Economic Liberalisation and the Empirics of Endogenous Growth in India

by

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Abstract

In this paper, we explore the joint impact of financial development (FD) and trade liberalisation (TL) on real per capita income (y) in post-partition India from the perspective of endogenous growth theory. India followed restricted trade and financial policies until the mid-1980s and started liberalising both sectors from then onwards. The joint impact on growth of FL and TL in India and less developed countries generally is relatively unexplored. We emphasise the shared importance of both policies and their complementarities and assess their joint impact on y. Investment in physical capital (INV) and human capital (HC) are also considered as determinants of y. In addition, the impact of both oil shock and droughts during 1973-75 and 1979-82 is examined. Our analysis of time series data suggests that FD, TL and HC have a positive and statistically significant impact on y, supporting the case for liberalisation of both financial and trade sectors and suggesting that government initiatives in education policy may expedite economic growth. The insignificant impact of INV in the Indian case may be due to the inefficiency of investment expenditure associated with the government and regulated private sectors. Our results also reveal that the second oil price shock and droughts from 1979-82 adversely affected y while the first oil price shock and droughts from 1973-75 did not have statistically any significant impact on y. The insignificant impact of the first shock may be due to the coincident export boom during 1973-75, triggered by the official devaluation of exchange rates.

Keywords: Financial and Trade Liberalisation; Endogenous Growth; Cointegration; India.

JEL Classification: C22; G28; F13; O11; O53.

1. Introduction

The aim of this paper is to examine the *joint* impact on real per capita income of financial development or liberalisation (FD or FL) and trade liberalisation (TL)[1] using endogenous growth theory (EGT), various time series techniques and annual data for India from 1954-1994. Until the mid-1980s, India followed restrictive financial and trade policies and but has since started liberalising both sectors, with significant changes in the early 1990s (see section 2 below). It is widely accepted that financial repression discourages (financial) savings, mis-allocates resources towards less productive sectors and hence deters economic growth (McKinnon (1973) and Shaw (1973))[2]. On the other hand, FL raises: (i) the ratio of saving to gross domestic product (s); (ii) the proportion of savings channelled to investment (ö) and (iii) the marginal productivity of capital (A) (Siddiki (1999) for a survey). FL raises the efficiency of investment by: (a) improving competitiveness, including the availability of information regarding investment projects and (b) facilitating education and training which enhance the quality of human capital (HC) (Gregorio (1996)). Increases in ö, A and s due to FL in turn raise economic growth. Similarly, trade restrictions mis-allocate resources and are deleterious to economic growth whilst TL channels resources towards relatively more productive sectors. TL also increase markets and profits for new

[1] FL implies the removal of restrictions such as administrative setting of interest rates, the allocation of credit facilities to preferred sectors and high reserve requirement. TL implies the removal of quantitative and qualitative restrictions including tariffs and quotas on foreign trade. TL also implies the removal of restrictions on participation in foreign exchange markets.

[2] The McKinnon (1973) and Shaw (1973) hypothesis predicts that restrictions on interest rates discourage financial savings and hence investment is constrained by the supply of funds. These restrictions also reduce the efficiency of investment by encouraging investors to undertake low return projects. Preferential/directed credit also reduces the efficiency of investment since investment decisions under such circumstances are based on government socio-political goals rather than on the productivity of investment.

products and helps in exploiting scale economies and hence a rise in economic growth.

The main goals of both liberalisation policies are to reduce inefficiency in the production process. Note that new or endogenous growth theory (EGT) based on endogenous technological progress predicts that the liberalisation of government financial and trade policies should positively affect economic growth. Empirical evidence shows that growth rates in countries which are following liberalised trade and financial policies outperform the growth rates in countries associated with restrictive financial and trade policies (Fry (1995); McKinnon (1973); Shaw (1973); Siddiki (1999); Thirwall (1994); World Bank (1987, 1989); Levine (1997)). Thus, there has been a growing consensus that both liberalisation policies positively affect economic growth by reducing inefficiency in the production process. However, neither is fully effective in isolation since restrictive policies in either sector could mis-allocate resources and hence cause inefficiency in the production process. Moreover, EGT predicts that investment in physical capital (Romer (1986)) and human capital (Lucas (1988)) increases economic growth.

However, in the case of India, empirical studies have tended to look separately at the impact of FL or TL on economic growth, generally finding a positive effect (Demetriades and Luintel (1997)) for FL and (Ghatak and Price (1997); Ghatak and Utkulu (1997) for TL). To the best of our knowledge, none of the studies looks at the joint impact of both financial and trade policies on economic growth despite their shared importance for India which followed restrictive financial and trade policies. The cost of these restricted policies on Indian economic growth is enormous and is reflected in the low level of economic growth despite levels of saving and investment which, at one fifth of GDP, were higher than other LDCs (Joshy and Little (1994)).

Research on the joint impact of FL and TL on economic growth is very underdeveloped, even on a global scale. Considering the shared importance of both factors Roubini and Sala-i-Martin

(1991) have extended the Barro (1991) growth model to incorporate them. Their inclusion causes the Latin American dummy in the Barro model to be insignificant and also increases the explanatory power of the model, highlighting the importance of both financial and trade variables in economic growth. Blackburn and Hung (1998) consider the impact on economic growth of both financial intermediation (or development) (FD) and TL. Using EGT, their model predicts that economic growth rates under FD tend to be higher than those under direct lending or borrowing and shows that both FD and TL jointly facilitate the rate of economic growth by decreasing redundant research efforts and increasing markets for new products.

In examining the predictions of the Blackburn and Hung model, we look at the impact of financial deepening and TL on real per capita income. In accordance with EGT, we also assess the impact of investment in physical and human capital on real per capita income. Moreover, we explore the impact of both oil price shocks and droughts during 1973-75 and 1979-82, which pushed India into deep crises. These disruptions caused reductions of 2% and 1.5% in the growth rates during these periods. Separating the impact of both shocks is important since unacknowledged regime changes might lead to mis-specification bias in model estimation and to mis-diagnosis of the time-series properties of the data.

We employ three methods: the cointegration analysis of Engle and Granger (EG) (1987), fully modified least squares (FMLS) of Phillips and Hansen (1990) and the ARDL approach of Pesaran and Shin (1998). The EG method has been criticised as sensitive to the endogeneity of the explanatory variables and serial correlation in the disturbances (Maddala and Kim (1998) and Banerjee *et al.* (1993) for a review). The ARDL method includes lagged regressors that proxy dynamic specifications omitted from the model in order to mitigate the effects of serial correlation and functional mis-specification. The FMLS method modifies the traditional estimators to produce an alternative with better known distributional properties and robust with respect to endogeneity and serial correlation. Thus, we explore the robustness of our results by applying the EG, FMLS and ARDL methods.

Our paper makes three main contributions in the empirical literature on FL/TL and endogenous economic growth. Firstly, it explore the joint impact of both FD and TL on real per capita income in India in an EGT framework. Secondly, it applies the EG, FMLS and ARDL time series techniques to compare the results. Finally, it explores the impact of two oil shocks and droughts during 1973-75 and 1979-82. This paper is organised as follows: section two explains financial and trade policies and two shocks and their consequences on economic growth in India. Section three is a literature survey. Section four explains the empirical modelling and the final section draws the conclusions.

2. Financial and Trade Policies in India: 1950-1995

India followed repressive financial policies since the late 1950s[3] and restricted trade policies since independence in 1947. It launched a major planning programme during the 1950s and 1960s for rapid industrialisation via import substitutions, tariffs, forex controls and channelling funds towards the priority sectors (e.g. agriculture, exports and small scale industry) (Demetriades and Luintel (1997); Ghatak and Siddiki (1998), pp. 3-5); Joshy and Little (1994); Sen and Vaidya (1998)). This planning programme was mainly aimed at achieving national self- reliance and economic independence. Large scale industries were mainly promoted and regulated by the government. Imports were severely controlled and exports were subsidised. Such interventionist policies were

[3] However, until the late 1950s, India followed liberal financial policies with no controls on interest rates and low reserve requirements (Demetriades and Luintel (1997)).

used to: (i) protect domestic infant industry; (ii) to insulate the domestic economy from external shocks stemming from the international capital markets; (iii) to reduce the chronic balance of payments (BOPs) deficits and (iv) to make the best use of scarce forex. Interventionist policies were reduced and the trade regime was liberalised significantly in 1985 and 1991. However, imports of consumer goods are still restricted; import tariffs in India still remain as amongst the highest in the world; forex is strictly regulated (World Bank (1994), p. 224; IMF (1997)). Trade restrictions are also reflected in a very high rate of black market premia (Siddiki (1998)).

The Government of India (GOI) nationalised the 14 largest commercial banks in 1969 and another six in 1980 in order to accommodate the government's development programmes and sustain socio-political objectives and 'social controls' over commercial banks (Demetriades and Luintel (1997); Joshy and Little (1994); Sen and Vaidya (1998)). Consequently, after the first nationalisation in 1969, the 22 public sector banks accounted for 86% of deposits, which increased to 92% after the second nationalisation in 1980. Nationalised banks were directed to allocate credit towards priority sectors and expand the banking network towards rural areas. The administratively determined lending rates for the priority sectors were lower than other commercial lending rates. The nationalised commercial banks (NCBs) were asked to increase the priority sector lending to 33% of total credit, by May 1979, of which 16% to the agricultural sector. This directed credit was further raised to 40% of total credit. In addition, the entry of new domestic and foreign commercial banks was also significantly restricted. In the late 1980s, the financial sector was being gradually liberalised with complete removal of ceilings on lending rates in 1989 and of concessionary lending rates in 1990 (Demetriades and Luintel (1997)). The government restricted financial policies have both positive and negative effects. The high growth of bank branches resulting from the government directed policies increased the deposits from 15.3% of GDP in 1969 to 44.7 in 1993 (Joshy and Little (1994)). However, credit controls can have a negative impact on saving, investment and economic growth (Demetriades and Luintel (1997); Ketkar (1993)). The overall impact of distortions in foreign trade and financial sectors on resource allocation is enormous, which is reflected in the low productivity of investment and in a very low level of GDP growth rates until the 1980s, despite saving and investment in India being very high relative to other LDCs (Joshy and Little (1994); World Bank (1994)).

Indian economic growth was also adversely affected by the two oil price shocks and droughts in 1972-75 and 1979-82 (Joshy and Little (1994)). The droughts during 1972-74 reduced average food grain and agricultural production by 8%. The first oil price shock in 1973 raised imports prices by 135% in one year. The official depreciation in 1973 also raised import prices by 15%. Consequently, the terms of trade deteriorated by 43% from 1973 to 75, the current account deficit increased from 16% of exports of goods and services (0.7% of GDP) in 1973 to 21% of exports of goods and services (1.1% of GDP) in 1975. This deterioration of the current account due to increased import prices occurred despite the fact that exports rose, due to the depreciation in official rates, by 64% in dollar value and 17% in volume from 1973 to 1975. The cumulative effect of droughts and the increase in oil prices during 1973-1975 was a 2.4% fall in GDP.

The adverse consequences of the second oil price shock in 1979 were also worsened by the severe droughts in 1979/80. The droughts brought about a reduction of 17.6% in food grain production and of 15% in agricultural production. Overall prices rose rapidly during 1979-82. In addition, import prices in dollars rose by 50% in 1979 and 1980. Domestic oil prices also rose due to the disruption in oil production resulting from the agitation in Assam. Trade balances also deteriorated: the current account position changed from a deficit of 0.3% of GDP (4% of exports) in 1978/79 to a deficit of 2% of GDP (31% of exports) in 1981/82. These shocks from 1979-82 caused a 20% decline in exports and a 1.5% reduction in GDP (Joshy and Little (1994), p. 149).

3. The Economics of Financial and Trade Liberalisation

It is well recognised in the literature that restrictive trade and financial policies mis-allocate resources and deter economic growth. Consequently, growth rates in countries which are following liberalised trade and financial policies outperform the growth rates in countries associated with restrictive financial and trade policies. In particular, countries with negative real interest rates, resulting from an administratively determined low level of nominal interest rates, and a low level of financial deepening (FD) have experienced lower growth rates than those in countries with a high level of FD and positive real interest rates (Fry (1995); McKinnon (1973); Shaw (1973) and World Bank (1989)). In addition, growth rates in LDCs since the 1950s correlate better with export growth than any other single economic indicator (Thirwall (1994));

economic performance of countries with unrestricted trade policies is significantly higher than that of countries with restricted trade policies (World Bank (1987)). Thus, there has been a growing consensus that both liberalisation policies positively affect economic growth.

Earlier literature based on neoclassical growth theory (NGT) offers limited theoretical foundation for this positive relationship, since NGT predicts that neither financial nor trade policies have any long-run impact on the rate of economic growth. However, many researchers have tried to explain the positive relationship between trade and growth by incorporating efficiency effects which result from the use of internal and external scale economies due to TL (Bhagwati (1988); Lee (1993); Krueger (1998)). Note that efficiency and dynamic efficiency effects are considered as major sources of long-run economic growth in 'new' or endogenous growth theory (EGT), which opens an new era in explaining this positive relationship. EGT predicts that both FL and TL along with investment in physical and human capital enhance economic growth (Romer (1986); Rivera-Batiz and Romer (1991); Lucas (1988); King and Levine (993)).

EGT predicts that trade between two countries reduces redundant research efforts and increases: (i) market size for products, (ii) the efficiency of investment and (iii) positive externalities for firms (Krugman (1994); Rivera-Batiz and Romer (1991); Grossman and Helpman (1991). These results are robust even when a third country is included in two country models (Walz (1998)). Similarly, EGT predicts that FL increases saving, investment and the efficiency of investment by: (i) encouraging people towards financial savings; (ii) channelling investment towards more productive investment; (iii) reducing redundant research efforts (Pagano (1993); (iv) facilitating human capital (HC) accumulation (Gregorio (1996)).

Thus, one of the main aims of both FL and TL is to increase economic growth through reducing inefficiency of investment. However, it is apparent that the existing literature mostly emphasises the separate impact of FL and TL despite their shared importance in increasing efficiency of investment. Note that neither FL nor TL policies, in isolation, are very effective in reducing the inefficiency of investment completely if resources are mis-allocated by either of the restrictive trade and financial policies. FL in the presence of trade restriction cannot allocate resources efficiently as the latter causes the mis-allocation of resources. Similarly, international trade requires competitiveness in the production process which in turn requires large scale and efficient investment, which necessitates a liberalised and established or developed financial structure. Hence, FL and TL complement each other.

Demetriades and Luintel (1997) show that bank branches and real interest rates (positively), and

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various types of financial repression (negatively) affect financial deepening in the form of time deposits. In addition, real per capita income is positively associated with investment, real interest rates and financial depth and negatively to bank branches. Note that the impact of real interest rates on financial deepening and growth rates are very small. Thus, the authors argue that financial policies only affect growth through influencing financial deepening. In addition, using EGT, Ghatak and Utkulu (1995) show that trade policies affect both the short and long run output growth rate in India. The long-run growth rate is also positively affected by physical and human capital accumulation. Using disaggregated data, Ghatak and Price (1997) also show that nontraditional manufactured exports and human capital are the most important determinants of output growth.

All of the above studies only consider the separate impact of either TL or FL on real per capita income in India and none of them explores their simultaneous impact, which is particularly important for a LDC, such as India, that has been undergoing a liberalisation process in both financial and trade sectors (see section 2 above). As far as the authors are aware, no research has been undertaken to assess the *joint impact* in LDCs, more particularly in India, using time series analysis and our paper tries to fill this gap.

Research into the joint impact of FL and TL on economic growth is very underdeveloped, even on a global scale. The joint impact of both financial and trade variables is initially highlighted in the Roubini and Sala-i-Martin (1991) model, which has extended the Barro (1991) growth model by incorporating both factors. The Barro model, based on cross-section data, excludes trade and financial policies and includes a dummy to capture lower per capita growth rates, caused by omitted variables, in Latin American countries. The dummy is significantly negative and shows that per capita income growth rates in that region are 1.1% lower than those in the rest of the world. The inclusion of both financial and trade variables by Roubini and Sala-i-Martin (1991) causes the Latin American dummy in the Barro (1991) model to be insignificant and also increases the explanatory power of the model, highlighting the importance of both financial and trade variables in economic growth.

Only recently, Blackburn and Hung (1998) offer a theoretical analysis of the impact on economic growth of both financial development (FD) and TL. Using EGT, this model predicts that economic growth rates under FD tend to be higher than those in the absence of financial intermediation, i.e. under direct lending or borrowing. The model also predicts that both FD and TL jointly facilitate the rate of economic growth by decreasing redundant research efforts and increasing markets for new products. In addition, the authors observe that, in the absence of FD, international financial liberalisation[4] does not have any impact on growth as such, IFL cannot reduce research redundancy and hence, research and development (R&D) remains unchanged.

4. Econometric Model

In examining the predictions of the Blackburn and Hung (1998) model and EGT, we explore the impact on real per capita income of investment in physical and human capital, FL and FL. Our model also incorporates dummies to capture the two external shocks occurred during 1973-75 and 1979-82. Thus, our empirical model specification can be written as follows:

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[4] IFL implies the removal or elimination of restrictions on international borrowing and lending.

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where y is real per capita income (the wholesale price index with base 1990 is used as a deflator); INV is investment as a percentage of GDP; SEC is secondary school enrollment as a percentage of total population; FD is financial deepening, the ratio of money supply (M3) as a percentage of GDP; OPEN is trade penetration ratios, total exports plus imports as a percentage of GDP, D73 and D79 are dummies to capture the oil shocks and droughts during 1973-75 and 1979-82, respectively (see section two). D73 takes a value one during 1973-75 and otherwise a value of zero and D79 takes a value one during 1979-82 and otherwise a value of zero. We use annual data with sample period: 1954-1994. All variables are in natural logarithms. All of our econometric analysis has been carried out using *Microfit 4.0* (Pesaran and Shin (1997)).

We apply cointegration analysis of Engle and Granger (EG) (1987), fully modified least squares (FMLS) of Phillips and Hansen (1990) and ARDL approach to cointegration analysis of Pesaran and Pesaran (1998).

We first carried out the EG method. The augmented Dicky Fuller (ADF) test is used to explore the order of integration of variables in question and shows that all variables except INV are I(1), i.e. the levels are non-stationary, while the first differences are stationary at the 5% level of significance (see table 1 in the Appendix). On the other hand, INV is I(0). We have included INV in the first stage of the EG method in order to improve the small sample efficiency of estimation of the cointegrating relationship among the I(1) variables. To test for a static long-run relationship among

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the variables, we estimated a cointegrating regression, the results of which are as follows[5]:

$\underline{R}^2$ = 0.97, DW = 1.48, ADF = -4.75 (CV at a 5% significance level = **-5.26**; CV at a 10% significance level = -4.83), S.E. of regression = 0.4097, SBC = 63.65, RSS = 0.0571, AR2-F(2, 32) = 1.416[0.257], AR2-ë^2(2)= 3.33[0.189], RESET-F(1,33) = 5.79[0.0.022], RESET-ë^2(1) = 6.12[0.013], NOR-ë^2(2)= 1.62[0.443], H-ë^2(1)= 0.52[0.47], H-F(1, 39)= 0.50[0.482].

Throughout our analysis, t-statistics are reported in the parentheses, ** and * represent 1% and 5% significant levels, respectively; probability values are reported in the square brackets. Although, the model (equation 4.2) passes all diagnostics except functional mis-specification tests, the variables are not cointegrated 5% significance level as the estimated ADF statistics is lower than the critical value (CV). In addition, the coefficients of D73 and INV are statistically insignificant. Thus, we re-estimated the long-run model excluding insignificant variables:

$\underline{R}^2$ = 0.97, DW = 1.4472, ADF = -4.68 (CV at a 5% significance level = -4.77; CV at a 10% significance level = -4.11), S.E. of regression = 0.034, SBC = 67.18, RSS = 0.058, AR2-F(2, 34) = 1.49[.239], AR2-ë^2(2) = 3.31[0.191], RESET-F(1,34)= 5.99[0.02], RESET-ë^2(1) =

[5] AR2-F and AR2-ë (2) are the F and chi square tests, respectively, for joint autocorrelation of the residuals up to order two. RESET-F and RESET-ë^2 are the F and chi square tests for mis-specified functional form. NOR-ë^2(2) is the chi square statistic for testing normality. H-ë^2(1) and H-F are the chi square and F statistics, respectively, for testing heteroscedasticity. The computations are performed by *Microfit 4.0*.

5.99[0.014], NOR-ë^2(2)= 1.92[0.383], H-ë^2(1)= 0.54[0.46], H-F(1, 39)= 0.52[0.475].

Equation (4.3) passes all diagnostic tests except the tests on mis-specified functional forms and shows that variables are cointegrated at a 10% level (or 'marginally' at a 5% level). Thus, the residual based ADF test result for cointegration (equation 4.3) tends to support the long-run 'stable' relationship among the variables included in the model. Results of the system-based Johansen tests (Johansen (1988)) support the 'uniqueness' of the cointegrating vector obtained from the residual based ADF test (table 2 in the Appendix).

Having found a unique and stable cointegrated relationship, we follow the EG methodology by constructing an error correction (EC) model. The favoured parsimonious EC model excluding insignificant terms is reported in equation 4.4:

$\underline{R}^2$ = 0.54, DW = 1.98, S.E. of regression = 0.024, SBC = 86.2361, RSS = 0.019803, AR-1 F(2, 34)= .018[.0.984], AR2-ë^2(1)= .021[.884], RESET-F(1,34)= 5.22[0.0.029], RESET-ë^2(1) = 5.33[0.021], NOR-ë^2(2)= 0.69[0.709], H-ë^2(1)= 0.006[0.937], H-F(1, 38)= 0.005[0.939].

The EC model passes all diagnostic tests except the possibility of functional mis-specification. The coefficient of the EC term is negative and significant supporting a cointegrated relationship as is suggested by the Granger representation theorem (GRT) (Engle and Granger (1987)). The GRT attests that there must be an EC mechanism, if variables are cointegrated, to force variables to maintain their equilibrium relationship. Thus, the residual based cointegration analysis and the EC model support our long-run model. The Johansen (1988) maximum likelihood method also supports the uniqueness of our cointegrated relationship (see table 2 in the Appendix). However, our cointegrated regression (equation (4.3)) and the EC model (equation (4.3)) suffer the problem of functional mis-specification.

The small sample properties of OLS estimation of cointegrated regressions may be weakened by, for example, endogeneity of the explanatory variables and serial correlation in the disturbances (Maddala and Kim (1998) and Banerjee *et al.* (1993)). Two strategies have been considered for dealing with this problem: modifying the initial choice of regression model versus modifying the initial choice of estimator. In the first case, initial models are respecified to include lagged regressors that proxy dynamic specifications omitted from the model in order to remove serial correlation and functional mis-specification. In the second case, initial estimators are modified to produce an alternative with better known distributional properties and robust with respect to non-iid disturbances. The ARDL and FMLS methods fall in the first and second groups, respectively. The ARDL method tests for the existence of a cointegrated relationship among variables and estimates the short and long-run parameters. This method is applicable whether the variables in question are trend stationary or difference stationary (Pesaran and Shin (1998)). The FMLS method is applicable when variables are I(1) and there is a single cointegrated relationship among them (Phillips and Hansen (1990)).

We next employ the ARDL approach to further explore the long and short-run dynamics of our model and to remove the functional mis-specifications (see the Appendix). As described in the appendix, we follow a two-step procedure to estimate equation (4.1). In the first step, we carried out 'stability tests' for examining the existence of the long-run relationship, if any, among the variables y, INV, HC, FD and OPEN. Dummies D73 and D79 are considered as exogenous variables. The following EC model is constructed where y is considered as a dependent variable and the others are independent variables:

Considering the limited number of observations and annual data, we select n = 2, that is, the number of lags is two. The F test, denoted by $F_y(y| INV, HC, FD, OPEN)$, is used to examine existence of the 'stable and long-run relationship'. The null hypothesis of the 'nonexistence of the long-run relationship', i.e. the coefficients of all level variables are jointly zero can be written as follows: H_0 : $\tilde{a}_{1y} = \tilde{a}_{2y} = \tilde{a}_{3y} = \tilde{a}_{4y} = \tilde{a}_{5y} = 0$. The alternative hypotheses that the existence of the long-run stable relationship is $H_1 : \tilde{a}_{1y}, \tilde{a}_{2y}, \tilde{a}_{3y}, \tilde{a}_{4y}, \tilde{a}_{5y} \neq 0$. The calculated F statistic, F_y (.| . . .), is equal to 4.4083 which is higher than the upper bound critical value[6] 4.049 at a 5% significance level. Therefore, we reject the null of no long-run relationship. Similarly, we constructed another three EC models where INV, HC, FD and OPEN are used as dependent variables in turns (each time). The corresponding F statistics are all lower than the critical value 4.049 at a 5% level. Thus, we obtain a cointegrated model with y as a dependent variable. However, our ARDL modelling shows that INV and D73 are statistically insignificant in both short and long run[7], which is also supported by the EG exploration reported above.

Thus, we re-examine the long-run relationship excluding INV and D73. Re-estimated F(.|...) statistics are as follows: $F_y(y| HC, FD, OPEN) = 6.3905$, $F_{HC}(HC| y, FD, OPEN) = 0.976$, $F_{FD}(FD|$

[6] This is the upper bound appropriate for I(1) variables.

y, HC, OPEN) = 1.2715, F_{OPEN}(OPEN| y, HC, FD) = 1.9834. Thus, our results show that only F_y(.|...) is statistically significant and the remaining F_{HC}(.| ...), F_{FD}(.|...), F_{OPEN}(.|...) are statistically insignificant. Therefore, we have again found a stable long-run relationship, excluding INV and D73, with y as dependent variable.

Having found a unique relationship, we estimate the following ARDL (1,2,1,1) model, with lag length determined by the Schwartz Bayesian Criterion (SBC) and considering the dummy D79 as an exogenous variable:

$\underline{R}^2$ = 0.98, DW = 1.94, S.E. of regression = 0.0234, SBC = 82.8618, RSS = 0.017, AR2- F(2, 29) = 0.624[.542], AR2-ë^2(2)= 1.69[.429], RESET-F(1,30)= 0.51[0.479], RESET-ë^2(1) = 0.69[0.406], NOR-ë^2(2)= 0.64[0.726], H-ë^2(1)= 0.86[0.355], H-F(1, 39)= 0.83[0.368].

The model passes all diagnostic tests including functional form. The corresponding static long-run model can be written as follows:

All variables are statistically significant and have expected signs. The EC representation of ARDL (1,2,1,1) model can be written as follows:

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[7] The estimated long-run model of ARDL (1,1,2,1,1) is as follows:

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$\underline{R}^2$ = 0.49, DW = 1.94, S.E. of regression = 0.0234, SBC = 82.86, RSS = 0.01953. The negative and statistically significant coefficient on the error correction term (ECM_{t-1}) confirms our cointegrated stable long-run relationship obtained the ARDL method.

Finally, we also employ the FMLS method, which is intended to correct for any the problems of endogeneity or serial correlation in our empirical modelling. Assuming none of the variables has a drift and selecting Parzen weights with two lags, the results from the FMLS method can be written as follows:

All variables in equation (6.6) have expected signs[8]. Importantly, both EG and ARDL as well the FMLS method give similar results and the coefficients of INV and D73 are statistically insignificant across all methods. Thus, the model is re-estimated excluding D73 and INV and the results can be written as follows:

The exclusion of D73 and INV does not alter the results significantly. Note that all three methods, i.e. EG, ARDL and FMLS, employed in our analysis,

[8] Similar results are obtained across Parzen, Tucky and Bartlet weights and different lag structures. We are using Parzen weights as suggested by Pesaran and Pesaran (1997) *Microfit 4.0.*

provide similar results. Thus, our conclusions are robust across methodologies. These results reveal that real per capita income (y), human capital (HC), financial deepening (FD) and trade penetration ratio (OPEN) are cointegrated where y is a dependent variable. That is, the important long-run determinants of y are HC, FD and OPEN. We observe that HC, FD and OPEN have positive and statistically significant impact on y. The second oil shock and droughts during 1979-82 also negatively affected real per capita income. On the other hand, investment in physical capital (as a percentage of GDP) (INV) and the first oil shock and droughts during 1973-75 captured by D73 have statistically insignificant impact on y. The overall conclusions from our modelling are discussed below.

Our results show that HC is one of the most important determinants of y. This is consistent with EGT, which predicts that technological progress (TP) is an engine of growth, with HC playing a pivotal role in the process of TP (Lucas (1988)), i.e. TP is unsustainable in the absence of skilled manpower. Thus, our result on HC lends support to EGT which predicts that an increase in investment in HC facilitates TP and thus economic growth.

On the other hand, the impact on y of INV is statistically insignificant across all methods. This result is in accordance with the fact that the growth rate of India has been very low even when saving and investment have been more than one fifth of GDP; in fact the apparent inefficiency of investment within the Indian economy is one of the most worrying factor for Indian economists and media (see Joshy and Little (1994) for a survey and WB (1994))). Note that the bulk of the investment in India has been carried out by the government sector, the productivity of which is very low (Joshy and Little (1994)). In addition, a significant proportion of private investment in India has been regulated and controlled via preferential credit arrangements. This preferential credit is mainly allocated according to socio-political consideration rather than the productivity of projects. Thus, though the quantity of physical investment is very high, the quality of it is very low. Results for INV and HC highlight the fact that quality of investment rather than the quantity of investment is more important in raising economic growth in India.

Our result also shows that financial deepening (FD) has a positive and statistically significant impact on y. This positive impact supports the prediction of the McKinnon and Shaw hypothesis and of EGT. An increase in financial deepening raises the capacity of financial intermediaries to supply credit which increases investment and economic growth. Our results are similar to Demetriades and Luintel (1997) who use the ratio of bank deposits to GDP as a measure of FD. These authors also find the impact of real interest rate (R) on y is very small (0.0022). Our own unreported research has also suggested a positive but statistically insignificant impact of R (results are available on request). Our results on FD and R reveal that the availability of funds is more important than the costs of funds in the growth process.

Finally, we observe that the trade penetration ratio (OPEN) as a proxy for trade liberalisation (TL) has a positive and statistically significant impact on y. This result is again in accordance with other studies (Ghatak and Utkulu (1997)) and with EGT. As explained in section three above, TL allows market forces to channel resources towards relatively productive sectors and hence leads to a rise in efficiency. It also increases markets for new products, helps in using scale economies and reduces redundant research efforts across countries.

Finally, our results reveal that the second oil shock in 1979 together with droughts during 1979-82 adversely affected real per capita income. On the other hand, the first oil shock and droughts during 1973-75 captured by D73 do not have any statistically significant impact on y. This may be due to the adverse impact of those shocks being mitigated by a 64% rise in exports from 1973-75 following official devaluations (see section two).

The EG and ARDL methods provide similar results for short-run dynamics, which reveal that the short-run effects on y of HC, FD and OPEN are negative (equations (4.4) and (4.8). Note that the signs of the short-run impact are not constrained priori to estimation. However, our short-run results could be explained as follows. Investment in HC is a long-run project, which requires giving up present consumption for future benefits. Consequently, investment in HC reduces economic growth in the short-run. Similarly, liberalising trade may adversely affect the economy in the short-run due to the shut down of inefficient businesses and the economy requiring a transitory period to adjust to the international competitive environment. Finally, a statistically insignificant short-run impact of FD may again be due to the fact that the financial system needs time to transform financial savings into investment.

Conclusions

In this paper, we have explored the long run *joint impact* of financial development/liberalisation (FD/FL) and trade liberalisation (TL) on the growth of real per capita income (y) in India. We have used annual data from 1954-1994 and various time series techniques to examine the predictions of endogenous growth theory (EGT), which are that FL and TL along with investment in physical (INV) and human capital (HC) increase y. Our study also looks at the impact on y of two oil price shocks and droughts in India during 1873-75 and 1979-82. There is a vast literature on FL or TL and economic growth, which predicts that both FL and TL channels resources towards more productive sectors and increase investment and economic growth. Thus, one of the main goals of both policies are to reduce inefficiency in the production process, however, neither of them is fully effective in isolation since restrictive policies in either sector could mis-allocate resources and hence cause inefficiency in the production process. Very few studies have examined the joint impact of both FL and TL on economic growth despite their shared importance. In fact, to the best of our knowledge, there is no such study of the time series evidence for LDCs, and in particular India. The joint impact is particularly important in the case of India which has been liberalising both financial and trade sectors.

To examine the robustness of our results, our empirical modelling was based on three time series methods: the cointegration analysis of Engle and Granger (EG) (1987), the fully modified least squares (FMLS) method of Phillips and Shin Hansen (1990) and the autoregressive distributed lag approach (ARDL) of Pesaran and Shin (1998). Our overall results reveal that there is a unique cointegrated relationship among y, HC, FD and trade liberalisation (OPEN). However, INV does not enter in the cointegrated relationship. Importantly, all of the three methods provide similar results, implying the robustness of our results across methodologies.

It is observed that HC has a positive and statistically significant impact on y. This result is in accordance with EGT which predicts that skilled manpower is essential for technological progress which is one of the driving force of economic growth. Our result for HC tends to support this argument and suggests that a policy to increase investment in human capital will increase economic growth. Our evidence suggests that economic growth in a LDC such as India is unsustainable without sustained education. On the other hand, the impact of INV on y is not statistically significant. This result agrees with the fact of the low economic growth rate in India during periods of high levels of saving and investment. The bulk of investment in India has been carried out by the government sector, the productivity of which is very low. In addition, a significant proportion of private investment has been controlled and directed towards the preferential sectors, (e.g.

agricultural, exports and small scale industries) by the government. Thus, our result highlights the productive inefficiency associated with administered investment.

Moreover, it is found that FD has a positive and statistically significant impact on y. This positive impact supports the McKinnon and Shaw hypothesis that an increase in FD raises the capacity of banking systems to supply credit for investment which in turn raises y. We also observe that trade liberalisation (OPEN) positively influences y. This result is accordance with the argument that OPEN reduces inefficiency by channelling resources towards more productive sectors and increasing markets for new products, hence helping to achieve scale economies. Finally, it is observed that the second oil shock and droughts during in 1979-82 adversely affected y. On the other hand, the first oil shock and droughts during 1973-75 do not have any statistically significant impact on y. This may be due to the adverse impact of D73 being mitigated by a substantial rise in exports following official devaluations.

In short, our results reveal that both FD and OPEN along with HC are important for increasing economic development. Thus, our conclusions are that the government of India should continue to liberalise its trade and financial sectors and increase investment in human capital to increase the productivity of investment in physical capital and thus increase real per capita income.

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Appendix

Table 1: Augmented Dicky-Fuller Test for Unit Roots: sample period 1954-1994

Variables	Levels	No of lags	First Differences	No. of lags
y	0.665	0	-7.92	0
INV	-3.206	0	-7.166	0
HC	-1.726	0	-6.664	0
FD	-0.1788	0	-6.579	0
OPEN	-0.328	0	-7.369	0

The Dicky-Fuller Regressions include an intercept but no trends. To remove autocorrelation in the DF tests , we included two lags when testing for the level of variables and one lag when testing for their first differences. We use Schwartz Bayesian Criterion (SBC) in selecting the number of lags. In all cases, the SBC selects zero lag at which the error terms experience no autocorrelation. *Microfit 4.0* calculates the 5% critical values for ADF statistics with an intercept and 41 observations = -2.9339.

Table 2

Johansen Tests for the number of cointegrating vectors, with unrestricted intercept but no trends in the VAR; order of VAR = 1(based on the SBC); variables included: y, D79, HC, FD, OPEN; sample period: 1954- 1994. D79 is considered as an exogenous variable which takes one during 1979-1982. We model this dummy as I(1), i.e. difference stationary as the best description available with constraint of the available software.

Null hypothesis	Alternative hypothesis	Test Statistics:	Critical value	Test Statistics:	Critical value
r = 0	r = 1	44.816	31.48	79.7231	62.75
r ≤ 1	r = 2	20.0647	25.54	34.9071	42.40
r ≤ 2	r = 3	9.3863	18.88	14.8424	25.23

Null hypothesis	Alternative hypothesis	Test Statistics:	Critical value	Test Statistics:	Critical value
r ≤ 3	r = 4	5.4561	12.45	5.4561	12.45

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Data Sources:

(A) Chandhol, H.L. and the Policy Group (1990) *India Database - The Economy,* Vol. 1, p. 286-87.

(B) GOI (various years)) *Education in India*, Vol. I.

(C) GOI (various years) *Foreign Trade Statistics*, *Directorate General of Commercial Intelligence and Statistics* (DGCIS), Ministry of Commerce.

(D) GOI (various years) *National Accounts and Statistics,* Central Statistical Organisation (CSO), Ministry of Planning.

(E) GOI (various years) *Office of the Economic Adviser*, Ministry of Finance.

(F) Reserve Bank of India (RBI) (various years) *Report on Currency and Finance*, *Vol. II: Statistical Statements.*

(G) RBI (various years) *RB Bulletin* - Monthly.

(H) GOI (various volumes) *Selected Educational Statistics.*

(I) GOI (various years) *Statistical Abstract of India* (Annual), CSO, Ministry of Planning.

Wholesale price index (WPI): (E) and (A); investment gross domestic product (GDP) at factor costs: (D); money supply: (F) and (G); secondary school enrollment: (B) and (H); exports and imports: (C) and (I).

Methodology: the EG, ARDL and FMLS methods

The Engle - Granger (EG) (1987) representation theorem asserts that whenever the level of a set of I(1) variables are constrained by one or more cointegrating relationships then their data generating process may be expressed as an error correction model (ECM). However, at one level an ECM is simply one possible (constrained) parameterisation of a vector autoregression (VAR). Since the separate equations of a VAR are individually autoregressive distributed lag (ARDL) regressions then the representation theorem may be taken as a hint that cointegrating relationships may be investigated via estimation of ARDL regressions.

We are particularly interested in the case of a single cointegrating relationship, which we might sketch as

which implies by the representation theorem an error correction model

Re-parameterisation as an ARDL model gives

The EG method estimates the long run relationship directly by ordinary least squares (OLS), which is known to be (super) consistent when LR exists. There are problems with this approach. Firstly, the asymptotic properties of OLS now involve the Dicky Fuller distribution. Secondly the long run relationship omits the short run dynamics of ECM and additionally ignores any correlation between the innovations in ECM and the innovations that generate the data for **x**. These omissions may induce serial correlation in the innovation of LR and endogeneity of its regressors, which can be a significant issue in finite samples.

The fully modified least squares (FMLS) method of Phillips and Hansen (1990) estimates the extent of serial correlation and endogeneity and corrects for these by pre-filtering the data for y and adjusting the sample cross-product moments of y with **x** before applying OLS. Pesaran and Shin (1998) argue that un-modified OLS has desirable asymptotic properties when applied to ARDL, provided that the lag lengths are sufficient to proxy for the serial correlation and endogeneity. They further suggest that the choice of estimator for small-sample investigations should be based on Monte Carlo assessment and offer evidence to support a "two-step" strategy in which lag lengths are first determined by the Schwartz

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Bayesian criterion or by the Akaike information criterion and OLS is then applied. Recovery of the coefficients of the long run model is a re-parameterisation exercise and therefore purely computational.

Pesaran, Shin and Smith (1996) offer a procedure for identifying the dependent variable in a system containing a single cointegrating relationship. This procedure involves computation of standard hypothesis tests, albeit with non-standard critical values, applied to an unrestricted version of ECM (UECM):

The joint hypothesis ö =0, **ä′**= **0** asserts that no ECM and therefore no long run relationship exists. An "F-statistic" of this hypothesis is carried out using non-standard critical values developed by Pesaran, Shin and Smith (1996). The UECM is normalised upon a particular selection of dependent variable by omitting the current change of this variable from the right hand side ; applying the F-test to all such normalisations constitute for a search for the direction of causation.