WPS4838

POLICY RESEARCH WORKING PAPER 4838

Local Financial Development and Growth

Jake Kendall

The World Bank
Financial and Private Sector Vice Presidency
February 2009

Policy Research Working Paper 4838

Abstract

Using a unique sample of net domestic product data for districts in India, I investigate the connection between banking sector development, human capital, and economic growth at the sub-national level. Using disaggregate data avoids many of the omitted variable problems that plague cross-country studies of the finance-growth connection and facilitates an instrumentation strategy. The findings show that the growth of many districts in India is financially constrained due to lack of banking sector development, and that the relationship between finance and growth may be non-linear. For the districts in the sample, moving from the 75th percentile of credit/net domestic product to the 25th percentile implies an average loss of 4 percent in growth over the 1990s. This indicates that the gains from increased banking sector outreach may be large. The analysis shows that human capital deepening can reduce the effect of the financial constraint and help decouple growth from financial development. In a district at the 25th literacy percentile, the implied growth loss due to a constrained banking sector is twice as large as in a district at the 75th literacy percentile. Thus, higher levels of human capital may activate alternative growth and production channels that are less finance intensive.

This paper—a product of the Financial and Private Sector Vice Presidency—is part of a larger effort in the department to understand the role that banking sector outreach plays in economic development. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at jkendall1@worldbank.org.

Local Financial Development and Growth[1]

Jake Kendall[2]

The World Bank

Keywords: Banking; Financial Development; Human Capital; India; Regional Growth.

JEL Classification Numbers: I2, I3, O1, O3, O4, R1, F4, G2

[1] The findings, interpretations, or opinions expressed in this paper do not necessarily reflect those of the World Bank, its Board of Executive Directors, or its member organizations. I would like to thank Nirvikar Singh for his help in obtaining this data and his generous advice. I would also like to thank my advisor Joshua Aizenman for his critical support in my research. Further thanks go to Carl Walsh, Yin-Wong Cheung, Mike Dooley, Micheal Hutchison, Alan Spearot, Jon Robinson, Lori Kletzer, Lauren Malone, Jonathan Conning, Bob Flood, Thorsten Janus, Simeon Djankov, Alejandro Ponce Rodriguez, and seminar participants at UC Santa Cruz, Oxford, Vasar, Georgetown, Hunter College, the World Bank, and U. Richmond, for valuable comments

[2] **Author Contact Information**: The World Bank, 1818 H Street NW, Washington, DC, 20433. E-mail: jkendall1@worldbank.org

1. Introduction

The idea that the financial sector has the potential to affect patterns of innovation and growth is an old one going back at least to Schumpeter (1912). In the recent literature, the question of whether economic growth is enhanced in the presence of a strong and efficient financial mechanism has been examined in many contexts and the conclusion has usually been that it is. A prominent line of empirical research - started by King and Levine (1993) and extended by Levine and Zervos (1998), Levine, Loayza and Beck (2000), and others - has studied cross-country data and reached a consensus that financial development is an important factor in national growth.[3] This line of research has demonstrated that the size and depth of an economy's financial system (usually measured as the value of a financial aggregate, such as credit, to GDP) is positively correlated with its future growth in per capita, real income.[4] The evidence from cross-country regressions, however, is plagued by omitted variables problems and must be viewed with some skepticism because the data have been used so intensively by so many researchers (see e.g. Levine and Renelt (1992) who demonstrate the parametric instability inherent in cross-country regressions).

One contribution of this paper is to reassess the finance-growth relationship in a sample of sub-national economies where there are fewer omitted variable problems. In doing so, the paper addresses an issue that has received much less attention, namely, the importance of promoting geographically diffuse banking sector development across regions. The results presented here demonstrate the potential returns to efforts to develop local financial capacity both because the lack of such capacity is found to stymie growth, and because the least financially developed districts suffer a disproportionately greater penalty. I also test the interaction between human capital depth and financial development at the district level and find that human capital may help to decouple the dependence of growth from finance. This result is non-obvious, as a model based

[3] Though it does not purport to address the connection between finance and growth, a cross country study by Aizenman, Pinto and Radziwill (2007) shows that countries who finance their growth from local savings as opposed to foreign borrowing have grown faster historically.

[4] Significant work has also been done into the determinants of the level of financial development, including: Djankov, McLiesh and Shleifer (2007), La Porta, Lopez-de Silanes, Shleifer and Vishny (1998), and Djankov, La Porta, Lopez-de Silanes and Shleifer (2008).

on a standard production function would likely show the two to be complements, but is in line with other work on the Indian economy which shows that human capital may enable less finance-intensive activities (e.g.Amin and Mattoo (2008)).

For this study, I use a new data set of district level Net Domestic Product (NDP) measurements from the internal records of the Reserve Bank of India (RBI).[5] The data document growth over the 1990s at the level of the district (in India, districts are the geographical government division that is just below the level of the state). In addition to NDP measurements, the dataset includes measures of adult literacy, credit and deposits in local commercial banks, geographic area, population, and road infrastructure by district in both 1990-91 and 2000-01.

The use of disaggregated district level data limits the omitted variable problems mentioned above. Districts in my sample exist within a unified political, legal, and monetary framework, there are no de jure barriers to trade or capital flows between them, and they are - for the most part - at similar stages of development. This homogeneity means that there are fewer omitted control variables relative to cross country growth studies. Additionally, district borders often correspond to the economic catchments around a single city making them a natural unit of study.[6]

While disaggregate data help to address some of the methodological issues associated with cross-country data, they also allow me to focus on important substantive issues which have been largely ignored by the finance-growth literature. Studies of the financial sector's influence on growth tend to focus on factors which apply at the national level. They do this explicitly by focusing on markets, such as stock and bond markets, for which access does not vary much across regions.[7] They also do it implicitly by choice of

[5] NDP is GDP adjusted for estimated capital depreciation.

[6] Many Indian districts derive from princely city-states which existed in pre-colonial India and whose borders were formed by older historical/economic forces.

[7] See, e.g. Levine and Zervos (1996).

instruments. The inflationary tendencies of the central bank, banking reserve requirements, features of securities law and financial regulations, and features of the judiciary system are examples of instruments which have been used in the cross country literature on finance and growth.[8] In each case, these factors measure constraints on the financial sector that apply at the national level and affect the entire economy as a whole.

This approach raises the question of whether the positive relationship between financial development and growth obtains at the sub-national level. On the one hand, there is mounting evidence that location and the distance between borrower and lender is a factor in the production of financial services, especially credit to small and medium enterprises. Petersen and Rajan (2002), for instance, document that even in the United States, the distance between small business borrowers and their banks is very short, less than 20 miles (35 km) for over 75% of loans to these firms. On the other hand, it seems completely plausible that for larger enterprises, finance could be intermediated entirely from the developed banking sector of a major city, rendering irrelevant the size of the local financial sector in other regions.

In one of the few recent papers that addresses the topic of regional financial development, Guiso, Sapienza and Zingales (2002) study regions in Italy and find that a higher level of local financial development promotes the growth of local firms and increases the probability that an individual will start a business. The paper does not, ultimately, address the issue of growth and leaves open the possibility that their partial equilibrium results will not translate directly to a general equilibrium equivalent. Another study, by Jayaratne and Strahan (1996), finds a positive relationship between bank branching law reform and growth in US states. While the magnitude of the effect they find is large, they address a very specific legal constraint on

[8] Much effort has been expended to determine the causes of financial development or the lack thereof. La Porta et al. (1998) show that the extent of investor legal protections largely determines the ability of the financial system to extend credit. Other determinants of financial development that have been explored are financial repression (Haslag and Koo (1999) and Aizenman (2008)), macroeconomic stability (Rousseau and Wachtel (2001)), politics (Rajan and Zingales (2001)), regulatory features (Jayaratne and Strahan (1996)), social and religious practices (Stulz and Williamson (2001)), among others. Some of these factors have not been studied to the same extent as legal institutions but have been shown to be important in at least some contexts.

competition in the US financial system, which may not apply in other countries and contexts. The approach I take here parallels other work in the finance-growth literature in using relative size of the financial system as a proxy for the level of development of the financial system, while employing instrumental variable techniques to mitigate endogeneity concerns.

The studies mentioned above address topics related to those addressed in this paper, however, none of these studies has addressed the issue of whether greater banking sector depth is associated with faster growth in a region, and none were conducted in a developing economy.[9] In this paper I address these gaps in the literature by measuring the relationship between the depth of a district's banking sector and the growth of that district.

The results presented here demonstrate the potential gains from banking sector outreach by showing that regions with greater banking sector capacity grow faster.[10] I find that a district which moves from the 75th percentile of bank credit/NDP down to the 25th percentile will lose 4% growth over the decade. I also attempt to measure whether this relationship is non-linear and find evidence that it is. The measured effect of banking sector depth on growth is more than double in districts with credit/NDP below the median. This result is especially relevant in India where many of the past policies designed to foster banking sector outreach have focused in the areas with the lowest banking sector penetration (Burgess et al. (2005)). My regressions indicate that it is precisely these areas which were still the most financially constrained in the 1990s.

While there are many cross-country growth studies that investigate financial development, human capital,

[9] The relationship between banking sector depth and growth is the one most comparable to the line of literature embodied in King and Levine (1993), which tends focus on financial depth measures to measure financial development.

[10] Designing policies to promote banking sector outreach is an issue which Indian policy makers and others around the world continue to struggle with. Burgess, Pande and Wong (2005) document the results of the Indian social banking experiment, Kumar (2006) documents initiatives in Brazil to foster banking sector outreach. In fact, my results demonstrate the importance of geographic banking sector outreach generally, whether it be market or policy driven.

and their separate contributions to growth, none that I know of has measured the interaction between the two.[11] A further contribution of this paper is to measure the interaction between financial development and human capital in generating growth and find them to be substitutes. This result would likely be at odds with a model incorporating a standard production function, where human capital and invested resources enter multiplicatively and are thus complements. Instead, this result provides support for the notion that higher levels of human capital may activate alternative growth and production channels which are less finance intensive. A recent study by Amin and Mattoo (2008) finds that, in the 1990s, areas in India with greater levels of human capital saw much faster growth of the service sector, which generally requires less up-front financing.[12] I build on this result and show that the regression parameter on the interaction between the intensity of human capital (which I proxy with the adult literacy ratio) and banking sector depth has a negative parameter indicating that the two factors are substitutes and that human capital reduces the magnitude of the financial constraints on growth. In my sample, a district at the 25th percentile of adult literacy, the loss of growth attributable to constraints on the banking sector is twice as large as in a district at the 75th literacy percentile.[13]

Section 3 develops an instrumentation strategy that relies on the disaggregate nature of the data set. Because banks in each district are connected to regional and national markets for funds via the money market and the internal capital markets of their parent banks, capital can flow freely across district boundaries. Thus each district's banking sector can be thought of as an open economy where the level of deposits generated in the districts does not determine the local supply of credit to local banks, which is effectively infinite. Thus, if we do see covariation of credit/NDP and deposits/NDP this will be driven by variation in the capacity of the banking sector to deliver those services to the local economy. By exploiting

[11]The paper by Ahlin and Pang (2008) tests the interaction between financial development and corruption and finds them to be substitutes.

[12]Another recent study by Bell and Rousseau (2001) set in post-independence India concludes that the financial sector contributed to gross investment and to manufacturing growth but did not have a measurable impact on TFP.

[13]To show that this result is not driven by a non-linear relationship between finance and growth combined with a correlation between finance and human capital, I include a non-linear finance term in some regressions and the result holds.

this fact, I can instrument for the supply-determined, portion of credit/NDP and asses its impact on growth.[14] As a robustness check I employ an alternative strategy that relies on measures of urban density as proxies for the ability to profitably overcome the fixed costs of bank branching. Both instrumentation strategies pass the usual battery of instrument tests and give similar results.

The paper is structured as follows: Section 2 briefly describes recent economic history in Indian and various efforts at developing greater banking penetration and higher levels of human capital. Section 3 is an analysis of the district NDP data which shows that 1) financial constraints are a significant bottleneck to growth at district level, 2) it is the least financially developed districts that suffer the most from this constraint, and 3) literacy and banking sector development appear to be substitutes in the aggregate growth process. Section 4 is a series of robustness checks and refinements on the main results. Section 5 concludes.

2. India in the 1990s

Through most of the 1970s, India's growth averaged 3.75% per year.[15] This rate of growth was not enough to produce significant convergence to the frontier and was soon eclipsed by the rapid growth rates elsewhere in Asia during the 1980s. Due partly to the contrast with the rest of Asia, the 1980s saw a significant shift in policy to a more pro-business attitude and a loosening of centralized socialist policies while growth accelerated to 5.8% (Rodrik and Subramanian (2004)).

Facing a balance of payments crisis in the early 1990s, the Indian government made two major changes which were the lowering of tariffs and other quantitative restrictions on trade, and liberalizing financial markets. These changes fed into the pro-business shift of the 1980s and growth continued apace. Additionally, the move to loosen central control opened up state and district governments to greater

[14]This instrumentation strategy is similar in concept to the one used by Calomiris and Mason (2003), who use sub-national data to eliminate the effects of shocks to the money supply and employ lagged measures of bank balance sheet weakness as instruments for future credit market outcomes.

[15] Rodrik and Subramanian (2004) dub this the "Hindu" rate of growth, "...disappointing but not disastrous..."

autonomy of local action to promote growth through local policy initiatives (Singh and Srinivasan (2002)).

Over the course of the 1980s and 1990s, India's economy went through major sectoral shifts as well. In Singh and Srinivasan (2002), the authors document a large change in the composition of GDP over the course of the 1980s with agriculture losing ground as a percentage of GDP (going from 38.1% to 30.9%) to industry (25.9% to 30.0%) and services (36.0% to 39.1%). During the 1990s the services sector continued to grow and ended the decade at 40.6% of GDP while the industrial sector fell slightly to 29.4% of GDP. Recent research by Amin and Mattoo (2008) indicates that much of the differential growth of services over manufacturing happened in areas with greater concentrations of human capital. Their evidence points to a differential role for human capital as an important factor for enabling the services sector. The results in Section 3 indicate that human capital and banking sector penetration are substitutes in the process which accounts for district level growth. Because the service sector often is less "finance intensive", human capital may have freed some areas from the constraint of a less developed banking system.

Despite the attention that the growth of the Indian IT-related services sector has received, its contribution to GDP at the end of 2001 was only 1.2% (though it has grown to nearly 5% in 2007). The rapid growth of services in India over the 1990s was largely in low-tech services such as transport, construction, maintenance, and repair. Additionally, the IT-led growth was clustered in a few major centers, Bangalore and Hyderabad being the main examples, and did not much impact the outlying areas which are more heavily represented in my data set.

The pro-business shift of the 1980s set the stage for greater levels of competition and investment and the associated innovation and productivity growth. The sectoral shifts, first toward industrialization, then toward a greater mix of services have favored human capital including higher levels of literacy and worker

skill. These shifts combined with the market liberalization of 1991 to create an environment where there was at least the possibility for rapid growth given the proper inputs. Of the districts in my sample, a handful of them staged a "growth miracle" and doubled their income per capita in 10 years.[16] On the other hand, some districts barely grew at all and some even exhibited negative growth in real terms, ending the decade worse off than they began it. [17]

In Section 3, I attempt to determine what accounts for this wide variation in growth rates. I focus on two potentially major factors: financial development and human capital.

2.1 The Indian Banking System

Even before independence in 1947, the Indian financial system was fairly advanced by developing country standards, featuring the significant presence of foreign banks and a stock market. Two nationalization waves in 1969 and 1980 left the banking sector largely in public hands. Until the reforms of 1991 the banking industry was also highly regulated under what was termed "social control". Banks were mandated to branch into poor and rural areas, and lend on favorable terms to "priority sectors" including small firms and agriculture and to traditionally disadvantaged groups within these sectors. After the reform of 1991, rural branching stopped and there was an attempt to and lending was supposed to be based on market forces, though ownership was still largely in public hands. Burgess et al. (2005) summarizes work by the authors that investigates the impact of social banking branching rules on rural poverty and on individual access to loans and credit. The authors find that these rules, which required banks to branch into rural, unbanked locations, reduced poverty and increased local access to financial services.

[16]This definition of "growth miracle" comes from Parente (2000), which is a doubling of income in 10 years.

[17]Some of the negative growth may be attributable to changes in the method of calculating real NDP between 1991 and 2001 which occurred in Uttar Pradesh. The changes imply a constant level difference and thus will not much effect regressions on the growth rate with state dummies added in.

Despite this liberalization and subsequent expansion of the financial sector, significant barriers remained that hindered the extension of credit and collection of deposits. In a recent World Bank report, Kumar (2008) collected survey responses from central bank regulators and commercial banks in 54 countries around the world. The responses document the various barriers to financial access by poor households and SMEs. While India has some of the lowest fees of the 54 countries surveyed, access is still hindered there by some of the longest wait times and highest document requirements for deposit accounts.

Based on Figure 1, it seems that whatever the effects of the liberalization, they fell proportionally equally on all districts and did not affect the relative distribution of financial depth. A Spearman Rank test, used to estimate the correlation in a district's rank in the financial depth distribution in 1991 with its rank in 2001, measures the correlation at over 0.8 indicating very little mixing over the 1990s.

This implies that whatever forces shaped the initial distribution of banking sector penetration did not go away after the liberalization.

2.2 Education and Literacy in India

Similar to physical capital, human capital is non-rival and excludable. In addition, however, it is also non-appropriable, which means that it cannot be used as collateral and its accumulation may be difficult to fund by borrowing, even in relatively advanced credit markets. There are also well documented spillovers from human capital (as there are in many new growth theory models) that push the social marginal product above the personal marginal product. For these reasons, most governments around the world, including India's, have chosen to subsidize education provision as a public good.

The National Policy on Education (NPE) 1986 and revised Plan of Action (PoA) 1992 envisioned that free and compulsory education should be provided for all children up to 14 years of age before the beginning of 21st

century. The government of India made the further commitment that by 2000, 6% of the gross domestic product (GDP) would be spent on education, out of which half would be spent on primary education. Though they did not quite reach this level, by the end of 2000, 94% of India's rural population had primary schools within one kilometer and 84% had upper primary schools within 3 km. Special efforts were made to enroll historically disadvantaged castes and girls.

The National Literacy Mission (NLM), launched in 1988 by the national government, adopted the Total Literacy Campaign (TLC) model as the primary policy instrument for eliminating adult illiteracy in the 1990s. By most accounts, the NLM was responsible for the large gains in literacy over the 1980s and 1990s in India.

The educational mission in India since the original NPE in 1986 has been to provide free and compulsory education to all, and much progress was made toward this goal during the 1980s. While the goal may not have been achieved everywhere, India had recognized the value of human development and the need for public provision of education services. Thus, to a large extent, the provision of education is a policy variable set from above rather than generated purely within the district economy.

3. Empirical Analysis

3.1 Data

The district level Net Domestic Product (NDP) measurements for this study come from internal Reserve Bank of India records (districts are the sub-state level economies). The measures of credit and deposits of scheduled commercial banks come from the Reserve Bank of India. Credit, deposits, and NDP measures are all converted to real terms using 1992-3 prices. The other control variables, including literacy rate, road density, and population density come from the Indian census and www.indiastats.com. The data set includes NDP

for 209 districts across 9 Indian states for the years 1991-2 and 2000-1 in constant 1992-3 prices.[18] This NDP data is not publicly available and to my knowledge no similar sample of Indian district GDP or NDP has been analyzed in the literature. The coverage of the sample of districts is broad, comprising approximately 60% of GDP in 1991-92 and includes both northern and southern states. The selection of districts into the sample was determined by availability given that only some states collect this data at district level. The data and sources are described more fully in the Appendix.

3.2 Choice of Specification

This study relies primarily on Barro-type growth regressions which include the log of initial income as the main control variable. As in Barro (2001), the basic regression equation comes from the following generic equilibrium growth equation which can be derived from a number of growth models:

$$\log\left(y_{i,T} / y_{i,0}\right) = g + \left[1 - e^{-\beta T}\right]\left(\log\left(y_i^*\left(x_i\right)\right) - \log\left(y_{i,0}\right)\right)$$

$\log\left(y_{i,T} / y_{i,0}\right)$ is the log difference in income per capita over the observation period (growth), $y_i^*\left(x_i\right)$ is the steady state income per capita, possibly conditional on district level variables *Xi*, and *g* is the exogenous growth rate of technology. The rate of growth is assumed proportional to the distance from the steady state $\log\left(y_i^*\left(x_i\right)\right) - \log\left(y_{i,0}\right)$ which implies that initial income should figure negatively into the regression. The estimation equation can be written as:

$$\log\left(y_{i,T} / y_{i,0}\right) = a\left(x_i\right) - \left[1 - e^{-\beta T}\right]\log\left(y_{i,0}\right) + \varepsilon_i$$

[18] The states in the sample are: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Districts are the level of government just below the state level. The median district in the sample is 5200 km^2 which is a little over three times the size of the median U.S. county. The median population in 1991 is 2.3M people per district. NDP data is used here because GDP was not available at district level. NDP is defined as GDP corrected for capital depreciation. All depreciation estimates were carried out by state offices where the data was collected.

where the steady state term has been absorbed into the constant term, $a(x_i)$. In absolute convergence regressions, $a(x_i) = a$, a constant, and all economies are assumed to grow toward the same steady state. In conditional regressions, conditioning variables, *Xi*, are assumed to modify the level of the steady state district by district. The measured parameter value on initial income $(\log(y_{i,0}))$ can be used to calculate the value of *(3* which is usually interpreted as the percent per year catch up of the lower districts to the high ones or, equivalently, the percent distance traveled toward the steady state.

In conditional regressions, any variable which theory indicates might lead to a higher steady state level of income, should have a positive parameter value since it will imply faster growth irrespective of initial income. Additionally, if a variable modifies the speed of convergence *to* the steady state then we should interact this variable with initial income (i.e. $\beta = \beta_i(x_i)$).[19] For this study, the main conditioning variables of interest (the x_i) are literacy (human capital) and banking sector depth (financial development).

These two principles will be used in the subsequent sections to investigate the growth roles of various factors.

3.3 A Preliminary Look at the Data

Figure 1 plots bank credit to NDP and deposits to NDP for all 209 Indian districts in 1991 (x-axis) and 2001 (y-axis). The graph shows that most districts nearly doubled the values of these ratios over the decade and that the growth in these ratios was fairly uniform. As mentioned above, this indicates that despite the 1991 reforms the forces that shaped the distribution of financial depth in 1991, continued to shape the observed distribution of financial depth over the 1990s.

[19] The technique of conditioning the convergence term has been used before in the literature, e.g. in Keefer and Knack (1997) who find that institutional variables modify the rate of convergence.

Literacy is a crude measure of human capital that measures only basic educational achievement and skills. In many advanced countries a worker who is merely literate would be counted as unskilled and near the bottom of the distribution of human capital attainment. In a developing country like India, however, a worker who is literate will have distinguished herself as being higher up the distribution of human capital and may possess a critical advantage over illiterate workers.[20]

Literacy is a good measure for the lower level skill set that is important in the Indian context but it also correlates with other schooling outcomes. Table 7 shows the correlation between literacy and school enrollment ratios at state level across India. The correlation is always above 0.9. Thus the literacy rate is also likely to be a good proxy for the number individuals in the population with higher level skills.

3.4 Endogeneity and Instrumentation Strategy

The basic empirical fact to establish is whether or not growth is impacted by the supply capacity of the financial sector. Since factors which affect demand for investable funds may be correlated with future growth, OLS estimates using contemporaneous credit/NDP as the measure of financial development could be biased. In empirical and theoretical work this was noted by Levine (1997), King and Levine (1993), Calderon and Liu (2003), Greenwood and Jovanovic (1989), and many others.

Various instrumentation strategies have been employed in the cross country finance-growth literature to overcome this problem. Beck and Levine (2004) employ instrumental variables derived from the "Law

[20] In Hull (1997), the authors describe anecdotal evidence from a Silicon Valley electronics manufacturing plant that typically does one-off, contract production runs. The authors find that for production line workers struggling to learn new factory tools, process written instructions, and keep track of the small variations in task, literacy, and especially higher level comprehension, was the critical skill. This and other studies point to a critical role for the "lower level" skills associated with literacy, especially in facilitating the successful adoption of new processes and technologies. In the model presented in the web appendix, I attempt to incorporate this fact by assuming that human capital (interpreted as either entrepreneur human capital or worker human capital) figures into the probability of success of a firm's attempt at innovation.

and Finance" literature, which indicate differences in the degree of creditor protection in the legal system. Other authors have used variables which indicate governmental commitment to macroeconomic stability, proxies for corruption and financial repression, and measures of banking sector concentration (see e.g. Rousseau and Wachtel (2001) and Haslag and Koo (1999) who study the effects of financial repression on financial development). Still others have used time-series and dynamic panel techniques to deal with endogeneity between financial variables - see Catalan, Impavido and Musalem (2000) and Calderon and Liu (2003), among others. Many of these instruments and strategies are either not relevant or not practical in district level data. The "Law and Finance" variables and measures of inflation or other macroeconomic variables will not vary across districts and time series data are not available at district level. A survey of many of the empirical approaches attempted to date is contained in Beck (2008).

Though many of the instruments employed in cross-country studies are not available or not relevant at district level, it is possible to identify shocks to the supply capacity of the banking sector by exploiting the relationship between credit/NDP and deposits/NDP. The key is to note that local banks are the vehicles for delivery of both credit and deposit services within a district. Banks generate the supply curves for both types of service; however, the demand curves for loans and deposits are generated by very different forces. A critical assumption for my identification strategy is that, aside from that caused by level of income, most of the covariation between the equilibrium quantity of deposits and the equilibrium quantity of loans outstanding is caused by variation in the supply capacity of banks.[21]

One might question this assumption, noting that credit is simply deposits which have been loaned out. However, the market that matches deposits (loanable funds) to banks that will extend it as credit equilibrates above the district level, at the national level. In fact, most banks in a district are members of

[21]This strategy parallels one used in Calomiris and Mason (2003) who also exploit the sub-national character of their data to eliminate money supply issues and use bank balance sheet measures to instrument for supply shocks to banks which determined the banks ability to extend credit.

regional or national branching networks and so will have access both to internal bank capital markets that span districts as well as to the national money market. They will easily be able to transfer excess deposits from one district to another via the national market, thus, the banking sectors of individual districts will function as truly open economies. [22]

To implement the IV strategy, I first regress deposits/NDP in 1991 on log(NDP) in 1991 - to control for a relationship between deposits percentage and income - and state level dummies - to control for the possibility of state level market segmentation in credit markets - as well as the other controls. I then take the residuals from the regression as being representative of the variation in banking sector capacity and use them as instruments for credit/NDP in the growth regressions. A positive residual value will indicate a higher than expected level of deposits/NDP due on average to (I assume) higher banking sector supply capacity and vice versa for a negative residual. In practice, I include both the residual and its squared term as instruments. Henceforth and in the tables, I abbreviate the deposit residual strategy **dep_iv**. Clearly, since these residuals include the error term from the deposit regression, they only measure banking sector supply capacity with error.[23]

There are scenarios which have the potential to confound the deposit based instrumentation strategy. A serious threat to the validity of the IV strategy would be the existence of an unmeasured factor which simultaneously generates growth, investment opportunities (and thus demand for credit), as well as simultaneous demand for deposit services (i.e. higher demand as a percentage of income). Such a factor would break the causal interpretation that the supply capacity determined portion of credit impacts growth. There are few likely candidates for such a factor that could both generate the wide variation in credit and deposit

[22]The fact that there is a very strong relationship is somewhat surprising. It echoes the relationship Feldstein and Horioka (1980) found looking at the correlation between savings and investment across countries. A parallel result is found in Aizenman et al. (2007) who show evidence that self funded investment is better for growth.

[23]The implied measurement error in using the residuals as a proxy for financial frictions will have the effect of inducing an attenuation bias toward zero in the estimate of the impact on growth. Thus any significant results probably understate the true parameter value.

depth (credit goes from 5% to 200% of NDP, deposit penetration varies similarly), and the high correlation between the two ($\rho = 0.9$). This degree of variation in commercial bank deposit and credit depth as well as the high correlation between them is most likely explained by variation in banking sector supply capacity and is unlikely to come from demand side factors that cause simultaneous variation in the marginal propensity to save and the demand for credit. Nevertheless, as a robustness check, I also employ a specification where population density and higher order terms are excluded from the regression and used as instruments. This secondary strategy relies on the fact that, in light of fixed costs associated with branching, achieving higher deposit and credit penetration may be easier in more densely populated areas (see, e.g. Calem and Nakamura (1998)). I abbreviate the population density instrument strategy **pop_iv**.

Table 3 presents the results of various tests of instrument validity and relevance. The F-test of the excluded instruments in the first stage, and the Kleibergen-Paap-rk-Wald statistic test the null that the instruments are weak or the system underidentified respectively. We can reject both of these nulls for both the **dep_iv** and **pop_iv** strategies. Additionally, looking at the partial R^2 of the instruments in the first stage regression, we can see that the **dep_iv** instruments explain 44% of the variation in the credit variable, holding constant the other controls and the **pop_iv** instruments explain 73% of the variation. Thus, the instruments appear to be relevant in that they are strongly correlated with the endogenous variable. More importantly, the Sargan/Hansen J-statistic tests the null that the instruments are properly excluded from the second stage regression. We cannot reject this null, indicating that the instruments are also valid. Thus, on both conceptual and technical grounds, the deposit residuals and the population instruments are quality instruments.

These instrumentation strategies would be dominated (or at least complemented) by one which included more direct measures of financial frictions at district levels, including measures of average distance between firm and bank branch, local government rapacity toward the financial sector, local costs of mitigating adverse

selection and moral hazard, local financial literacy, etc. Unfortunately, as is often the case, such measures are not available.

One set of candidate instruments for the variation in local institutional quality are the variables used in Banerjee and Iyer (2005) that measure the date of British control of the district, pre-British institutional set-up and the type of land-tenure system used by the British after they achieved control. These variables have a parallel in the settler mortality variables and legal origin dummies used in Acemoglu, Johnson and Robinson (2000) and La Porta et al. (1998). Banerjee and Iyer (2005) find these pre-colonial institution dummies to be significant in predicting growth in many measures of economic activity over a period covering the 1960s-1980s but they are not significant predictors of financial depth or growth in my data. Neither do they pass the formal tests for relevant instruments as can be seen in Table 3.[24]

3.5 District-Level Growth between 1991 and 2001

In Figure 2 we can see the level of NDP/Capita in 1990-1991 plotted against its value in 2000-01 by district. Visual inspection indicates that there may be a "convergence club" phenomenon occurring where the districts with the lowest initial levels of NDP have not shown much catch-up to the leaders or the districts in the middle. Growth (which appears as the distance above the 45° line) was strongest in the districts which were already high and middle income. The outlier is Greater Bombay which started with the highest income per capita and grew at a very rapid rate indicating that it may be on an entirely different growth path.[25]

To analyze the situation more rigorously, I conduct the conditional and unconditional growth regressions

[24]In an unreported result, they do pass the Sargan/Hansen test in that we cannot reject the null that they are properly excluded from the growth equation but this is only due to their lack of predictive power in determining NDP growth over the 1990s.

[25]The standard deviation of log per capita income goes from 0.35 in 1991 to 0.42 in 2001 indicating that σ-convergence may not be occurring within the sample. σ-convergence is the phenomenon whereby the standard deviation of income levels falls.

described at the beginning of Section 3. Table 1 contains results from OLS regressions with and without state level dummies and controls. They show that the districts in the sample do not display absolute convergence, in the sense that when controls and state dummies are excluded, the parameter on initial income is not significantly different from zero. They also show that conditional convergence without state dummies is weak at best. In the conditional convergence regression without state level dummies, the coefficient on initial income of -0.12 implies a convergence rate of 1.3% per year while the cross-country data usually show a rate of 2.0%.[26] Once state level dummies and controls are included, however, the parameter jumps to -0.28, implying a convergence rate of 3.3% per year, a number well above the consensus cross-country result. This indicates that relative convergence within states is happening at a faster rate than convergence within the sample as a whole. Policy decisions at state level likely account for these patterns.

From Table 1, we can see that the coefficient on literacy is significant and measures 0.003. Given this value, a district which moved from the 25th percentile (38.1%) to the 75th percentile (61.9%) would increase growth by 7% over the course of a decade. Population/km^2 is not significant in any specification and its squared term (designed to capture the special situations inherent in very high density areas) is negative but significant in only one regression. In the standard specification with state dummies included as controls, the coefficient on credit is 0.42 implying that a move from the 25th percentile of credit/NDP (7.2%) to the 75th percentile (14.3%) implies an average gain of 4% growth over the decade. This is a significant growth bonus to improving the functioning of the banking sector. Alternatively this is significant penalty to pay for not doing so. This analysis of the patterns of district growth in India shows many similarities and some differences from the results of cross country growth regressions. As with most cross country studies, conditional convergence is evident in the data but a deeper look shows patterns of cross state divergence and as well as stagnation and rapid growth. As with many cross country studies, financial development and

[26]In his survey of the convergence literature, Sala-i-Martin (1996) concludes that "the estimated speeds of convergence are so surprisingly similar across [cross-sectional] data sets, that we can use a mnemonic rule: economies converge at a speed of two percent per year."

human capital measures prove to be of significant importance to growth.

3.6 Financial Constraints on Growth

Table 2 shows the results of 2SLS regressions employing the instrumentation strategies outlined above. The second and third columns show that credit is indeed significant with the two instrumentation strategies, **dep_iv** and **pop_iv**. With the **dep_iv** strategy, the magnitude of the coefficient on Credit/GDP is 0.44, significant at 5% level, and is indistinguishable from its value in the OLS equation. Using the **pop_iv** strategy, the parameter is 0.20 and significant at 1% level.[27] These results indicate that financial development is an important ingredient for growth at the district level and that this relationship is statistically robust across various instrumentation strategies.

In Aghion, Howitt and Mayer-Foulkes (2004) the authors find that, in a cross country sample, financial development is important to growth but the relationship is non-linear and may not be very strong after a certain threshold is reached (approximately 35% credit/GDP in their data). Rioja and Valev (2004) also test a non-linear specification and find that the effect of financial development on growth may be non-monotonic. Finally, a non-linear specification is relevant given the history of the social banking experiment in India.[28] The social banking program amounts to a cross subsidy from highly branched locations to less branched locations within India and the relative shadow costs of financial development is directly relevant to the overall value of that type of program.

A non-linear relationship is tested in Table 4 where a dummy for districts with a level of financial development greater than the 75th (Credit/NDP >10.8%) is interacted with credit/NDP allowing the slope of this variable to vary across the groups. Essentially, this allows for a non-linear relationship between

[27]The difference between the two may be a result of having a different set of controls in the two regressions. Further, a Hausman test does not reject the null that the difference between the coefficients is not systematic.

[28] The social banking system was studied by Burgess et al. (2005) and pronounced a success due to its measured impacts on poverty ratios and the probability of a household getting a loan. The paper does not investigate the impact on growth at district or state level.

banking sector development and growth. The OLS results in the first and second columns indicate that as one goes from the low FD group to the high group, the magnitude of the credit/NDP parameter decreases. In the low FD group, which has less than 10.8% commercial bank credit to NDP, the slope parameter on credit/NDP is 1.86 and significant whereas in the highest quartile of credit/NDP (>10.8%) the slope drops to 0.30. In the second column, where the high financial development dummy is interacted with both initial income and Credit/NDP, the slope parameter on initial income becomes more negative (indicating faster convergence) in the high FD group going from -0.24 and significant in the low group to -0.34 though this difference is not significant at standard levels. To test for a non-linear relationship using the instrumental variable specifications, the instrumental variables were interacted with the high financial development dummy and the full set of interactions was used to instrument the interaction terms of the endogenous variables. None of these terms are significant at standard levels with either the **dep_iv** or **pop_iv** strategies though the signs are similar to the OLS parameters.

These results give some support the notion that there is a non-linear relationship between financial development and growth. The importance of financial development seems to decline as it as it reaches higher levels and the speed of convergence may increase. There is only weak evidence of a threshold beyond which financial development is not significant at all possibly due to the fact that only a handful of the districts in the sample will have crossed it.[29]

3.7 Human Capital Depth and the Growth-Finance Bottleneck

The regressions in Table 5 test the interaction between initial human capital (measured by literacy in 1991 and abbreviated HC) and financial development as well as the interaction with initial income using OLS and both instrumentation strategies. I again create a dummy for the high HC group of districts defined as

[29] In unreported regressions, I run successive regressions with breaks at higher and higher levels of FD and find that credit/NDP parameter value is no longer significant when the break is set at the 19% level. However, the power of this test is low because only 10 districts were above the break.

those having a literacy rate greater than the median and interact this with Credit/NDP or with initial income and Credit/NDP.

In the OLS regressions, we can see that while the credit/NDP parameter value is high at 1.3 and significant in the low HC group, it is significantly lower in the high HC group (-0.4). This result is robust in the **dep_iv** 2SLS regression and the parameter values are of similar magnitude. None of the parameters are significant in the **pop_iv** regression, but the pattern is the same. The parameters on the interaction terms between initial income and the high HC group are not significant.

The parameters from Table 5 can be used to estimate the economic significance of these results. Assuming a 10% drop in financial depth in year 1990-91, the model implies a district in the low HC group will lose 1.3*(10%)= 13% in growth over the following decade. Contrast this with the situation of a district in the high HC group where the lost growth due to the same loss of financial depth would only be 0.30*(10%) = 3.0%, less than a third the original value. These calculations show that the size of the effect of financial underdevelopment is large and so is the mitigating effect of higher human capital.

These numbers indicate that financial development plays an important role in growth. They also imply that human capital (as measured by literacy rates) and financial development may be in fact substitutes in the aggregate production function. This result is a surprising one in the context of standard growth models where human capital and ability to generate external funds for physical investment would be compliments.

4. Robustness Checks and Refinements of the Main Results

To see how the result of a negative interaction term between financial development and human capital depth play out across India and as a robustness check, Table 9 shows the results of regressions in sub-samples of districts. The sub-samples are divided at the 75th percentile of population density, and between northern

and southern states. The results of regressions in each subdivided sample are reported in Table 9.[30]

In both northern and southern Indian states, the interaction term is negative and significant in both the OLS and 2SLS regressions and the magnitudes of the parameters are similar. The pattern seems not to vary much across the geography of India even though the interior northern states have fairly different economic structures than those in the south.

In the low population density districts, a similar pattern emerges. In the high density districts, neither the interaction term nor the Credit/NDP term are significant. Banking may appear to be less important in the high density areas because there is less variation in banking sector penetration of those areas implying the test is of lower power.

If there were a non-linear relationship between financial development and growth, and if human capital accumulation and financial development were highly correlated, one might suspect that the measured negative interaction between Credit/NDP and literacy in the growth regression is simply measuring the declining importance of financial development. To exclude this possibility, Table 10 shows similar results to the ones in Table 5 but includes the term $(\text{Credit/NDP})^2$ to control for the non-linear component of Credit/NDP. The results are basically the same.

Finally, as an alternate specification to the one presented in Table 4, Table 11 replaces the dummy interaction term with the term $(\text{Credit/NDP})^2$. As we would expect, the parameter on the $(\text{Credit/NDP})^2$ term is negative though only significant in one of the OLS regressions.

[30] The northern states are Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, and Maharashtra; the southern states are Punjab, Rajasthan, Uttar Pradesh, and West Bengal

5. Conclusion

This paper has two main findings. The first is that underdevelopment of the local banking sector can hinder growth at the district level. The second is that a higher presence of human capital may decouple this relationship. Statistically, these results are robust to the inclusion of various controls and breaks in the sample and to the use of instrumental variables that identify variation in the supply capacity of the local banking sector.

The-cross country literature that investigates the connection between finance and growth has shown that the banking sector is an important component of national growth. However, the question of whether such a result would hold if capital markets were open and integrated and financial services could be easily provided across borders has been left open. The results presented here show that even at very small scale, between economies which are much more integrated that national economies could ever be, the finance-growth connection still holds (and is of similar magnitude). In addition to furthering our understanding of the fundamental connection between finance and growth, this result demonstrates that regional banking sector outreach is an important policy objective and that it may be critical for enabling the catch-up of economically disadvantaged areas. The fact that the relationship between growth and banking sector outreach may be non-linear indicates that it is precisely the least financially developed districts which stand to benefit the most from the development of their banking sectors.

The second result of this paper, that human capital depth helps to decouple the dependence of growth on financial development, is interesting because it has little precedent in the empirical literature or in theory. Tables 5 and 9 show that banking sector depth and literacy interact negatively in growth regressions. A standard interpretation of this result is that these variables are substitutes in generating economic growth. Another interpretation is that increasing literacy lowers the impact of finance on growth. I am not aware of a similar empirical result appearing elsewhere in the growth literature, or of a standard theoretical model which would explain it. In fact, a standard model, featuring human capital and physical investment in a multiplicative relationship would generate the opposite result. If anything, there should be a positive

interaction between human capital measures and the ability to finance physical investment.[31]

This is not to say that growing less finance intensive sectors, such as services or the informal sector, via investments in human capital is the first best solution to a weak financial system. Manufacturing has proven to be a strong and reliable engine of growth, and the informal sector's inability to finance via formal lending, and ability to avoid regulation and taxes are problematic (see, e.g. McKinsey (2004), and Adams (2006)). Increasing access to finance by bringing more firms into the formal economy and by promoting regional banking sector outreach is likely the first best solution, though this process can be difficult and costly.

This paper substantiates the role of the local banking sector in growth and documents a new role for human capital. While the data are drawn from a sample of Indian districts, I believe the results are more widely applicable to other regional contexts.

[31] It seems likely that human capital is enabling economic activities which are less finance dependent. A paper by Amin and Mattoo (2008) analyzes state level data in India and finds that the presence of human capital tends to promote the transition of the economy to a higher mix of services. In Kendall and Singh (2006), we document the experiences of village entrepreneurs in India who start internet kiosks in their villages using very little or no formal finance but who rely heavily on their own education to succeed.

Appendix: Description of the Indian Dataset

The data set covers 209 districts from 9 states in India, The states in the sample are: Andhra Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. This represents just over half the districts in India in 1991 and covers approximately 60% of 1991 India GDP. Literacy rates, area of districts, population numbers, and roads come from various sources of the government of India and were collected from www.indiastats.com. Credit and Deposits come from the Reserve Bank of India and are credit and deposits of registered commercial banks. NDP are measured in 1991 and 2001 (at 1993 prices) from internal RBI records and were themselves calculated by state offices. Some districts in the sample split into two districts between the years 1991 and 2001 and so the data points were merged in the 2001 observation so that the geographic area covered is consistent with the 1991 observation. Below is a list of the merged districts.

Annex : Merging of Districts

District Merged	Merged Into
Punjab	
Nawa shahar	Hoshiarpur
Moga	Faridkot
Muktsar	
Fateh Sahib	Patiala
Mansa	Bhatinda
Andhra Pradesh	
Ragareddy	Hyderabad
Rajasthan	
Hanumangarh	Ganganagar
Baran	Kota
Rajsamand	Udaipur
Karauli	Sawai Madhopur
Dausa	Jaipur
Uttar Pradesh	
Jyotiba Phule Nagar	Moradabad
Bagpat	Meerut
G B Nagar	Bulandshahr
Hathras	Mathura
Kannauj	Farrukhabad
Aurraiya	Etawah
Chitrakoot	Banda
Mahoba	Hamirpur
Kaushambhi	Allahabad
Ambedkar Nagar	Faizabad
Shravasti	Bahraich
Balrampur	Gonda
Kushinagar	Deoria
Sant Kabir Nagar	Basti
Sant Rabidas nagar	Varansi
Chandauli	

District Merged	Merged Into
Karanatka	
Chamarajanagar	Mysore
Davanagere	Chitradurga
Gadag	Dharwad
Haveri	
Koppal	Raichur
Udupi	Dakshin Kannad
Bagalkote	Bijapur
Tamilnadu	
Kancheepuram	Chengalpattu
Thiruvallur	
Caddallore	Caddallore
Villupuram	
Thanjavur	Thanjavur
Nagapatinam	
Thiruvarur	
Salem	Salem
Namakkal	
Tiruchirapalli	Tiruchirapalli
Karur	
Perambalur	
Madurai	Madurai
Theni	
West Bengal	
South 24 Parganas	North 24 Parganas
Dakshin Dinapur	West Dinapur
Uttar Dinapur	
Maharastra	
Nandurbar	Dhule
Gondia	Bhandra
Washim	Akola
Hingoli	Parbhani

References

Acemoglu, D., P. Aghion, and F. Zilibotti, "Distance to Frontier, Selection, and Economic Growth," Journal of the European Economic Association, 2006, 4 (1), 37–74.

S. Johnson, and J.A. Robinson, "The Colonial Origins of Comparative Development: An Empirical Investigation," 2000.

Aghion, P., P. Howitt, and D. Mayer-Foulkes, "The Effect of Financial Development on Convergence: Theory and Evidence," 2004.

Ahlin, C. and J. Pang, "Are financial development and corruption control substitutes in promoting growth?," Journal of Development Economics, 2008, 86 (2), 414–433.

Aizenman, J., "On the hidden links between financial and trade opening," Journal of International Money and Finance, 2008.

B. Pinto, and A. Radziwill, "Sources for financing domestic capital–Is foreign saving a viable option for developing countries?," Journal of International Money and Finance, 2007, 26 (5), 682–702.

Amin, M. and A. Mattoo, "Human Capital And The Changing Structure Of The Indian Economy," World Bank Working Paper Series, 2008.

Banerjee, A. and L. Iyer, "History, Institutions and Economic Performance: the legacy of colonial tenure systems in India," American Economic Review, 2005, 95 (4), 1190–1213.

Barro, R.J., "Sala-i-Martin, X.(1995) Economic Growth," 2001.

Beck, T., "The Econometrics of Finance and Growth," World Bank Working Paper Series, 2008.

and R. Levine, "Legal Institutions and Financial Development," 2004.

Bell, C. and P.L. Rousseau, "Post-independence India: a case of finance-led industrialization," Journal

of Development Economics, 2001, 65 (1), 153–75.

Burgess, R., R. Pande, and G. Wong, "Banking for the Poor: Evidence from India," Journal of the European Economic Association, 2005, 3 (2-3), 268–278.

Calderon, C. and L. Liu, "The direction of causality between financial development and economic growth," Journal of Development Economics, 2003, 72 (1), 321–334.

Calem, P.S. and L.I. Nakamura, "Branch Banking and the Geography of Bank Pricing," Review of Economics and Statistics, 1998, 80 (4), 600–610.

Calomiris, C.W. and J.R. Mason, "Consequences of Bank Distress During the Great Depression," American Economic Review, 2003, 93 (3), 937–947.

Catalan, M., G. Impavido, and A.R. Musalem, "Contractual Savings or Stock Market Development: Which Leads?," World Bank, 2000.

Djankov, S., C. McLiesh, and A. Shleifer, "Private credit in 129 countries," Journal of Financial Economics, 2007, 84 (2), 299–329.

R. La Porta, F. Lopez de Silanes, and A. Shleifer, "The law and economics of self-dealing," Journal of Financial Economics, 2008.

Feldstein, M. and C. Horioka, "Domestic Saving and International Capital Flows," The Economic Journal, 1980, 90 (358), 314–329.

Greenwood, J. and B. Jovanovic, "Financial Development, Growth, and the Distribution of Income," 1989.

Guiso, L., P. Sapienza, and L. Zingales, "Does Local Financial Development Matter?," 2002.

Haslag, J.H. and J. Koo, Financial Repression, Financial Development and Economic Growth, Federal

Reserve Bank of Dallas, 1999.

Hull, G.A., Changing Work, Changing Workers: Critical Perspectives on Language, Literacy, and Skills, State Univ. of New York Press, 1997.

Jayaratne, J. and P.E. Strahan, "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation," The Quarterly Journal of Economics, 1996, 111 (3), 639–670.

Keefer, P. and S. Knack, "Why Don't Poor Countries Catch Up? A Cross-National Test of an Insitutional Explanation," Economic Inquiry, 1997, 35 (3), 590–602.

Kendall, Jake and Nirvikar Singh, "Internet Kiosks in Rural India: What Influences Success?," NET Institute Working Paper No. 06-05, 2006.

King, R.G. and R. Levine, "Finance and Growth: Schumpeter Might be Right," The Quarterly Journal of Economics, 1993, 108 (3), 717–737.

Kumar, A., Expanding Bank Outreach Through Retail Partnerships: Correspondent Banking in Brazil, World Bank Publications, 2006.

Kumar, A., "Banking the Poor: Measuring Banking Access in 54 Countries", World Bank, 2008.

Levine, R., "Financial Development and Economic Growth: Views and Agenda," Journal of Economic Literature, 1997, 35 (2), 688–726.

and D. Renelt, "A Sensitivity Analysis of Cross-Country Growth Regressions," American Economic Review, 1992, 82 (4), 942–963.

and S. Zervos, "Stock Market Development and Long-Run Growth," 1996.

and , "Stock Markets, Banks, and Economic Growth," The American Economic Review, 1998, 88 (3), 537–558.

N. Loayza, and T. Beck, "Financial intermediation and growth: Causality and causes," Journal of Monetary Economics, 2000, 46 (1), 31–77.

McKinsey, The Hidden Dangers of the Informal Economy, McKinsey Global Institute, 2004.

Parente, S., "The Failure of Endogenous Growth," Knowledge, Technology, and Policy, 2000, 13 (4), 49–58.

Petersen, M.A. and R.G. Rajan, "Does Distance Still Matter? The Information Revolution in Small Business Lending," The Journal of Finance, 2002, 57 (6), 2533–2570.

Porta, R. La, F. Lopez de Silanes, **A. Shleifer, and R.W. Vishny**, "Law and Finance," Journal of Political Economy, 1998, 106 (6), 1113–1155.

Rajan, R. and L. Zingales, "The Great Reversals: The Politics of Financial Development in the 20th Century," 2001.

Rioja, F. and N. Valev, "Does one size fit all?: a reexamination of the finance and growth relationship," Journal of Development Economics, 2004, 74 (2), 429–447.

Rodrik, D. and A. Subramanian, "From" Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition," 2004.

Rousseau, P.L. and P. Wachtel, "Inflation, Financial Development and Growth," Economic Theory, Dynamics and Markets: Essays in the Honor of Ryuzo Sato, Deventer, Kluwer, 2001.

Schumpeter, J.A., Theorie der wirtschaftlichen Entwicklung, Duncker & Humblot, 1912.**Singh, N. and TN Srinivasan**, "Indian Federalism, Economic Reform and Globalization," Paper for the Comparative Federalism Project, CREDPR, Stanford, 2002.

Stulz, R.M. and R. Williamson, "Culture, Openness, and Finance," 2001.

Figure 1: District-wise financial depth in 1990-91 and 2000-01.

Financial depth is measured here as the ratio of credit or deposits to NDP. The dramatic increase in financial depth that occurred in these districts between 1990 and 2000 can be seen in this graph. The slope of the cluster points is roughly two, indicating a doubling of financial depth over the decade.

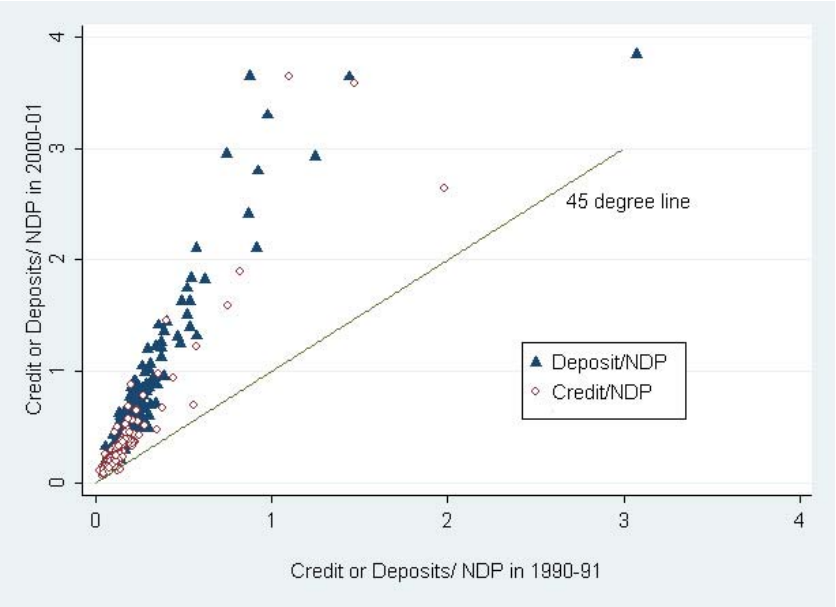

Figure 2: District-wise log of NDP/Capita in Rs in 1990-91 (x-axis) and 2000-01 (y-axis).

The growth of each district in percent terms is measured by distance above the 45 degree line. The graph shows that there was stagnation in the sense that many districts that started out at low levels of income did not catch up to the higher income areas.

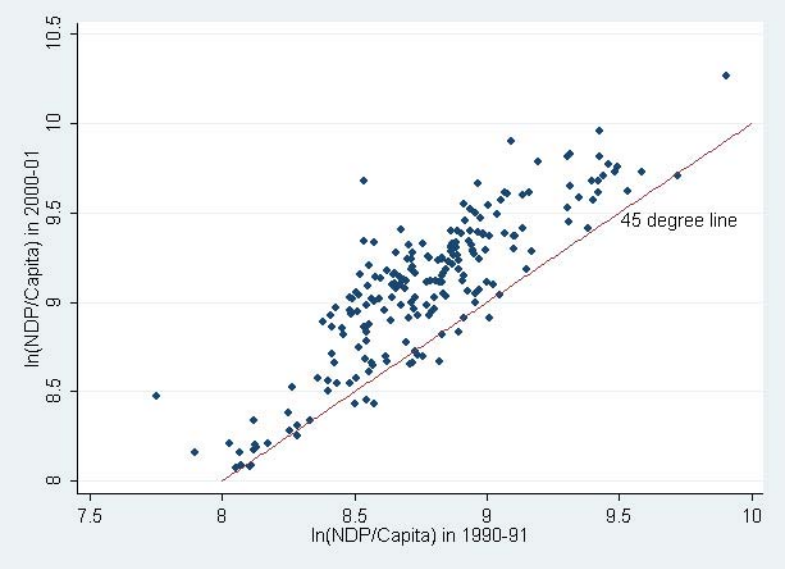

Table 1: District-level Growth Regressions

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

	Absolute Convergence		Conditional Convergence		
LHS: NDP growth	w/o state dummies	w/ state dummies	w/o state dummies	w/ state dummies	w/ state dummies
Ln(NDP/Capita) '91	0.039	-0.17***	-0.12***	-0.28***	-0.28***
	(0.044)	(0.047)	(0.046)	(0.046)	(0.048)
Population Density '91			-0.000081***	-2.4e-06	-2.2e-06
			(0.000027)	(0.000014)	(0.000014)
Population Density^2 '91			2.1e-09*	-8.8e-10	-9.1e-10
			(1.1e-09)	(6.7e-10)	(7.1e-10)
Road km/Area '91			0.015	0.018	0.019
			(0.019)	(0.014)	(0.016)
Literacy '91			0.0039***	0.0027**	0.0026*
			(0.00092)	(0.0012)	(0.0013)
Bank Credit/NDP '91			0.59***	0.42***	0.40***
			(0.17)	(0.12)	(0.14)
Deposits/NDP '91					0.017
					(0.084)
Constant	-0.026	1.89***	1.14***	2.70***	2.69***
	(0.39)	(0.41)	(0.39)	(0.39)	(0.40)
R^2	0.00	0.60	0.18	0.67	0.67

Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

Table 2: District-level Growth Regressions with Instruments for Credit/NDP

dep_iv regression employs deposit residual and squared term as measures of banking development, pop iv regression employs population density and squared term as instruments for financial development (see text for discussion). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

LHS: NDP growth	OLS w/ states	2SLS dep_iv	2SLS pop_iv
Ln(NDP/Capita) '91	-0.28***	-0.28***	-0.28***
	(0.046)	(0.046)	(0.047)
Population Density '91	-2.4e-06	-3.9e-06	
	(0.000014)	(0.000015)	
Population Density^2 '91	-8.8e-10	-9.3e-10	
	(6.7e-10)	(7.7e-10)	
Road km/Area '91	0.018	0.021	-0.0066***
	(0.014)	(0.021)	(0.0018)
Literacy '91	0.0027**	0.0026**	0.0034***
	(0.0012)	(0.0013)	(0.0011)
Bank Credit/NDP '91	0.42***	0.44**	0.20***
	(0.12)	(0.19)	(0.035)
Constant	2.70***	2.71***	2.65***
	(0.39)	(0.39)	(0.40)
R^2	0.67	0.666	0.661

Table 3: Tests of Validity and Relevance of Instruments

dep_iv and **pop_iv** regressions include instrument and squared term instruments as in regressions in Table 2. Ban/Iyer is an instrument from the Banerjee and Iyer (2005) which measures whether British land revenue control in the district occurred between 1820 and 1856.

	Instrumentation strategy:					
	dep_iv		**pop_iv**		**Ban/Iyer**	
Tests:	stat	p-value	stat	p-value	stat	p-value
Partial R^2 of ex. IVs	**0.44**		0.73		0.00	
	F-stat.	p-value	F-stat.	p-value	F-stat.	p-value
F-test of exc. IVs	17.11	0.000	57.12	0.000	0.03	0.870
	Chi-squ.	p-value	Chi-squ.	p-value	Chi-squ.	p-value
Kleibergen-Paap rk Wald	17.71	0.000	122.40	0.000	2.63	0.100
	F-stat.	p-value	F-stat.	p-value	F-stat.	p-value
Kleibergen-Paap rk Wald F	8.18	20-25%	57.12	<10%	2.39	>25%
	J-stat	p-value	J-stat	p-value	J-stat	p-value
Sargan/Hansen J-stat	0.00	0.981	0.72	0.400	NA	NA
Number of Observations	209		209		128	

Tests:	**Null Hypothesis:**
Partial R^2 of ex. IVs	Statistic is IV partial R^2 from 1st stage
F-test of exc. IVs	Excluded IVs are joint insignificant
Kleibergen-Paap rk Wald	Model is underidentified
Kleibergen-Paap rk Wald F	Instruments are weak
Sargan/Hansen J-stat	Instruments properly excluded

Table 4: Regressions with Non-linear Credit/NDP Interaction Term

FD(high)=1 indicates 1991 Credit/NDP> 75%tile (10.8%). Instruments for credit and interaction term are generated by interacting original instruments with FD(high). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

LHS: NDP growth	OLS		2SLS		2SLS	
	w/ states	w/ states	**dep_iv**	**dep_iv**	**pop_iv**	**pop_iv**
Ln(NDP/Capita) '91	-0.28***	-0.24***	-0.28***	-0.24***	-0.29***	-0.24***
	(0.045)	(0.044)	(0.049)	(0.048)	(0.051)	(0.048)
FD(high)*Ln(NDP/Cap)		-0.095		-0.093		-0.088
		(0.073)		(0.073)		(0.073)
Population Density '91	-1.8e-06	2.9e-06	-4.8e-07	6.0e-06		
	(0.000012)	(0.000014)	(0.000013)	(0.000015)		
Population Density^2 '91	-4.8e-10	-6.5e-10	-4.2e-10	-5.0e-10		
	(6.1e-10)	(6.4e-10)	(8.2e-10)	(8.4e-10)		
Road km/Area '91	0.0080	0.0077	0.0056	0.0014	-0.0061***	-0.0063**
	(0.012)	(0.013)	(0.022)	(0.023)	(0.0022)	(0.0025)
Literacy '91	0.0020*	0.0020*	0.0021	0.0021	0.0027**	0.0024*
	(0.0012)	(0.0012)	(0.0016)	(0.0016)	(0.0013)	(0.0013)
Bank Credit/NDP '91	1.86***	1.89***	1.85	1.98	0.79	1.52
	(0.66)	(0.67)	(2.45)	(2.42)	(2.63)	(2.55)
FD(high)*Credit	-1.56**	-1.58**	-1.57	-1.74	-0.60	-1.31
	(0.65)	(0.66)	(2.49)	(2.47)	(2.65)	(2.57)
FD(high)	-0.088	-0.089	0.18	1.01	0.11	0.93
	(0.058)	(0.65)	(0.21)	(0.70)	(0.21)	(0.68)
Constant	2.60***	2.20***	2.60***	2.17***	2.70***	2.24***
	(0.39)	(0.38)	(0.49)	(0.50)	(0.54)	(0.51)
R^2	0.68	0.69	0.68	0.69	0.68	0.68

Table 5: Regressions with Interaction between Credit/NDP and Human Capital Variable

HC(high)=1 indicates 1991 literacy > median (47.6%). Literacy itself has been dropped from these regressions. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

LHS: NDP growth	OLS		2SLS		2SLS	
	w/ states	w/ states	**dep_iv**	**dep_iv**	**pop_iv**	**pop_iv**
Ln(NDP/Capita) '91	-0.26***	-0.26***	-0.22***	-0.26***	-0.27***	-0.27***
	(0.044)	(0.062)	(0.061)	(0.061)	(0.054)	(0.064)
HC(high)*Ln(NDP/Cap)		-0.013		-0.0090		0.029
		(0.067)		(0.067)		(0.088)
Population Density '91	4.2e-06	4.7e-06	0.000013	8.0e-06		
	(0.000013)	(0.000014)	(0.000018)	(0.000014)		
Population Density^2 '91	-9.5e-10*	-9.7e-10*	-1.4e-09	-8.5e-10		
	(5.5e-10)	(5.8e-10)	(8.8e-10)	(6.9e-10)		
Road km/Area '91	0.014	0.014	0.021	0.0083	-0.0060**	-0.0061**
	(0.010)	(0.010)	(0.020)	(0.017)	(0.0029)	(0.0026)
Bank Credit/NDP '91	1.29***	1.28***	1.13**	1.29***	2.90	1.97
	(0.30)	(0.32)	(0.45)	(0.35)	(3.31)	(1.81)
HC(high)*Credit	-0.91***	-0.90***	-0.77*	-0.96***	-2.67	-1.75
	(0.28)	(0.30)	(0.46)	(0.35)	(3.33)	(1.84)
HC(high)	0.12***	0.23	0.018	0.20	0.32	-0.043
	(0.038)	(0.57)	(0.13)	(0.57)	(0.36)	(0.65)
Constant	2.53***	2.48***	2.19***	2.47***	2.44***	2.56***
	(0.38)	(0.52)	(0.49)	(0.52)	(0.42)	(0.48)
R^2	0.67	0.67	0.65	0.67	0.62	0.66

Table 6: Indian Banking System, Public Private Ownership

This data shows the extent of public, private, and foreign ownership in the Indian banking system in 1998.

	Number	Branches	Deposits/GDP (%)	Credit/GDP (%)
Public Sector	27	45,293	51	25
Private Sector	34	4,664	7	3
Foreign	42	182	4	3
Source: Sathye (2003)				

Table 7: State Level Correlations in Schooling Outcome Variables with Literacy

Data from indiastats.com and Indian census figures.

	Literacy in '91	Enrol. Ratio, '81	Enrol. Ratio in '91
Literacy in 1991	1.00		
Enrolment Ratio in 1981	0.92	1.00	
Enrolment Ratio in 1991	0.97	0.93	1.00
Sample: 30 Indian States			

Table 8: Summary Statistics of Major Variables in Sample Districts

All NDP and credit/deposit values in constant 1992-3 Indian Rupees. Sample size is 209 districts across nine states.

Variable:	Δln (NDP=Cap)	ln (NDP=Cap)091	Credit/NDP '91	Deposit/NDP '91
Average	0.31	6860	0.15	0.25
Std. dev.	0.21	2577	0.20	0.27
Variable:	Literacy '91	Roads/km2 '91	Pop/km^2 '91	(Pop/km^2 '91)^2
Average	50.5	0.62	910	1.0E+07
Std. dev.	17.1	1.72	3034	7.2E+07

Notes: All NDP and credit/deposit variables in constant 1992-3 Rs. Sample size is 209 districts.

Table 9: Sub-sample Regressions with Credit/NDP Human Capital Interaction

These are the same specifications as in Table 5, but where control variables are not reported. The sub-samples are districts in northern vs. southern states, and urban vs. rural districts, where the cut-off is the 75%-tile of population density. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

Panel A:	**Urban vs. Rural (by population density)**			
LHS: NDP growth	OLS		2SLS (dep_iv)	
	Dens.<75%tile	Dens.>75%tile	Dens.<75%tile	Dens.>75%tile
Ln(NDP/Capita) '91	-0.34***	-0.0099	-0.34***	0.0014
	(0.057)	(0.12)	(0.056)	(0.10)
HC(high)*Ln(NDP/Cap)	0.052	-0.23	0.058	-0.24
	(0.079)	(0.20)	(0.095)	(0.17)
Bank Credit/NDP '91	1.43***	0.96	1.52***	1.67
	(0.34)	(1.11)	(0.47)	(1.10)
HC(high)*Credit	-1.07***	-0.58	-1.17	-1.21
	(0.41)	(1.05)	(0.86)	(1.05)
HC(high)	-0.32	2.02	-0.36	2.12
	(0.68)	(1.71)	(0.77)	(1.46)
R^2	0.70	0.68	0.70	0.68
Observations	156	53	156	53
Panel B:	**Northern vs. Southern States**			
LHS: NDP growth	OLS		2SLS (dep_iv)	
	Northern	Southern	Northern	Southern
Ln(NDP/Capita) '91	1.26	-1.72	1.15	-1.61
	(0.89)	(1.18)	(0.91)	(1.24)
HC(high)*Ln(NDP/Cap)	1.26	-1.72	1.15	-1.61
	(0.89)	(1.18)	(0.91)	(1.24)
Bank Credit/NDP '91	1.34**	1.40***	1.68*	1.28**
	(0.53)	(0.39)	(0.89)	(0.53)
HC(high)*Credit	-0.92*	-1.04***	-1.36	-1.02*
	(0.56)	(0.40)	(0.91)	(0.59)
HC(high)	1.26	-1.72	1.15	-1.61
	(0.89)	(1.18)	(0.91)	(1.24)
R^2	0.60	0.49	0.60	0.49
Observations	105	104	105	104

Table 10: Robustness Check of Credit/NDP X Human Capital Interaction with Credit/NDP^2 Term

These are the same specifications as in Table 5. The (Credit/NDP)^2 term is designed to control for the possibility that what is being measured is a non-linear relationship between Credit/NDP and growth coupled with a correlation between human capital and financial development. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

LHS: NDP growth	OLS		2SLS		2SLS	
	w/ states	w/ states	**dep_iv**	**dep_iv**	**pop_iv**	**pop_iv**
Ln(NDP/Capita) '91	-0.26***	-0.26***	-0.20**	-0.25***	-0.28***	-0.28***
	(0.046)	(0.063)	(0.083)	(0.064)	(0.041)	(0.062)
HC(high)*Ln(NDP/Cap)		-0.016		0.0013		0.0064
		(0.065)		(0.072)		(0.095)
Population Density '91	1.2e-06	1.7e-06	0.000036	0.000017		
	(0.000016)	(0.000017)	(0.000045)	(0.000031)		
Population Density^2 '91	-5.5e-10	-5.5e-10	-3.3e-09	-1.5e-09		
	(1.1e-09)	(1.1e-09)	(3.1e-09)	(1.8e-09)		
Road km/Area '91	0.0053	0.0047	0.057	0.018	-0.0089**	-0.0097***
	(0.019)	(0.018)	(0.055)	(0.029)	(0.0042)	(0.0037)
Bank Credit/NDP '91	1.32***	1.31***	0.94	1.23***	2.36	1.99
	(0.32)	(0.34)	(0.65)	(0.44)	(2.32)	(1.80)
HC(high)*Credit	-0.89***	-0.87***	-0.97**	-1.07***	-1.93	-1.53
	(0.27)	(0.30)	(0.42)	(0.37)	(2.45)	(1.91)
(Credit/NDP)^2 '91	-0.053	-0.057	0.28	0.10	-0.098	-0.11
	(0.096)	(0.092)	(0.39)	(0.27)	(0.095)	(0.085)
HC(high)	0.12***	0.26	0.038	0.13	0.23	0.13
	(0.038)	(0.55)	(0.12)	(0.61)	(0.26)	(0.69)
Constant	2.55***	2.50***	1.99***	2.43***	2.54***	2.59***
	(0.40)	(0.53)	(0.68)	(0.54)	(0.45)	(0.48)
R^2	0.67	0.67	0.64	0.67	0.65	0.67

Table 11: Regressions with Credit/NDP and Credit/NDP^2 Term

This set of regressions is an alternate specification for Table 4, which is testing for a non-linearity in the relationship between financial development and growth. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, Sample size = 209.

LHS: NDP growth	OLS		2SLS		2SLS	
	w/ states	w/ states	**dep_iv**	**dep_iv**	**pop_iv**	**pop_iv**
Ln(NDP/Capita) '91	-0.29***	-0.24***	-0.28***	-0.25***	-0.28***	-0.26***
	(0.048)	(0.050)	(0.049)	(0.051)	(0.047)	(0.048)
Credit*Ln(NDP/Cap)		-0.38**		-0.30**		-0.21*
		(0.15)		(0.15)		(0.11)
Population Density '91	-8.9e-06	0.000021	-2.8e-06	0.000021		
	(0.000017)	(0.000021)	(0.000021)	(0.000022)		
Population Density^2 '91	0	0	-9.2e-10	-7.9e-10		
	(1.2e-09)	(1.2e-09)	(1.1e-09)	(1.1e-09)		
Road km/Area '91	-0.0021	-0.037	0.019	-0.011	-0.0087***	-0.012***
	(0.021)	(0.027)	(0.020)	(0.026)	(0.0026)	(0.0031)
Literacy '91	0.0027**	0.0024*	0.0027**	0.0024**	0.0031**	0.0026**
	(0.0012)	(0.0012)	(0.0013)	(0.0012)	(0.0012)	(0.0012)
Bank Credit/NDP '91	0.53***	4.03***	0.42	3.18**	0.37*	2.40**
	(0.19)	(1.46)	(0.31)	(1.44)	(0.20)	(1.06)
Credit^2	-0.12	-0.22*	0.0026	-0.095	-0.083	-0.12
	(0.11)	(0.13)	(0.13)	(0.12)	(0.11)	(0.078)
Constant	2.76***	2.34***	2.71***	2.38***	2.71***	2.50***
	(0.40)	(0.42)	(0.41)	(0.42)	(0.40)	(0.41)
R^2	0.67	0.67	0.67	0.67	0.67	0.67