	863.6118	713.3577
1972-1976	4976.135	2005.29	1480.041
1977-1981	9427.103	4323.754	2737.831
1982-1986	11458.78	6857.617	4043.132
1987-1991	18816.64	13818.5	9021.606
1992-1996	28057.14	21550.97	13986.36
1997-2001	44906.04	38710.11	20867.75

Notes: Per-capita GDP (Y_t), credits allocated to the private sector ($X1_t$) and quasi-money ($X2_t$) are all in real per-capita terms.

Panel (c): Standard deviation (US dollar)

Time block	Y_t	CRT_t	QM_t
1967-1971	5063.352	1924.482	1759.921
1972-1976	11404	4192.616	3485.5
1977-1981	22121.33	8621.455	5726.769
1982-1986	24715.78	13128.06	8138.697
1987-1991	44047.63	28701.47	19989.75
1992-1996	74319.27	50500.92	32341.35
1997-2001	179513.1	137975.6	57310.46

Notes: Per-capita GDP (Y_t), credits allocated to the private sector ($X1_t$) and quasi-money ($X2_t$) are all in real per-capita terms.

Table 2: Test for conditional convergence with 5-year intervals (h = 5)

	overlapping intervals	non-overlapping intervals	end-of-period intervals
Coefficient	X_t=CRT_t	X_t=CRT_t	X_t=CRT_t
a_{11}	0.0255	0.0892**	0.1006**
	(0.0148)	(0.0201)	(0.0188)
a_{12}	1.3723**	1.2709**	1.3350**
	(0.0277)	(0.0324)	(0.0294)
a_{21}	0.6456**	0.6676**	0.6498**
	(0.0127)	(0.0169)	(0.0155)
a_{22}	0.0302*	-0.0211	-0.0676**
	(0.0145)	(0.0205)	(0.0197)
Wald test for	21297.74	12772.68	16706.14
Ho: a_{12}= a_{21}=0	(reject)	(reject)	(reject)
b_1	0.9693**	0.9572**	0.9517**
	(0.0167)	(0.0220)	(0.0205)
b_2	-0.9132**	-0.8888**	-0.9186**
	(0.0167)	(0.0219)	(0.0203)
Ha: $\|b_1\|$ -1< 0	accept	accept	accept
Ha: $\|b_2\|$ -1< 0	accept	accept	accept
conclusion	convergence	convergence	convergence

Notes: The two equations,

$$\ln X_{t+1} = \alpha_1 + a_{11} \ln X_t + a_{12} \ln Y_t + \varepsilon_{1t} ,$$

and

$$\ln Y_{t+1} = \alpha_2 + a_{21} \ln X_t + a_{22} \ln Y_t + \varepsilon_{2t} ,$$

were estimated by GMM with fixed effect, where CRT_t is (per-capita) credits allocated to the private sector, and Y_t is (per-capita) real GDP. b_1 and b_2 are the two characteristic roots. Values in parentheses are standard errors. Ha stands for alternative hypothesis. * stands for significance at 5% level. ** stands for significance at 1% level. Critical values for testing Ha were obtained from Fuller's (1996) test for stationarity around a constant.

Table 3: Test for conditional convergence – Split-sample analysis

Panel (a): 5-year end-of-period intervals (h = 5)

Coefficient	High-income (top third)	Middle-income (middle third)	Low-income (bottom third)
a_{11}	0.0292*	0.2843**	0.1865**
	(0.0080)	(0.0173)	(0.0277)
a_{12}	0.7466**	0.8361**	1.3429**
	(0.0115)	(0.0244)	(0.0629)
a_{21}	0.7005**	0.6414**	1.1833**
	(0.0062)	(0.0132)	(0.0184)
a_{22}	-0.0366**	0.0846**	-0.0619
	(0.0077)	(0.0189)	(0.0262)
Wald test for	50591.15	1852.82	76333.17
Ho: $a_{12}= a_{21}=0$	(reject)	(reject)	(reject)
b_1	0.7204**	0.9236**	1.3290**
	(0.0085)	(0.0183)	(0.0367)
b_2	-0.7277**	-0.5546**	-1.2044**
	(0.0085)	(0.0184)	(0.0365)
Ha: $\|b_1\|$ -1< 0	accept	accept	reject
Ha: $\|b_2\|$ -1< 0	accept	accept	reject
conclusion	convergence	convergence	divergence

Panel (b): 7-year end-of-period intervals (h = 7)

Coefficient	High-income (top third)	Middle-income (middle third)	Low-income (bottom third)
a_{11}	0.1547**	-0.0719**	0.1259**
	(0.0059)	(0.0451)	(0.0392)
a_{12}	0.7208**	1.2475**	1.2465**
	(0.0108)	(0.0769)	(0.0754)
a_{21}	0.7199**	0.6896**	1.1492**
	(0.0074)	(0.0545)	(0.0308)
a_{22}	-0.1335**	0.1565**	0.0308
	(0.0054)	(0.0560)	(0.0273)
Wald test for	73621.74	2994.30	1375.26
Ho: $a_{12}= a_{21}=0$	(reject)	(reject)	(reject)
b_1	0.7453**	0.9773**	1.2765**
	(0.0077)	(0.0597)	(0.0461)
b_2	-0.7240**	-0.8922**	-1.1190**
	(0.0075)	(0.0580)	(0.0465)
Ha: $\|b_1\|$ -1< 0	accept	reject	reject
Ha: $\|b_2\|$ -1< 0	accept	accept	reject
conclusion	convergence	inconclusive	divergence

Table 3: Test for conditional convergence – Split-sample analysis (continue)

Panel (c): 10-year end-of-period intervals (h = 10)

Coefficient	High-income (top third)	Middle-income (middle third)	Low-income (bottom third)
a_{11}	0.1515*	0.1391**	0.1108**
	(0.0348)	(0.0251)	(0.0116)
a_{12}	0.8648**	0.8875**	1.2862**
	(0.0486)	(0.0355)	(0.0267)
a_{21}	0.7576**	0.9409**	0.9896**
	(0.0394)	(0.0423)	(0.0106)
a_{22}	0.0242	-0.1382*	-0.0612**
	(0.0449)	(0.0392)	(0.0125)
Wald test for	707.96	1681.47	58890.92
Ho: a_{12}= a_{21}=0	(reject)	(reject)	(reject)
b_1	0.9001**	0.9244**	1.1563**
	(0.0416)	(0.0353)	(0.0155)
b_2	-0.7235**	-0.9241**	-1.1066
	(0.0428)	(0.0372)	(0.0156)
Ha: $\|b_1\|$ -1< 0	accept	accept	reject
Ha: $\|b_2\|$ -1< 0	accept	accept	reject
conclusion	convergence	convergence	divergence

Notes: The two equations,

$$\ln X_{t+1} = \alpha_1 + a_{11} \ln X_t + a_{12} \ln Y_t + \varepsilon_{1t} ,$$

and

$$\ln Y_{t+1} = \alpha_2 + a_{21} \ln X_t + a_{22} \ln Y_t + \varepsilon_{2t} ,$$

were estimated by GMM with fixed effect, where X_t = CRT_t is (per-capita) credits allocated to the private sector and Y_t is (per-capita) real GDP. b_1 and b_2 are the two characteristic roots. Values in parentheses are standard errors. Ha stands for alternative hypothesis. * stands for significance at 5% level. ** stands for significance at 1% level. Critical values for testing Ha were obtained from Fuller's (1996) test for stationarity around a constant.

Table 4: Test for conditional convergence with physical capital, human capital and economic freedom – Split-sample analysis

Coefficient	High-income countries (top-half)	Low-income countries (bottom-half)
a_{11}	-0.0085	0.0346
	(0.0131)	(0.1059)
a_{12}	0.8564**	1.1153**
	(0.0192)	(0.0944)
a_{21}	0.7541**	0.8543**
	(0.0242)	(0.0952)
a_{22}	0.0162	0.1095
	(0.0258)	(0.0895)
d_{11} [physical capital]	0.6193**	1.0686**
	(0.2498)	(0.1579)
d_{12} [human capital]	1.0450	3.0918*
	(0.6115)	(0.8864)
d_{13} [economic freedom]	0.1932**	0.1267
	(0.0739)	(0.1195)
d_{21} [physical capital]	0.7200**	0.7683**
	(0.2905)	(0.1518)
d_{22} [human capital]	-1.1794	1.7119
	(0.7147)	(0.6501)
d_{23} [economic freedom]	0.2227**	-0.0279
	(0.0860)	(0.0793)
Wald test for	20161.08	174.31
Ho: $a_{12}= a_{21}=0$	(reject)	(reject)
Wald test for	6.16	20.86
Ho: $d_{11}= d_{21}=0$	(reject)	(reject)
Wald test for	3.04	5.79
Ho: $d_{12}= d_{22}=0$	(accept)	(reject)
Wald test for	6.86	0.61
Ho: $d_{13}= d_{23}=0$	(reject)	(accept)
b_1	0.8067**	1.0514**
	(0.0146)	(0.0867)
b_2	-0.8001**	-0.9054**
	(0.0145)	(0.0885)
Ha: $\|b_1\| -1< 0$	accept	reject
Ha: $\|b_2\| -1< 0$	accept	reject
conclusion	convergence	divergence

Notes: The two equations,

$$\ln X_{t+1} = \alpha_1 + a_{11} \ln X_t + a_{12} \ln Y_t + d_{11} \ln PC_t + d_{12} \ln HC_t + d_{13} EFW_t + \varepsilon_{1t},$$

and

$$\ln Y_{t+1} = \alpha_2 + a_{21} \ln X_t + a_{22} \ln Y_t + d_{21} \ln PC_t + d_{22} \ln HC_t + d_{23} EFW_t + \varepsilon_{2t},$$

were estimated by GMM with fixed effect, where $X_t = CRT_t$ is (per-capita) credits allocated to the private sector and Y_t is (per-capita) real GDP. b_1 and b_2 are the two characteristic roots. Values in parentheses are standard errors. Ho stands for null hypothesis. Ha stands for alternative hypothesis.* stands for significance at 5% level. ** stands for significance at 1% level. Critical values for testing Ha were obtained from Fuller's (1996) test for stationarity around a constant.