Financial Development, Human Capital and Economic Growth: The Indian Case

FINANCIAL DEVELOPMENT, HUMAN CAPITAL AND ECONOMIC GROWTH AT THE SUB-NATIONAL LEVEL: THE INDIAN CASE

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ABSTRACT

Although at the national level the relationship between financial development, human capital and economic growth has received some attention, this is largely an under-researched area at the sub-national level. Human capital may impact economic growth through the channel of innovation and along with financial development could be complementary or substitute in their relationship to economic growth. Also, human capital investment, enabled by the financial sector development, not only affects growth but also directly and indirectly affects poverty reduction through the channel of growth. In this study we examine the interaction between financial development, human capital and economic growth at the sub-national level using panel dataset covering 23 states of India for the period 1999-2013. Our analysis suggests that there is evidence of positive relationship between human capital and financial development to economic growth.

Keywords: human capital, financial development, economic growth, sub-national, India

JEL Classification: G21; I25; O53; O11

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1. INTRODUCTION

The relationship between financial development and economic growth has been much discussed in the literature (King & Levine 1993a, b; Levine 1997). Financial institutions collect and analyse information, channel investible funds to the investment projects that yield the highest return, and stimulate investment and growth. Some studies have suggested that non-financial factors such as human capital and political stability also play an important role in building this relationship (Outreville 1999). Human capital may impact economic growth through the channel of innovation and along with financial development could be complementary or substitute in their relationship to economic growth (Kendall 2007; Maskay 2012). Better educated people are less risk averse, have high information and are high savers (Zaman, Izhar, Khan & Ahmad 2012). Improving educational levels including adult education provides new opportunities to people and empowers them. Education also allows people to move from informal sector to formal sector opportunities, enabling access to formal financial services. People with higher literacy levels will also be able to demand and comprehend financial products and influence savings and investment positively. Further, financial development enables investment, but for the production to take place, some sort of human capital and skills are required (Majumdar 2012). The two variables could therefore be seen as mutually interactive, requiring policy response at both ends. Human capital investment, enabled by the financial sector development, not only affects growth but also directly and indirectly affects poverty reduction through the channels of finance.

The relationship between financial development, human capital and growth has received some attention at the national level, but this is largely an under-researched area at the sub-national level. The sub-national units may differ significantly from the national level (particularly in large federations) economically, socially, geographically and even politically, consequently requiring a different set of policy responses tailored to their own specific needs, even though they do face a unified legal and monetary framework (Kendall 2007).

Among the few studies at the local level, Petersen and Rajan (2002) noted local distance matters in the grant of credit by the banks. Guiso, Sapienza and Zingales (2002) found a positive relationship between local financial development and economic growth. Jayaratne and Strahan (1996) also noted a positive relationship between bank branching reforms and economic growth at the sub-national level. At the sub-national level the relationship becomes even more complex as the units could be at varying levels of development. This study explores the importance of financial development in the presence of varying degrees of human capital at the sub-national level and their contribution to growth. Kendall (2007) also argues that local factors such as the level of human capital play a crucial role in financial outcomes.

We explore this relationship at the sub-national level for India. We choose India for our empirical investigation for several reasons. Firstly, India is a large country comprising 28 states and 7 union territories.[1] The population of its largest state, Uttar Pradesh is more than 50 per cent of Japan's population and many times more than the population of countries like Norway, Ireland, Switzerland, New Zealand, Spain and even UK. Secondly, the states are at diverse stages of economic development with some reflecting characteristics of developed countries, while others are lagging much behind (Arora 2009). The states have been experiencing high levels of economic growth in recent years. Various factors have been cited in the literature for this outcome such as the role of infrastructure; economic liberalisation resulting in freeing of regulations; higher investment; and technology (Kotwal et al. 2011). Thirdly, financial sector reforms are also being carried out in the country on an ongoing basis since 1991. Lastly, the stock of human capital also varies considerably in the Indian states with high achieving states like Kerala coexisting with low human capital states like Bihar and Uttar Pradesh.

Variations in these factors also impacts poverty reduction through varying growth outcomes (Montalvo and Ravallion 2010). Recent studies have also found that growth elasticity of poverty was highest for the tertiary sector in the post-reform period in India, though other sectors too played their part; also urban growth has been the major influence on poverty reduction since the reforms (Datt, Ravallion and Murgai 2016).

Our study, using growth accounting framework, tests the relationships rigorously using various econometric techniques. In the Indian context we have come across only one study by Kendall (2009) which has investigated the relationship between financial development and human capital in relation to economic growth at the sub-national level. Our data, however, is for 23

[1] In this study we consider 23 states which covers approximately 98% of the country's population.

states of India; whereas Kendall (2009) is at the district level covering only 9 states. Furthermore, we consider time series data for ten years 1999 to 2013 whereas that study includes only two time points 1991-92 and 2000-01.

Our study contributes to the growing body of literature on finance and development in general and in the Indian context. Moreover, our study, by examining the linkages between real sector and banking sector variables at the sub-national level contributes to literature on finance and sub-national entities and in the spirit of Stevens (2010) shows the differential response of regions to a uniform national level monetary policy based on their endowments.

The study is structured as follows. Section 2 reviews the literature. Section 3 contains brief discussion on data sources, model specification and econometric techniques. Section 4 presents the results and the last section of the study concludes.

2. REVIEW OF LITERATURE

The importance of human capital and its role in economic growth has been discussed by a number of studies (Mankiw et al.1992; Psacharopoulos 1984). Human capital, defined as 'direct expenditure on education, training, health and internal migration' was first recognised as a source of economic growth by Shultz (1961). Becker even titled his book 'Human Capital' and described the forms of human capital as schooling, on-the-job-training, medical care and migration to improve income prospects. Benhabib and Spiegel (1994) argue that a well-educated labour force contributes to innovation, adoption of technology and economic growth. Schultz (1993) stressed on the high importance of human capital and its immense contribution to economic progress.

Among the classical economists, Adam Smith highlighted the banks' role in augmenting the productivity of capital stock, and as an outcome, driving growth. Macleod too attributed a positive role to the banks in promoting economic growth (Skaggs 1999, 2003).[2] He argued that by lending, banks bring underutilised resources into production, extend the market by providing credit, and promote venture capitalists through cash credit facilities (see Skaggs, 1999). Bagehot (1853) also argued that the financial system played a critical role in igniting industrialisation in England (as noted in Levine, 1997). Goldsmith (1969) studied financial

[2] A Scottish barrister and a political economist in the nineteenth century.

development and economic growth empirically, taking 35 countries over the 1850-1960 period. He observed that in the course of economic development, a country's financial structure grows more rapidly than the national income.[3]

In the nineties King and Levine (1993 a & b) and De Gregorio and Guidotti (1995) showed that higher levels of financial development are positively associated with faster rates of economic growth. Levine (1997) concluded that, 'theoretical reasoning and empirical evidence suggests a positive, first-order relationship between financial development and economic growth'. Financial intermediaries boost economic growth by identifying the entrepreneurs who could introduce new goods and production processes (King & Levine, 1993a) and facilitate long-run investment in high return projects (Bencivenga & Smith, 1991).

As stated earlier, both human capital and finance contribute to economic development and growth, and their poor presence is regarded as an important factor in the persistence of rural poverty (Khan 2001).[4] De Gregorio (1996) argued that while borrowing constraints increased savings and therefore economic growth, they also reduce human capital accumulation and affect economic growth negatively. Benhabib and Spiegel (2000) examine the impact of financial development on the rates of investment in physical and human capital and observe that financial development leads to the accumulation of physical capital positively and significantly. The authors however, noted a weak relationship between financial development and human capital. This could be due to the choice of particular variables (the authors also mention that different results may be possible if enrolment ratios instead of average years of schooling is considered) and the rigours of the cross-country exercise.

Grier (2002) suggests that while physical capital and human capital can be endogenously determined in a growth model, they could be interacting with each other even if growth is not considered. Thus high level of physical capital can lead to increases in education level which can further lead to a build-up in physical capital through innovation and knowledge building (Nelson and Phelps 1966). Also, education can lead to increase in financial development via demand for financial services. Fishlow (1966) suggested that higher education leads to higher development of physical capital.

[3] This material draws heavily from the author's work Arora (2009).
[4] Physical capital is the accumulation of physical capital stock such as buildings, machines, factories, tools etc. To build physical capital finance is a necessary input.

The role of human capital in the development of the financial sector is also through the creation of innovative financial products. This could have repercussions for the non-financial sector as well. Kneer (2013) based on the sample of 13 EU countries for the period 1980-2005, which is a period characterised by the financial sector reforms in several countries in general, found that financial liberalisation leads to the upgrading of skills, as highly skilled people move to the financial sector resulting in 'brain-drain' from the non-financial sector. This finding is similar to Phillipon and Reshef (2013) who showed that the financial liberalisation led to an increase in the skill-intensity in the US financial sector. Also this resulted in the decline of labour productivity, total factor productivity and value added growth in R&D skill intensive industries. The misallocation of labour across the sectors following the financial sector reforms has been observed by other studies as well (Arcand, Berkes and Panizza 2012; Cecchetti and Kharoubi 2012). Among the reasons for increased demand for skilled labour in the financial sector are: removal of controls on financial activities; emergence of new and complex activities, more so in the securities market; increased competition with removal of barriers to entry and finally, also globalisation with the removal of geographical barriers has also assisted in increasing the demand for skilled people (Kneer 2013).

In contrast, availability of better educated and highly skilled people in the financial sector benefitted less skill intensive manufacturing industries due to better credit scrutiny and monitoring leading to a rise in credit availability. This positive effect was however offset by the loss in productivity in the skill intensive industries due to the movement of people to the financial sector (Kneer 2013).

On other hand, financial development may also lead to the accumulation of human capital through increased credit. Further, an inclusive financial system which covers more groups of people will enable the accumulation of human capital through access to education and training. Moreover financial systems enable the accumulation of human capital by easing liquidity constraints (De Gregorio 1996).

Outreville (1999) was perhaps, one of the early studies to have examined empirically the role of non-financial factors such as human capital and political instability in influencing financial development. The study used M_2/GDP and M_2/M_1 as the indicators of financial development. Using cross-country data for 57 countries, the results of the study showed a positive relationship between financial development and human capital and negative correlation with political instability. The study also found a positive relationship between financial development and real GDP per capita.

Testing the joint endogeneity of two variables, Grier (2002) in a study of 18 Latin American countries concluded that both are jointly determined and have spillover effects on each other. Increase in financial development may also lead to low human capital as people may postpone higher education, other than generic education, in favour of entrepreneurial activities.

Kendall (2009) investigated the relationship between banking sector development, human capital and economic growth at the sub-national level in the Indian context. The study found that an increase in human capital can lead to economic growth despite low financial development constraints. The conclusion which emerges from this study is that a higher level of human capital may reduce dependence on finance and allow growth to take place from human capital intensive activities.

In contrast, Hakeem (2010) employing an augmented Solow model in a panel data framework examined the impact of financial development and human capital in facilitating economic growth in the Sub-Saharan Africa region. The study found a complementary relationship of the financial development and human capital to economic growth in the Sub-Saharan Africa countries. However, it noted a lower impact of the financial development on growth which could be due to the existence of financial repression, low institutional development and poor infrastructure.

In a cross-country context, Maskay (2012) examined the extent to which the effect of financial development on growth depended on a country’s human capital and whether this effect varies with the differences in human capital. The study employed two indicators for financial development- M_3/GDP (liquid liabilities) and the size of stock market as a proportion of GDP and proportion of population above 25 having completed secondary education as a measure of human capital. The findings show a substitute relationship between the two as the countries with low level of financial development can achieve high economic growth with an improvement in human capital.

Cull & Xu (2011) using World Bank Enterprise Surveys database on labour growth in 89 countries found that in low income countries, where the banking system is relatively well developed, firms tend to grow faster, especially those firms which are dependent on external finance. The study also established that a relatively developed banking system in low income countries is associated with higher investment rates, employee training indicating the banks role in developing human capital in the less developed countries.

Using translog production function, Evans et al. (2002) investigated the relative importance of human capital and financial development in the economic growth process in a panel dataset of 82 countries for the period 1972-1992. The study employed two indicators of financial development (M_2/GDP; domestic credit/GDP) and three indicators for human capital (primary and secondary school enrolment rates and real public expenditure on education). The authors found that finance (whether taking M_2/GDP or credit) has a significant contribution to economic growth. The study also found that the interaction between both credit and finance contribute significantly to economic growth and are equally important in the development process.

The above review, especially the empirical literature, shows that most of the studies investigated the relationship in a cross-country setting with countries at different stages of development. The results of the studies are contingent to the selection of countries, period of study and the choice of variables.

3. DATA AND MODEL SPECFICATION

3.1 Model Specification

The objective of the empirical analysis reported below is to test for a causal link between financial development, human capital and economic performance. The approach is to adopt a growth accounting framework, where economic growth is used as the measure of economic performance and FD and HC are entered as inputs in the production function.

Neoclassical growth modelling began with the work of Solow (1956), who employed a neo-classical production function to explain economic growth in the USA during the first half of the twentieth century. Important assumptions of this approach are constant returns to scale and diminishing returns to investment, which imply that for a given rate of saving and population growth economies move towards their steady-state growth path. This can be extended to differences in income levels between countries and regions. A lack of empirical support for convergence and the presence of a large, unexplained “residual” factor in the function estimates have presented a major challenge to these models.

The endogenous growth theory put forward by Romer (1986) and Lucas (1988) led to renewed interest in economic growth analysis. An important advantage of endogenous over traditional growth models is that it is possible to explain a lack of growth and income convergence between countries and regions. The framework also helps to account more fully for the residual factor in Solow-type analyses. The "growth accounting" exercises, popularised by Barro and others (Barro, 1991, 2000; Mankiw *et. al*. 1992, Barro and Sala-i-Martin, 1999) fall within the generalised Solow-type growth model. An important characteristic of this approach is the inclusion of various indicators of economic structure. Most empirical research using this approach has found evidence of "conditional" convergence, where convergence is conditional on the level or availability of complementary forms of investment, including financial development (FD), human capital (HC) and a supportive policy environment and institutional set ups. The importance of institutional capacity to design and implement effective economic policy has been demonstrated in various empirical studies of cross-country growth, for example Sachs and Warner (1995) and Barro (2000). A similar approach is adopted in this study, to examine the role of FD and HC in cross-regional variations in economic growth.

The approach used in the modelling is to assume that each country's production possibility set, in common with most literature in this area, is described by a Cobb-Douglas production function:

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} \qquad (1)$$

where Y is the output level; A, level of productivity; K, stock of capital; and L, stock of labour - 'i' and 't' stand for country and time respectively. Assuming that the production function exhibits constant return to scale with respect to physical inputs, (2) can be written in per capita terms as:

$$y_{it} = A_{it} k_{it}^{\alpha} \qquad (2)$$

where lower case letters refer to per capita units. Assume a simple Keynesian capital accumulation rule according to the following specification:

$$dk / dt = sy - (n + \delta)k \qquad (3)$$

where dk/dt is the rate of change of the per capita capital stock, which is assumed to be equal to the flow of saving (equal to investment) minus capital depreciation and the growth of the labour force. In this equation s is the share of gross saving in output per capita, δ is the depreciation of capital and n the rate of growth of population as a proxy for the growth of the labour force. Setting (3) equal to zero gives us the steady state solution for the stock of per capita capital; k=sy/(n+ δ). Taking the logarithm of both sides of equation (2) and replacing the steady state solution for k from above into (2) gives the steady state solution for output per capita, which is as follows:

$$ln(y_{it}^{*})=[1/(1-\alpha)][ln A_{it}+\alpha ln(s_{it}/(n_{it}+\delta_{it})] \qquad (4)$$

Where (*) above the variable signifies the steady state solution.

We adopt the Mankiw et al. (1992) assumption that economies move towards their steady state solution according to the following approximation:

$$ln\, y_{it}-lny_{i0}=\lambda(lny_{it}^{*}-lny_{i0}) \qquad (5)$$

where y0 stands for the initial level of per capita income, and $\lambda=(1-e^{-\eta t})$ is the adjustment dynamic towards steady state, where $'\eta'$ is the speed of convergence. From (5) we can solve for the growth of per capita output, which is as follows:

$$g_{it}=(\lambda/t)(lny_{it}^{*}-lny_{i0}) \qquad (6)$$

Replacing (lny_{it}^{*}) by its equivalent from (4), gives us a relationship for actual growth of per capita output:

$$g_{it}=(\lambda/t(1-\alpha))[ln A_{it}+\alpha ln(s_{it}/(n_{it}+\delta_{it})]-(\lambda/t)lny_{i0} \qquad (7)$$

Total factor productivity plays an important role in growth. We assume that it takes the following generic form:

$$A_{it} = f(FD_{it}, HC_{it}, Z_{it}) \qquad (8)$$

Where Z is the vector of other control variables, such as economic stability, trade policy, government's role, etc.

There are a number of possible outcomes regarding the interaction between growth, FD and HC, as well as FD and HC. Although the general literature suggests a positive link between growth and FD, there are a few (e.g. Robinson 1956 and Lucas 1988) that question this interaction. Similarly in the context of FD and HC, as well as being complementary positively interaction jointly with growth, there are studies, such as Kendall (2009) as mentioned earlier, which suggest the two may instead be substitute for each other. To test these competing hypotheses we include an interactive term (HC*FD) to capture this interaction. We further assume that the specific functional form that *A* takes is as follows:

$$A_{it} = \beta_0 A_{i0} + \beta_1 \ln FD_{it} + \beta_2 \ln HC_{it} + \beta_3 \ln(FD_{it} * HC_{it}) + \beta_4 Z_{it} \qquad (9)$$

Substituting for A from (9) into (7), per capita growth of output (g), gives us a growth model of the following form:

$$g = \phi_1 ln A_{i0} + \phi_2 \ln FD_{it} + \phi_2 \ln HC_{it} + \phi_3 \ln(FD_{it} * HC_{it}) + \phi_4 Z_{it} + \phi_5 ln(s_{it} / (n_{it} + \delta_{it})) - \phi_6 ln y_{i0} \qquad (10)$$

Adding some control and qualitative variables as well as a stochastic term to (10) provides a model which we use to assess the role that FD and HC plays in economic growth.

Variables added to equation (10) broadly follow the growth empirics literature, such as Barro (1991, 2000), Mankiw et al. (1992) and Islam (1995). Amongst the control variables included in most empirical research are initial conditions, both in terms of the level of development (as proxied by GDP per capita). Most also include proxies for the macroeconomic environment such as inflation, trade openness and the government's involvement in economic activities. In the case of one country case study such as this one however, these factors are expected to be common for all the regions, or if different information on the regional basis may not be available. In our case however we have data on regional basis for infant mortality rate and road length that could be added as control variables. Qualitative variables can also be added to account for specific events in a region, as well as data heterogeneity when panel data are used. In our analysis, depending on the nature of data set constructed, we make use of all or some of these variables with the aim of ensuring that our regressions are appropriately specified.

An issue that needed to be addressed at the outset is causality. It could be argued that instead of FD and HC determining economic growth, both could be determined by the economy's growth rate. Economies that grow faster are able to generate higher levels of income and are therefore able to support the development of better supportive environment, including enhanced quality and quantity of their FD and HC. Or, alternatively, there may be a level of simultaneity, in the sense that FD and HC generate more sustained economic growth, which in turn supports more and better FD and HC.

The Granger causality test is commonly used in empirical work to establish the direction of causation. However, this test is sensitive to the length of lags of the variables used and therefore requires a relatively long time series dimension to be able to select the right length of lag and to be relatively confident about the conclusion drawn. The problem we face is that the time dimension of most variables in our data set is rather limited. We were therefore unable to apply the Granger causality test. Instead, as discussed below we make use of GMM that is expected to address both endogeneity as well as causality.

We apply a number of methods of estimation to the model specified by equation (10). One is based on application of simple OLS to pooled data that we have constructed. In this we attempt to measure directly any possible impact that FD and HC may have on regional economic growth. Signs of the parameter for the interaction would also tell us whether the two are complementing each other or substituting for each other. There may potentially be a non-linear, quadratic relationship between all these that could also be tested for. The second is based on panel data, in which we indirectly estimate the growth contribution of FD and HC. Given the limitations of this technique in cases where endogeneity and causality may be an issue, we also apply GMM that is expected to address these potential problems. This would allow us to make firmer statements regarding possible links between growth, FD and HC.

3.2 Data Specification

Data is collected annually over the period of 1999-2013. There are, however a few gaps in the data coverage for a number of states. In addition, a number of variables such as states' population are based on a 10 years survey and annualized by interpolation. Annual data of this nature also suffers from a number of other problems such as cyclical variations that would generate considerable noises for time series analysis. To correct for some of these problems, variables are converted into 5 year averages over the periods 1999-2003, 2004-2008 and 2009-2013, which would give us three observations for each of the 23 states we have data on. For a small number of variables, such as financial development index (finindex) and education development index (deindex) that extend to 2008, the number of observations per state is reduced to 2.[5] Given the small number of observations, we have not included these variables in our analysis. This would give us a total number of 69 observations. For two states however, data on a couple of key variables that we are using in our analysis are not available and as a result they are excluded from the analysis. Stata in the package we have used in the analysis reported below.

4. RESULTS

Starting with the descriptive analysis of data, Table 1 provides correlation coefficient matrix for the variables that are considered here. As indicated in column 1, all the variables except one, initial GDP per capita (linigdppc) have the expected sign with GDP growth (gdpg). The strength of this relationship however, is not very high and varies between variables. Some also have quite a high correlation between themselves (rm3gdp, fdhc and their logs for example) creating potential problems of multicollinearity if used in the same regression together. This is in fact a problem that we have encountered here, using the model specification (10) above that incorporates both an indicator of financial development and human capital (rm3gdp, pe and their logs) as well as their interaction (fdhc or lfdhc).

[5] The indices are not reported here, however they can be provided on request.

Using a simpler version of the regression model specification (10) above, we start our analysis by running simple OLS for both sets of data that we have constructed, one on a time series basis over the period of 1999-2013 for the 23 states and the other for the five year average dataset. In both cases, there seems to be considerable heterogeneity in the data leading to regression results that are generally invalid. To correct for this, we make use of a fixed and random effect panel. Hausman diagnostic tests suggest that in general, the fixed effect is a more appropriate technique to use.

Data description above provides details on the proxies that we have used for financial development indicators as well as human capital for different states. Given unavailability of other variables for both these proxies, we have ended up using rm3gdp (regional M3/GDP) for financial development and primary sector education and infant mortality as proxies for human capital. Data on primary school education for different states however is more fully covered for different states and therefore the regression results reported use this variable as a proxy for human capital formation. In terms of control variables, there is none available to be used in our analysis, which is a reflection on the relatively low R^2 in the regressions we have run and the one that is reported below. Additionally as pointed out earlier, given the very high correlations between *rm3gdp, fdhc* and their logs, the two combined in the same regression generates multicollinearity and the consequent unreliability of parameter estimates. There is also a weaker case of potential multicollinearity in the case of infant mortality and financial development indicator. For this reason we have reported below regression results that are based on entering these variables separately in regressions. Regression technique applied is that of heteroscedasticity adjusted panel fixed effect.

As indicated in Table 2 below, all parameter estimates appear with the correct sign though a few are statistically insignificant, which could be explained by the sort of data coverage as well as proxies used. Changing the proxy for human capital from primary education ratio to that of infant mortality improves the regression results somewhat, parameter estimates appear with the correct sign as before and their statistical significance improves. Introducing the interactive term (fdhc1=rm3gdp*infm), somewhat improves the regression results in terms of statistical significance of parameter estimates, though for the term itself it appears as statistically insignificant. The latter could partly be explained by a relatively high correlation between the two variables involved. Evidence of multicollinearity is apparent when comparing results in Table 5 with those in regressions Tables 2 and 6. In terms of convergence between states over time, although parameter estimate for the lag of initial lgdppc appears with the correct sign their statistical significance is marginal, which could be partly explained by lack of sufficiently long time series data for this to be effectively realised.

Although our analysis seem to support the positive role that financial development and human capital formation play jointly in the economic growth of the states in India, lack of sufficiently long data together with proxies to fully capture various dimensions of the two variables does not allow us to make a definitive conclusion about these interactions. Better quality and quantity of data is required to make this conclusion. At this stage however, given the available data, there is sufficient evidence to suggest that economic growth differentials between different states in India are partly due to the differential path that they have taken in terms of strengthening their financial and human capital developments reflected in differences in poverty also across the states.

5. CONCLUSION

The role of finance in economic growth has been well documented in the literature. However, in generating this outcome, non-financial factors also play a significant role. In this study we examine one such factor, human capital and its interaction with financial development and their relationship with economic growth for the Indian states for the years 1999-2013. Using growth accounting approach we test these relationships using various econometric techniques. Our regression analysis also seem to suggest that there is a relationship between human capital and financial development, however due to lack of sufficiently long term data on some variables we cannot arrive at a firm conclusion. Also, there may potentially be a non-linear, quadratic relationship between all these that could also be tested for.

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Table 1: Correlation coefficient matrix

	gdpg	rm3gdp	pe	lrm3gdp	lpe	lssexps	lkexps	linfm	fdhc	lfdhc	fdhc1	linigdppc
gdpg	1.0000											
rm3gdp	0.2271	1.0000										
pe	0.2519	-0.0683	1.0000									
lrm3gdp	0.2222	0.9592	-0.0952	1.0000								
lpe	0.3212	0.0081	0.9735	-0.0075	1.0000							
lssexps	0.0999	-0.0219	0.2499	-0.0689	0.3219	1.0000						
lkexps	0.3040	-0.2502	0.3233	-0.2906	0.3302	0.0436	1.0000					
linfm	-0.3829	-0.3927	-0.1302	-0.3744	-0.1287	0.0211	0.2434	1.0000				
fdhc	0.3098	0.9331	0.2745	0.8908	0.3495	0.1097	-0.1218	-0.3857	1.0000			
lfdhc	0.3435	0.8525	0.3793	0.8791	0.4687	0.1063	-0.0987	-0.3909	0.9551	1.0000		
fdhc1	-0.1289	0.6061	-0.1724	0.6232	-0.0931	-0.0458	-0.0954	0.4510	0.5433	0.5066	1.0000	
linigdppc	0.3151	0.5226	0.1065	0.5246	0.1305	-0.1729	-0.1326	-0.5765	0.5130	0.5248	-0.0099	1.0000

Table 2: dependent variable is gdpg

R-sq= 0.4807

Prob > F = 0.0000

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
rm3gdp	.0836838	.0326871	2.56	0.019	.0154998	.1518677
pe	.0265125	.0193756	1.37	0.186	-.0139042	.0669292
lkexpdep	7.011037	1.651035	4.25	0.000	3.567038	10.45503
linigdppc	-1.213906	2.047669	-0.59	0.560	-5.485268	3.057457
_cons	3.546808	18.56468	0.19	0.850	-35.17844	42.27206

Table 3: dependent variable is gdpg

R-sq= 0.5159

Prob > F = 0.0000

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
linigdppc	-2.770445	1.598472	-1.73	0.098	-6.1048	.5639099
rm3gdp	.0457219	.0270711	1.69	0.107	-.0107475	.1021912
infm	-.1330031	.0552068	-2.41	0.026	-.2481625	-.0178437
lkexpdep	7.792399	1.525105	5.11	0.000	4.611087	10.97371
_cons	31.04231	17.88206	1.74	0.098	-6.259007	68.34363

Table 4: dependent variable is gdpg

R-sq: within = 0.5200

Prob > F = 0.0000

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
linigdppc	-3.253663	1.525351	-2.13	0.045	-6.435489	-.071837
rm3gdp	.0595055	.0296916	2.00	0.059	-.0024301	.1214412
infm	-.1206529	.0627419	-1.92	0.069	-.2515301	.0102243
lkexpdep	7.700448	1.501511	5.13	0.000	4.56835	10.83254
fdhc1	-.0004227	.0006401	-0.66	0.517	-.0017579	.0009125
_cons	35.79822	17.46819	2.05	0.054	-.6397863	72.23622

Table 5: dependent variable is gdpg

R-sq: within = 0.5019

Prob > F = 0.0000

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
rm3gdp	-.0265822	.1001137	-0.27	0.793	-.2354158	.1822514
pe	-.0194066	.0436263	-0.44	0.661	-.1104094	.0715962
fdhc	.0009527	.0008011	1.19	0.248	-.0007183	.0026237
lkexpdep	7.203774	1.543221	4.67	0.000	3.984671	10.42288
linigdppc	-1.238082	1.918461	-0.65	0.526	-5.239923	2.763758
_cons	9.316162	16.78716	0.55	0.585	-25.70124	44.33357

Table 6: dependent variable is gdpg

R-sq: within = 0.4978

Prob > F = 0.0000

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
fdhc	.0006738	.000206	3.27	0.004	.0002442	.0011035
lkexpdep	7.072832	1.433941	4.93	0.000	4.081683	10.06398
linigdppc	-1.304278	1.745273	-0.75	0.464	-4.944852	2.336297
_cons	8.213553	16.63951	0.49	0.627	-26.49587	42.92297