

An Empirical Inquiry into the Development of Financial Structures and Economic Growth

BY

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THESIS

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This thesis is dedicated to my daughters, Sarah and Maryam, who gave me the courage and motivation to go on, my mother, Shareen, whom I intend to make proud, my wife, Lu Ann, who has been an extremely supportive partner, and to my sisters Mahvash, Beenish and Sehrish- anything is possible if you put your mind, back, heart and soul into it.

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LIST OF ABBREVIATIONS

BCBD	Private credit by deposit money banks as a share of demand, time and saving deposits in deposit money banks.
BDGDP	Demand, time and saving deposits in deposit money banks as a share of GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is demand and time and saving deposits, P_e is end-of period CPI, and P_a is average annual CPI
CBAGDP	Claims on domestic real nonfinancial sector by the Central Bank as a share of GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is Central Bank claims, P_e is end-of period CPI, and P_a is average annual CPI
CN	Country Name
CNCODE	Country Code
CONCENT	Assets of three largest banks as a share of assets of all commercial banks.
COSTINC	Total costs as a share of total income of all commercial banks.
DBACBA	Ratio of deposit money bank claims on domestic nonfinancial real sector (as defined above) to the sum of deposit money bank and Central Bank claims on domestic nonfinancial real sector (as defined above)
DBAGDP	Claims on domestic real nonfinancial sector by deposit money banks as a share of GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is deposit money bank claims, P_e is end-of period CPI, and P_a is average annual CPI
FDGDP	Demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is demand and time and saving deposits, P_e is end-of period CPI, and P_a is average annual CPI
INCGR	WB Income Category
INSLIFE	Life insurance premium volume as a share of GDP
INSNONLIFE	Nonlife insurance premium volume as a share of GDP
INTLDEBT	International Debt Securities (Amt Outstanding) as a share of GDP

LIST OF ABBREVIATIONS (continued)

INTLDBTNET	International Debt Securities (Net Issues) as a share of GDP
KC	Consumption Share of Real GDP per capita (RGDPL)
KG	Government Share of Real GDP per capita (RGDPL)
KI	Investment Share of Real GDP per capita (RGDPL)
LISTCO_PC	Number of publicly listed companies per capita.
LLGDP	Ratio of liquid liabilities to GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is liquid liabilities, P_e is end-of period CPI, and P_a is average annual CPI
NETINTMARG	Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets.
NRBLOAN	Offshore bank loans relative to GDP
OFAGDP	Claims on domestic real nonfinancial sector by other financial institutions as a share of GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is other financial institutions' claims, P_e is end-of period CPI, and P_a is average annual CPI
OFFDEP	Offshore bank deposits relative to domestic deposits
OPENK	Openness in Constant Prices
OVERHEAD	Accounting value of a bank's overhead costs as a share of its total assets.
P	Price Level of Gross Domestic Product G-K method
PCRDBGDP	Private credit by deposit money banks to GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI
PCRDBOFGD	Private credit by deposit money banks and other financial institutions to GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI
POP	Population (in thousands)
PPP	Purchasing Power Parity over GDP in national currency units per US\$

LIST OF ABBREVIATIONS (continued)

PRBOND	Private domestic debt securities issued by financial institutions and corporations as a share of GDP, calculated using the following deflation method: $\{(0.5) \cdot [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is amount outstanding of private domestic debt securities, P_e is end-of period CPI, and P_a is average annual CPI
PUBOND	Public domestic debt securities issued by government as a share of GDP, calculated using the following deflation method: $\{(0.5) \cdot [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is amount outstanding of public domestic debt securities, P_e is end-of period CPI, and P_a is average annual CPI
REMIT	Net remittance inflows as a share of GDP
RGDPCH	Real GDP per capita (Constant Prices: Chain series)
RGDPL	Real GDP per capita (Constant Prices: Laspeyres), derived from growth rates of c, g, i
ROA	Average Return on Assets (Net Income/Total Assets)
ROE	Average Return on Assets (Net Income/Total Equity)
STMKTCAP	Value of listed shares to GDP, calculated using the following deflation method: $\{(0.5) \cdot [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is stock market capitalization, P_e is end-of period CPI, and P_a is average annual CPI
STTURNOVER	Ratio of the value of total shares traded to average real market capitalization, the denominator is deflated using the following method: $T_t/P_{at} / \{(0.5) \cdot [M_t/P_{et} + M_{t-1}/P_{et-1}]\}$ where T is total value traded, M is stock market capitalization, P_e is end-of period CPI P_a is average annual CPI
STVALTRAD	Total shares traded on the stock market exchange to GDP
WB	World Bank
XRAT	Exchange Rate to US\$ (Annual Average)
YEAR	Calendar Year
ZSCORE	Z-score is estimated as $ROA + equity/assets / sd(ROA)$; the standard deviation of ROA, $sd(ROA)$, is estimated as a 5-year moving average

SUMMARY

This work contributes to the literature in comparative financial macroeconomics focusing on empirical evaluations of financial structures and economic growth with a secondary emphasis on corresponding appropriate public policy measures.

A study of the indicators of financial structure was carried out for 210 countries over the period of 1960-2009. The study used Principal Components Analysis to reduce the dimensionality of the structures while retaining the explanation of maximum variations. The study then separately performed a cross-sectional analysis on the original dataset to examine the relationship of the indicators of the financial structure with respect to economic growth. Those indicators were deemed either robust or fragile after a robustness check using a variant of Levine and Renelt's Extreme Bounds Analysis. Lastly, Partial Least Squares were used to determine which indicators were the best predictors for explaining both economic growth and changes in the financial structures.

Principal Components Analysis reveals that private credit, bank deposits, other financial assets, liquid liabilities and non-life insurance explained the maximum variation. Liquid liabilities were nearly perfectly correlated with financial system deposits. Non-life insurance had a very low correlation with life insurance so the two variables could be combined. Furthermore, stock, public bond and private bond markets capitalizations' had very low inter-correlations.

The Cross-Sectional Analysis with Extreme Bounds reveals, in the most restrictive of all models that bank deposits, bank assets, other financial assets, financial system deposits, liquid liabilities, private credit and liquidity were the positive robust indicators. Life insurance premiums were also found to be robust and positive. Bank concentration, bank income derived from interest earned, overhead and public bonds

SUMMARY (continued)

were robust with negative coefficients. Bank's return on equity and assets as well as their cost-income ratios were barely fragile and negative. Last critical points of consideration in these analyses were that trade openness and initial primary schooling variables were robust and positive while population growth rate was robust and negative. The initial GDP per capita was robust and negative providing further evidence of conditional convergence. Government's share in real GDP per capita and inflation rate were not statistically significant or robust.

Combining the two research goals, Partial Least Squares reveals that liquid liabilities, private credit, bank deposits, bank assets, public bond markets, other financial assets, life insurance premiums and international debt were considered important predictors of economic growth. Among the other explanatory determinants of growth, population growth rate, investments (as mapped by both investment's share in real GDP per capita and growth rate of new capital accumulation) and trade openness were estimated to be very important variables. Inflation rate was considered important only with imputed estimates and once again, government's share in real GDP per capita and taxes were not considered important with respect to the dual mandates of this methodology.

II. THESIS INTRODUCTION

A. Background

Walter Bagehot¹, 18th century intellectual wrote the two rules that should be observed on the role of the central banks and their prevention of banking panics:

“First. That these loans should only be made at a very high rate of interest. This will operate as a heavy fine on unreasonable timidity, and will prevent the greatest number of applications by persons who do not require it. The rate should be raised early in the panic, so that the fine may be paid early; that no one may borrow out of idle precaution without paying well for it; that the Banking reserve may be protected as far as possible.”

“Secondly. That at this rate these advances should be made on all good banking securities, and as largely as the public ask for them. The reason is plain. The object is to stay alarm, and nothing therefore should be done to cause alarm. But the way to cause alarm is to refuse someone who has good security to offer... No advances indeed need be made by which the Bank will ultimately lose. The amount of bad business in commercial countries is an infinitesimally small fraction of the whole business... The great majority, the majority to be protected, are the 'sound' people, the people who have good security to offer. If it is known that the Bank of England is freely advancing on what in ordinary times is reckoned a good security—on what is then commonly pledged and easily convertible—the alarm of the solvent merchants and bankers will be stayed. But if securities, really good and usually convertible, are refused by the Bank, the alarm will not abate, the other loans made will fail in obtaining their end, and the panic will become worse and worse.”

Bagehot is credited for the “Bagehot’s Dictum” often by central bankers² that in times of distress, the lender of last resort should “lend freely at a high rate, on good collateral.” Robinson³ later commented that “where enterprise leads finance follows”. Lucas had also dismissed⁴ finance as an overstressed determinant of growth several other economists⁵ have long debated this topic and continue to do so to date albeit using more sophisticated econometric methodology.

¹ He was also the author of the *Lombard Street: A Description of the Money Market* (1873)

² Thornton, D.L. Vice President, Federal Reserve Bank of St. Louis

³ Robinson (1952)

⁴ Lucas (1988)

⁵ Schumpeter (1911), Goldsmith (1969), McKinnon (1973)

B. State of the Problem

The debate boils down to the question of, does finance influence economic growth? This question has further evolved into the impact of financial development on economic growth. Recent literature has found evidence for and against the hypothesis using a variety of empirical techniques and a variety of data.

There is no singular measure for financial development. Researchers rely on proxy variables that capture various aspect of a financial structure. Researchers, in general, have endeavored to estimate models that will equally be applicable to country with various characteristics. More recently⁶, some researchers have concluded that it may not be possible to have a single model that could represent all countries. The problem then boils down to:

1. How to measure financial development?
2. How to tailor the analysis of an individual country or a group of countries so that an accurate examination can be performed on the relationship between that measure and economic growth⁷.

Researchers use different proxy variables, different group of country and different econometric techniques to arrive at different conclusions. A major problem here is that the financial system is very expansive and there are overlaps between the various economic actors which results in measured data that is highly inter-correlated.

⁶ IMF (2012)

⁷ Measure by the conventional real GDP per capita

C. **Purpose of the Study**

The goals of this study are three folds:

1. Try to simplify the financial structure: this study utilizes a dataset that captures 30 different aspects of a financial structure. These captures aspects are referred to as indicators, naturally, as expected, these indicators are highly inter-correlated with each. For example, a bank asset might be held in the form of cash or bond, should they be included under one variable and not the other? We seek to use empirical techniques that reduces the dimensionality of this dataset while explaining maximum variation in the over dataset itself.
2. We endeavor to study the relationship between economic growth and the changes in the financial structures i.e., financial development using conventional and not so conventional econometric methodologies that is typical seen in the economic growth literature.
3. We also illustrate that these indicators behave differently in each phase of country's development path. An indicator that may be considered crucial in the early stages of development may not be of the same magnitude of importance once the economy has matured.

D. Significance of the Problem

This study is meant to be a pragmatic quick reference for the policy makers. The assumption here is that the policy maker is a benevolent entity that is interested in the *long run* economic growth of their respective country. In the words of Jones⁸:

“... economic policy makers constantly shape the course of growth and development. A prerequisite to better policies is a better understanding of economic growth.”

Economic and banking crisis seem to be recurring theme in history. Policy ‘reforms’ are carried out in the name of economic prosperity, time and time again. Interestingly enough, economic growth has also been a sporadic phenomenon. The law makers may have the best interest in heart but if they don’t fundamentally grasp an understanding of the long run growth then all the economists in the world on their staff cannot prevent ineffective policies. Are policy makers expected to perform principal component regressions each time revised monthly economic data comes out as they head to their offices? Has the ‘dismal science’ have also become the ‘incomprehensible science’?

“Insanity is repeating the same mistakes and expecting different results⁹”- we need to approach the discussion of economic growth and the various determinants attributed to it with a fresh perspective. That may or may not include what the definition of economic growth should but that discussion is beyond the scope of this study; however, the study in future may be expanded to include various other human development indicators.

The lack of clarity in these mixed empirical results may misguide the policy makers to perform across the globe to misallocate the resources of their respective government. Their decisions should be based on what works for their country and the direction they want to take it in.

⁸ Jones (1998)

⁹ Although typically attributed to Albert Einstein, this quote first appeared on page 11 of the Basic Text of Narcotics Anonymous distributed to its fellowship in November of 1981.

E. **Significance of the Study**

This study holds different significance for different types of readers; it benefits the following groups of audience:

1. The policy makers,
2. The researchers and
3. The voter.

If you are a policy maker and you want to take your country's level of financial development to the next level, you can follow either one of these two paths:

1. See what works for the countries at the next level of development and emulate that or
2. See what works for the countries in the most developed regions and replicate that structure domestically.

The best course of action for the specific country will be a function on the preferences of the government, voters and their discipline. As a researcher you can use the results of this study to provide better cost-benefit analysis of each policy action to your customers with comparative evidence. As a voter, the economic prosperity of your country is at your heart and you can better hold your representatives accountable.

Which financial indicator is the best proxy has neither never been questioned at all in the literature nor is there any evidence documented to support the choices of the researchers. This study provides not only that evidence but it also provides support for how one can go about in developed improved measures of financial development and conduct more accurate analyses.

Section II elaborates on the theoretical and conceptual framework of how financial development, if measure correctly, can assist in the economic development of a

macro economy. Section III outlines the various data sources that have been used in the empirical analyses that follow.

Section IV reduces the dimensionality of the financial system, by reducing the dimensionality of the Financial Structures Database's data set for 210 countries over 1980-2009 and then expands the observed period to 1960-2009 using Principal Components Analysis (PCA). It further delves into the reduction of dimensionality of countries by the income group that they have been classified into by the World Bank.

Section IV performs traditional cross-country analyses, using cross-sections, first on all the countries over the years of 1980-2009 and then individually by country income groups. The results are then tested for robustness using a variant of Levine and Renelt's Extreme Bounds Analysis (EBA) for robustness check categorizing each indicator as either robust or fragile.

Section V, we combine the goals of the previous empirical sections by employing Partial Least Squares (PLS) to simultaneously search for indicators that could be the best predictors for not only explaining economic growth but also the variation in the overall financial structure. This is also done, for the sake of consistency, first in a sub-set of all countries from 1980-2009 and then by country income groups for data from 1960-2009. Lastly in Section VII, we conclude the study with final remarks.

II. CONCEPTUAL FRAMEWORK

Why would firms hold onto cash or money market securities that barely offer, if any, a meager positive real rate of return? Would students today still accrue massive amount of debts to obtain a college education if the borrowings were not subsidized?

At its core, the premise of financial development influencing economic growth is that it enables an efficient allocation. The allocation decision could be faced either by households with savings or firms with cash-in-hand, a phenomenon which currently has reached historic highs¹⁰ due to uncertainty. The function of a financial system is to facilitate the decision-making in these resource allocation considerations.

Financial system or financial development tends to be used as a catch-all phrase so let's begin by clarifying a few terms. The financial system of a country is a complex aggregate¹¹ of private sector financial institutions, including banks, insurance companies, mutual funds, finance companies, investment banks and the various money and capital markets (including derivatives) etc. The above entities are typically classified as either financial intermediaries or financial markets. A financial system's core components are the intermediaries and the various forms of markets. Intermediaries encompasses of the banking sector, bank-like (development banks, offshore entities) and non-bank institutions (insurance com., pension funds, mutual funds, hedge funds). There are a rapidly developing fields within the banking sector i.e., shadow banking and derivatives that are not adequately present in our financial system representation per se. The markets consist of capital and money markets whereas the capital markets can be further divided into debt (bond) and equity (stock) markets.

¹⁰ "Companies Still Hoarding Tons of Cash" by Catherine Rampell. Published: September 17 2010 in the NY Times

¹¹ Mishkin (2010)

A financial structure at a given point of time is a mix of these financial instruments, intermediaries and markets (components of its financial systems). Financial development is referred to as the evolution of this mix over time. This is a normative term as it implies that development is positive and there is no defined ideal structure for an economy. There is vast literature that evaluates the merits of bank-based (where banks are the dominant agents in the system) versus the merits of market-based (where markets are the dominant agents in the system). The core needs served by the financial system are¹²:

1. Methods of clearing and settling payments, supporting the basic functions of money
2. Mechanisms for pooling of resources, enabling the channeling of funds from those with excess (saver lenders) to those demanding it (borrowers)
3. Ways to transfer economic resources through time and across distance, allowing for inter-temporal consumption smoothing (provides support for the permanent income hypothesis)
4. Methods of managing risk via asset transformation (transforming low risk demand deposits into riskier ventures, spreading the risk)
5. Price information to help coordinate decentralized decision-making across the various sectors of the economy
6. Ways of dealing with incentive problems (adverse selection, moral hazard) created when one party to transaction is privy to information (information asymmetry) that another party does not or when party acts as an agent for another (principle-agent, agency problems).

¹² Merton (1995)

A detailed discussion of these merits can be found in several excellent surveys¹³.

In the past decade or so due to legislative changes, the lines between the banks and the active market participants have blurred. Retail banks through their investment banking arms routinely participate in capital market activities. This universal banking model, which allows for retail banks to provide underwriting and advising services to its clients, has been the norm in Europe but in the United States was not permitted after the great depression (Glass-Steagall Act) until more recently when it was repealed, ironically before the crash of the dot com bubble.

The challenge for the policy makers becomes one of how to determine that the financial structure of an economy is evolving in the right direction. Policy makers can pass legislation to influence certain financial structure of a country but they cannot pass legislation dictating the degree or the level of financial development. How a country's financial structure is then measured? What aspects of their structure matters most to their particular country type given their respective endowments? Unfortunately this inquiry begs more questions than it provides answers.

The second matter of interest of this particular paper is how financial development or its level is measured. Scholars¹⁴ have been limited in the past few decades by data and technology yet they still chugged long in attempts to demystify this empirical linkage. They relied on a few measures that they deemed adequate and studied them as an acceptable proxy. With time, as more data became available and technology more advanced, capital market indicators were introduced and researched.

¹³ Barro and Sala-i-Martin (2004), Levine (2005)

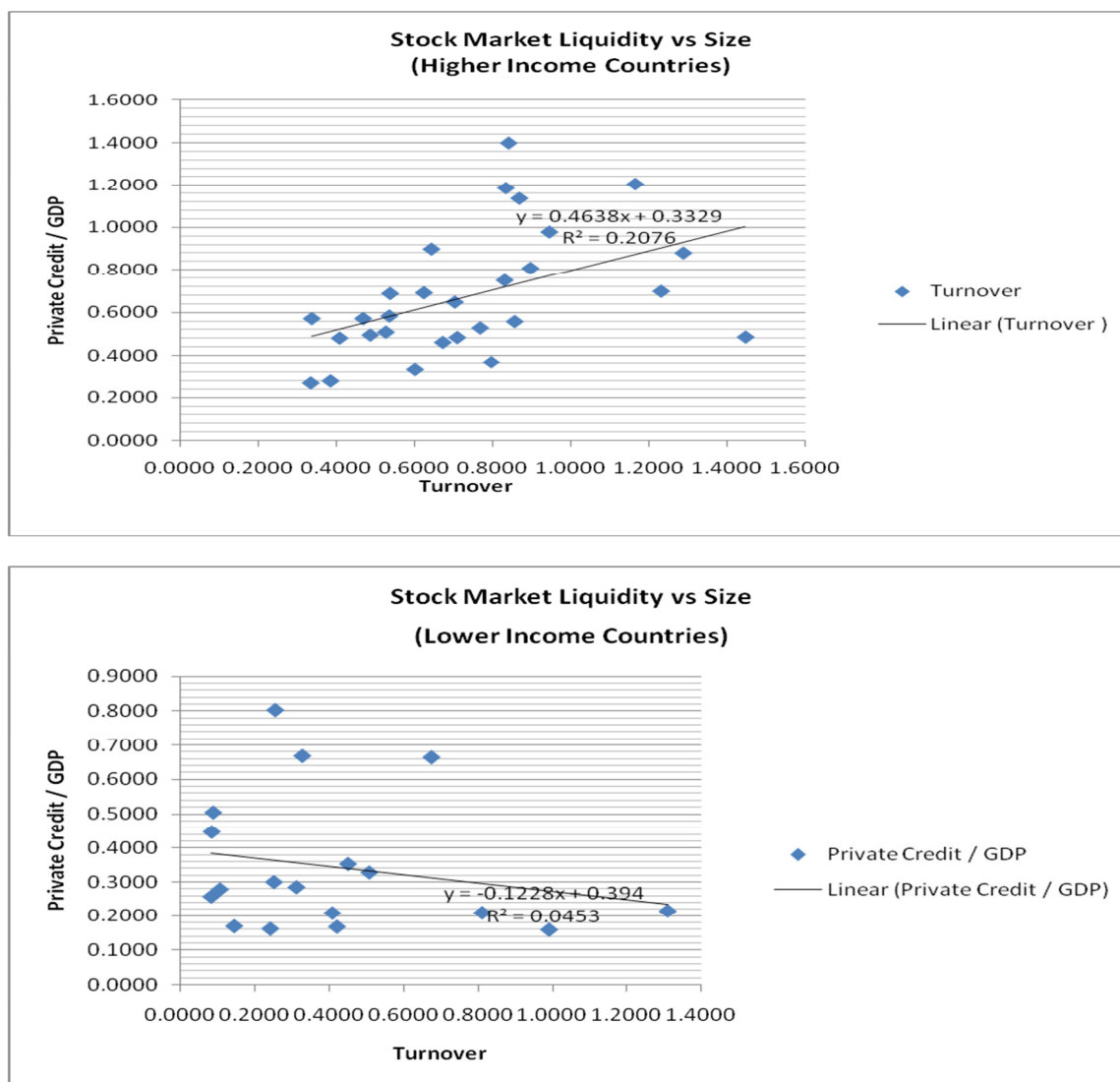
¹⁴ Goldman (1969), McKinnon (1973), Gurley and Shaw (1955), Roubini and Sala-i-Martin (1991), Atje and Jovanovic (1993), King and Levine (1993), Levine and Zervos (1998)

The compilation of the Financial Development and Structure database¹⁵ support Goldman's original ambition of reducing the barriers to entry in research of this field. This was followed by another wave of literature using more sophisticated econometrics techniques to explore the question; however, there are a few questions that warrant to be asked in the context of cross-country comparisons:

1. How can researchers and analysts model the financial structure of a country and ergo their system and track the corresponding development over time?
2. Are the proxy indicators sound representatives of the financial system?
3. A plethora of new literature continues to use the conventional aggregate indicators; did those studies consider using the new indicators?
4. Do all indicators have the same impact in all the countries (see Figure 1)?
5. What is the right estimating model? Is it the same for all countries?
6. What other explanatory variables should be included?
7. Is the inclusion of these explanatory variables justified for all countries?

¹⁵ Beck and Demirgüç-Kunt (2000, 2010)

FIGURE 1
Scatterplots of Stock Market Liquidity and Aggregate Private Credit exhibiting different behavior in the Higher versus the Lower Income Countries¹⁶



¹⁶ The scatterplot collapses the country groups into two categories for graphical representation (1960-2009)

Some scholars¹⁷ have called for and roughly outlined a composite representing financial development. Studying the indicators and their empirical linkage to long run economic growth in a simple cross-country framework is a solid first step towards reaching the goal of a composite and (possibly) a universal model which could be used for future country (case) or a regional based time-series or panel comparative studies. Let's briefly review the economic theory behind each of these indicators. You will see these indicators again when discussing data and the literature review:

Central Bank Assets comprises of government securities and loans (such as discount loans) made out to the banks or other intermediaries. These assets typically are interest bearing and act as a source a revenue for the Central Bank. Furthermore, these changes also lead to corresponding changes in the level of reserves, the monetary base and an eventual change in the money supply.

Liquid Liabilities is the liability side of a central bank's balance sheet. It is also referred to as the financial depth of the system and represents the financial intermediation carried out by all the sectors and thus the overall size of the financial sector. This is measured, in the literature as currency plus demand and interest bearing liabilities of banks and other financial intermediaries i.e. M3 or M2 when M3 is not available. An increase in either of the above measure results from an expansionary monetary policy. As long as the rate of monetary expansion is greater than the inflation rate, this paper expects it to have a positive influence on real output due to a lower cost of capital.

The Financial Systems Deposits indicator represents deposits by the general populace at the banks and bank-like institutions. These are that are available to the

¹⁷ Honohan (2004)

institutions to be used in their lending operations. They are considered liabilities to the bank as well as their reserves. The economic implication of this indicator is two folds:

1. Banks can lend out more than the deposits it holds because of fractional reserve banking systems. The less excess reserves they hold, the more private credit they can extend.
2. The more private credit they extend, the less excess reserves they hold and the more prone they are to being under-capitalized. In the event of an unexpected reduction in asset prices or increase in loan write offs, the institutions will face insolvency.

Under the traditional neo-classical assumptions of perfect capital markets, risk neutral agents, savings allocated efficiently leaving no unexploited gains on the table and as long as the return on lending is greater than the rate of return paid out to the holders of these checking, savings and time deposit account bearers adjusted for operational expenses, theory suggests that a credit expansion of such will ease the barriers to entry and increase competition having a positive effect on output.

Private Credit issued by deposit money banks and other financial institutions has become a standard measure of financial development used by the researchers in the literature. It represents all the credit issued by the intermediaries to the private sector alone excluding any public sector borrowings. This is said with a disclaimer that it may still include borrowings by the private sector that may be used to finance public debt acquisitions.

This indicator represents the core function of the financial system, the task of asset transformation where the savers channel funds to the borrowers or investors. The intermediaries become custodians and are expected to allocate resources more efficiently than a commoner. The intermediaries are expected to exhibit and exercise

professionalism and expertise and in return enjoy economies of scale mostly in the form of reduced transaction cost. They are also tasked with the responsibilities of risk management as well as corporate governance in some instances. It is within this theoretical framework that this study expects a positive influence of private credit expansion on total output.

The next indicator is part of the traditional capital account in the balance of payments accounting where when capital flowing from country A to B, it will be recorded as a (-) for A and (+) for B. For the sender country it behaves as a capital outflow and in the foreign exchange market the sender country's currency is exchanged for the receiving countries local currencies units resulting in a possible depreciation for the sender currency; the reverse could be said about the receiving country. Under managed float exchange rate system, there will also be an effect on the nominal interest rate and possibly the local inflation rates. The eventual resulting impact will whether on the 'relative' magnitude of these combined affects. The outflow from the US to Pakistan has a negligible impact on US but a considerable magnitude on Pakistan. This study enters its analysis with a possibly marginal positive¹⁸ argument to the long run economic growth invoked by the receiving country's capital formation and hence pushing its production possibilities frontier outwards.

Moving on from aggregate to sector specific indicators, we have a total of banking sector indicators that covers various aspects of the sector's size, competition, operational efficiency, stability and financial performance. Representing size private credit issued by banks, bank assets, money bank assets as a ratio of money bank and central bank assets and bank deposits. Observe that the former four are assets generally considered to be the debit side of the bank's balance sheets whereas the latter is a liability to the

¹⁸ This is consistent Giuliano and Ruiz-Arranz (2009)

bank or the credit side of their balance sheet. Managing these accounts is part of risk and bank management activities and has a tremendous influence on a bank's lending behavior.

It may be useful for the reader to distinguish between private credit and assets. Simply put, private credits are claims on the private sector only and it includes real and the financial sector but excludes the public sector. Assets are claims on the private and public sector but includes the real sector i.e. the financial sector is not included. They both are indicators on the debit side and maybe considered as two different asset management strategies. They can also be tabulated as follows:

TABLE I
TREATMENT OF PRIVATE CREDIT AND BANK ASSETS WITHIN THE PUBLIC AND FINANCIAL SECTOR

Indicator Type	Public Sector Included	Financial Sector Included
Private Credit	No	Yes
Bank Assets	Yes	No

Private Credit and Assets are both Asset side items of a typical balance sheet; Notice that they represent two different aspects of the Asset side. Private credit measures only the private sector including claims on the financial sector. On the other hand, Bank Assets reflect claims on the public sector but only on the real non-financial sector. Again under the assumptions of the banks doing their due diligence, the study expects these two indicators to have a positive influence on economic growth by facilitating credit appropriately.

The money bank assets as a ratio of the sum of money and central banks assets shows the relative weight of the banking intermediaries in the financial system. Central bank intervention is assumed to be preventing the markets to clear at one extreme end and on the other extreme end is its absence from the system altogether. A higher ratio represents the intermediaries to play a larger role in the system and hence there is a positive relationship here, as the banks play a bigger role, the economy should be positively increasing and disproportionate central bank participation a hint of a faltering real economy.

Bank deposits are generally liabilities for the bank however they are also conduits to a monetary expansion and contraction as they act as reserves for the banks. Under our former assumptions (of liquid liabilities), an increase in bank deposits will result in an increase in reserves and an increase in money supply and as long the inflation rate is less than money growth rate, we will see a positive change in the real economy due to economies of scale rents enjoyed by the intermediaries and 'easier' credit to make the optimal resource allocation decisions by individuals and firms. A word of caution here is that it all hinges again on the intermediaries doing their due diligence in banking management tasks such as appropriate assessment of risk.

The next three indicators measure the banking sector intermediaries' operational efficiency. If intermediaries are operating efficiently then they can keep their costs lower and in a competitive environment pass their savings on to their customers in the form of lower cost of capital encouraging and stimulating the investment climate.

The first measure is a ratio of Bank Credits / Bank Deposits where Bank Credit is the Private Credit value discussed earlier and includes claims on the financial sector but excludes the claims on the public sector. This is a ratio expressing the magnitude of assets the intermediaries can generate relative to their liabilities.

There are two items here that severely distorts this ratio: the first is that not including the public sector underestimates this value and secondly the credit extended here is a result of all reserves not just bank deposits. The shadow banking sector, comprising of financially innovative instruments has been increasingly more responsible for generating capital that is not subject to the reserve requirements. Hence these funds generated are fully available to act as reserves and be lent out and this overestimates the value of this measure.

Higher ratio will allow for more credit to be available from national savings and as a result facilitate optimal resource allocations resulting in a positive expected linkage between this ratio and the real national output.

The second indicator is a ratio of overhead expenses as a fraction of the bank's assets. Recall that assets represent the real, non-financial claims on the private and public sectors. This ratio tells us about the operational expenses relative to the magnitude of the business that is conducted by the intermediaries.

The efficiency concept here assumes that the lower the fraction is, the more effective the intermediaries are and as a result they will pass on the savings in a competitive landscape essentially resulting in lower cost of capital. This study assumes

this theoretical linkage to have a negative relationship. The lower the overhead cost ratio the higher the possibility of increased real output in the long run.

The last operational efficiency measures take the overhead costs and instead of comparing it with the size of the credit extended, like in the previous indicator, it measures it relative to the gross revenues that are derived from that extended credit giving us a cost-income ratio. The assumptions stated here are also that the intermediaries will pass on the lower costs resulting in a lower cost of capital for the decision-makers at the individual, household and the firm level. A negative relationship is expected here, as banks become cost efficient, the ratio will decrease and productivity and output will increase.

The competitive landscape in this study is estimated using a concentration ratio, CR_3 , as the sum of the market share of the three largest firms relative to the entire market size. The ratio, CR_3 , is bounded by the ranges $[0, 1]$ where a near zero value would represent perfect or monopolistic competition and near 1 values represent oligopolistic competition, cartel or even a monopoly in its environment. The theoretical assumptions here is that a competitive environment will lead to lower cost of capital and promote investments resulting in a negative relationship between the indicator and economic growth.

The study uses the datasets three measures here categorized as financial performance. The first two measures are profitability measures whereas the third measure is a financial wedge that may affect the size of the credit extended and the cost of capital to the eventual borrowers.

Return on Assets or ROA is one of the core profitability measures in security analysis; it is the earnings before interest and taxes divided by the total assets of the intermediaries. The dataset has computed this indicator and the next one as an un-

weighted average which would be the primary criticism of using these measures as appropriate indicators representing financial development. Nonetheless, this measure is directly to the arguments made under the cost control indicators' review. Lower costs lead to higher earnings and profits for a given level of assets. Therefore a higher ROA implies higher earning or lower costs and possibly better management of resource allocation leading to efficiency and output gains.

Return on Equity or ROE¹⁹ is an accounting ratio of net profits divided by equity. This indicator is the after-tax return of assets and the debt-to-equity ratio adjusted for returns from a risk free investment.

The last measure of financial performance is the wedge inserted by the intermediaries in search for rent from asset transformation. It is the accounting value of a bank's net interest revenues as a share of the total asset value. The net interest revenues represent the difference between the revenues generated from lending at the lending rates (asset side of their balance sheets) and the expenses paid out to deposit holders (on the liability side). The larger this ratio is, the larger the wedge that intermediaries have inserted resulting in a higher cost of borrowings for individuals, households and firms. This eventually distorts their choices and results in sub-optimal decisions. This study therefore expects a negative relationship between the net interest margin and the economic performance of the macro-economy.

The last banking sector measure is a standard measure of banking structure stability known as Z-scores. This is the standard measure of banking structure stability in that particular strand of literature although at an aggregate level not without caveats²⁰. It

¹⁹ $ROE = (1 - \tau)[ROA + (ROA - \text{Interest rates})\left(\frac{Debt}{Equity}\right)]$

²⁰ Strobel (2010)

is computed as the sum of the ROA and the capital-asset ratio divided by the standard deviation of the ROA (the denominator is also referred to as the volatility of the ROA).

The indicator Z-score as a whole represents the inverse of the probability of insolvency for an intermediary. The Z-score is the inverse of the probability of insolvency of a banking institution. Therefore, the lower the probability is, the higher the corresponding Z-score is. A higher Z-score represents a stable banking structure which concludes this study to expect a positive relationship with economic growth.

For the next category of indicators we first must distinguish between bank-like and non-bank-like institutions as defined by the international monetary fund and the international monetary statistics. Bank-like institutions include:

1. Deposit institutions that don't have transactions facilities such as building societies
2. Intermediaries that raise funds for loans issuance through their own debt offerings
3. Development banks that mainly obtain their funds through the government and other supranational such as the IRDB at the world bank
4. Off shore units

Non-bank institutions include:

1. Private (non-public sector) Insurance companies: both life and non-life
2. Non public sector pension funds
3. Pooled investment schemes, such as REITs, mutual funds, hedge funds, and venture capitalists
4. Non-government compulsory saving schemes, such as 401k and 403b

Data on bank-like institutions is usually compressive while the data on non-bank like institutions is fragmented and there are considerable variations across countries. This study includes two bank-like indicators, Other Financial Institutions Assets and Offshore Units, and two non-bank indicators, Life Insurance Premiums and Non-Life Insurance Premiums. Also observe that in the non-bank institutions category this dataset ignores mutual funds, pension funds, hedge funds and other retirement funds. However, it is 'hoped' the variation in those indicators are captured in the capital market indicators discussed next.

Other Financial Institutions' Assets are load made out to the various economic agents by the bank-like institutions. They are a conduit of channeling funds from either direct savers or individuals who have invested in or with them. The study also assumes that they will and do perform their due diligence like the banks and it is with that assumption that a positive relationship is expected because they not only provide another channel to pass on the savings to investors but they also intensify the competitive landscape.

The rationale behind the Offshore Units is that these are sources of funds that were initially capital outflows probably due to tax reasons and are now seeking rent. They perform similar functions that they act as another channel for potential borrowers and prove to be a source of competition within the lending markets. More recently, Sovereign Wealth Funds have also provided a similar role via the domestic Investment Banks, at least in the USA. A positive relationship is expected as this capital inflow occurs to spur economic growth. There may be a potential causality if the size of this inflow is very large relative to the size of the receiving economy.

A similar argument is made for the non-bank indicators of life and non-life insurance premiums. These are funds generated by life insurance companies that are available for potential investments by the firm assuming positive net cash flows. Not only this serves

as another channel for borrowing and a source of competition but there are two more economic implications of this indicator. The first is that is a risk-management strategy that may smooth consumption within the macro economy and provide stability, this will have a positive relationship with development. However, the second implication is that this may encourages moral hazard where the non-life insurance policy holders may engage in excessive risk taking. A good example of such a scenario is when AIG was underwriting exotic derivatives that they could not afford to pay out. As a result, it became 'too big to fail' and needed to be rescued to avoid a ripple effect of this practice across countries. This study does not evaluate the claims; it is a mere first attempts to set the stage for which future work might evaluate those type of claims. The relationship of these non-bank indicators is expected ambiguous in this study.

The last set of indicators measure the various aspects of the capital markets. The dataset includes four measures each for the two capital markets: debt and equity. The equity market is represented here by various stock market measures. The usefulness of stock markets must be motivated here first in order to convince the reader of its significance and the role it plays in economic growth. From the firm's perspective, stock market provides an opportunity to raise capital directly from the public in order to typically expand your enterprise. The investor is interested in the stock market because a share represents a fraction of an ownership in that enterprise, an investor can buy shares into multiple companies that she may be interested in. A parable to that is going to a buffet or simply buys one dish; stock market gives you an opportunity to diversify your savings or capital over multiple firms rather than put all your eggs in one basket.

The first indicator gauges possibly the barriers to entry; being listed on a stock exchange requires that a firm must meet certain requirements before it is allowed to be listed. These listing requirements vary with the exchange; some are more stringent than

others. Examples of these requirements may be revenues of in excess of a certain amount or a corporation needs to demonstrate that it has attained a certain revenue level or some other metric over a certain period of time.

A complete coverage of these requirements and coverage is beyond the scope of this paper; however what one can take away from it is that easing these requirements or barriers to entry to this equity form of capital raising efforts encourages entrepreneurship. This indicator is listed companies per 10,000 persons; its purpose is to illustrate the prevalence of public companies in a given country. The higher the number is the lower the barriers to going public may be in that country on a given exchange. Hence the entrepreneurs have a higher incentive to expand their business without concerns from any lenders trying to exercise undue influence on them. This study therefore expects a positive relationship between the two, theoretically speaking.

The second indicator that the study evaluates is the Stock Market Capitalization. Be mindful that this is different than the sum of the enterprise value of all the companies listed on a given exchange. Stock market capitalization incorporates the perception of a firm's value beyond its book value and may have an element of speculation. Furthermore, a few large firms may skew this particular measure such as the twelve companies in the Dow Jones Industrial Average.

This measure is meant to convey the funds raised by a firms in equity issuance, however it cannot because this indicator measures the market capitalization in the secondary market whereas our purpose is better served by capital raised in the primary markets²¹.

²¹ Bodie et al (2011)

However, what this indicator does accomplish maybe a perceived evaluation of an economy's health and a gauge of consumer expectations. The S&P 500 is considered to be highest weighted leading economic indicator for the US business cycle so a higher stock market capitalization may keep the entrepreneur abreast of the current or the expected macroeconomic conditions. This reduces information asymmetry and may lead to better information set for all economic agents involved and hence this study assumes a positive relationship here.

The third element of the equity market consideration is a liquidity measure and computes the daily traded volume of the different securities on each of the exchanges as ratio of the gross domestic product. This indicator is a confidence builder in the sense that investors know that if a company or management is not performing up to par they may switch to another. It makes resource (capital) allocation much more dynamic and increase the elasticity of capital with respect to information and changing investment climate. This inspires the investors to not to 'hoard' cash but rather be active participants in the equity markets. This flexibility and incentive leads this study to assume a positive relationship between liquidity of the savings and funds available for investments hence development.

The last indicator actually brings about the preceding two indicators and is very common in this literature; it is known as the turnover ratio and is the trading volume as a fraction of the total market capitalization (maximum possible trading volume). This ratio is bounded by zero at one extreme, perhaps when the markets are close and it does not have an upper bound as one share can be traded several times during a single day. This is the prevalent indicator of liquidity in the equity markets and is expected to have a positive relation with economic growth similar to its denominator and numerator.

The last category of our dataset is debt market aspect of a capital structure and here it is split between domestic and international indicators, two indicators for each sub-category. Domestic public and private bond indicators measure the total outstanding bonds issued by firms as a share of total production. Debt here has roots for a firm wishing to exercise corporate governance and discipline in its management. Short term debt may be viewed as management monitoring tool. Equity values maybe inflated with expectations of future growth that not always comes to fruition. Expansion using leverage is much more cautious; firms with low level of leverage can also exercise discretion where in the case of equity holders of firms who are highly leveraged already this may not be possible. The distinction between the private and the public indicators are simply the bond markets where the debt or bonds were issued. A more expanded theoretical distinction and their respective implications are beyond the scope of this paper. Debt issues as share of GDP should have a positive relationship with economic growth, however, it highly probably that this relationship exhibits non-linearity where after a certain critical point it may exhibit diminishing to perhaps even negative rates of returns.

The last two indicators are measures of financial openness from a debt perspective. International Debt issues are when funds are raised in foreign debt markets for example Toyota issuing 'Samurai' bonds or Nokia issuing 'Euro' bonds in the US. The access to funds in such a channel facilitates capital formation and acquiring funds as well as spurs competition and hence the study assumes a positive relationship.

TABLE II
FINANCIAL INDICATORS AND THEIR EXPECTED THEORETICAL SIGNS

Indicator type	Sub-category	Acronym	Indicator name	Expected sign
Aggregate	Size-Assets	CBAGDP	Central Bank Assets /GDP	+
	Size-Liabilities	LLGDP	Liquid Liabilities / GDP	+
	Size-Liabilities	FDGDP	Financial System Deposits / GDP	+
	Size-Assets	PCRDBOFGDP	Private Credit by Banks and Other Financial Institutions/GDP	+
	Openness-Assets	REMIT	Remittance Inflows (Openness)	+
Banking Sector	Bank-Efficiency	BCBD	Bank Credit/Bank Deposits	+
	Bank-Liabilities	BDGDP	Bank Deposits/ GDP	+
	Bank-Efficiency	CONCENTRATION	Bank Concentration	-
	Bank-Efficiency	COSTINC	Bank Cost-Income Ratio	-
	Bank-Assets	DBACBA	Deposit Money Bank Assets / (Deposit Money Banks + Central Bank Assets)	+
	Bank-Efficiency	NETINTMARGIN	Net Interest Margin	-
	Bank-Efficiency	OVERHEAD	Bank Overhead Costs/ Total Bank Assets	-
	Bank-Assets	PCRDBGDP	Private Credit by Banks/GDP	+
	Bank-Efficiency	ROA	Bank Return on Assets	+
	Bank-Efficiency	ROE	Bank Return on Equity	+
	Stability	ZSCORE	Bank Z-Score	+
	Bank-Assets	DBAGDP	Deposit Bank Assets/GDP	+
Other Intermediaries Sector	Lins- Assets	INSLIFE	Insurance (Life) Premiums/GDP	+
	NLins-Assets	INSNONLIFE	Insurance(Non-Life) Premiums/GDP	+
	Other-Assets	OFAGDP	Other Financial Institution Assets/GDP	+
	Offshore-Liabilities	OFFDEP	Offshore Bank Deposits/Domestic Bank Deposits	+
Debt Markets (ratio of GDP)	Openness-Liabilities	INTLDEBT	International Debt Issues	+
	Openness-Liabilities	NRBLOAN	Loans from non-resident banks	+
	Bond-pub	PRBOND	Private Bond Market Capitalization	+
	Bond-pvt	PUBBOND	Public Bond Market Capitalization	+
Equity Markets	Barriers to entry	LISTCO_PC	Number of publicly listed companies per 10k population	+
	Increased Trade	STVALTRADED	Market Value of Total Stocks Traded/GDP	+
	Equity Valuations	STMKTCAP	Stock Market Capitalization/GDP	+
	Liquidity	STTURNOVER	Turnover ratio (ratio of the preceding two indicators)	+

III. DATA

This investigation revolves around the indicators compiled by the Finance and Private Sector Research program at the World Bank, The Financial Structures Database, updated through 2009. All the indicators are investigated from this database for all the countries using a variety of empirical techniques. Furthermore, the Financial Development and its Structure's indicators were categorized (see Figure 2) per theory in to aggregate, intermediaries and capital markets indicators. Each of the above was further sub-categorized as Banks, Non-Banks, Stock and Bond markets (see Table III). Descriptive statistics and the correlation matrix of the indicators can be found in the appendix.

FIGURE 2
Hierarchy of the Financial Structure Database

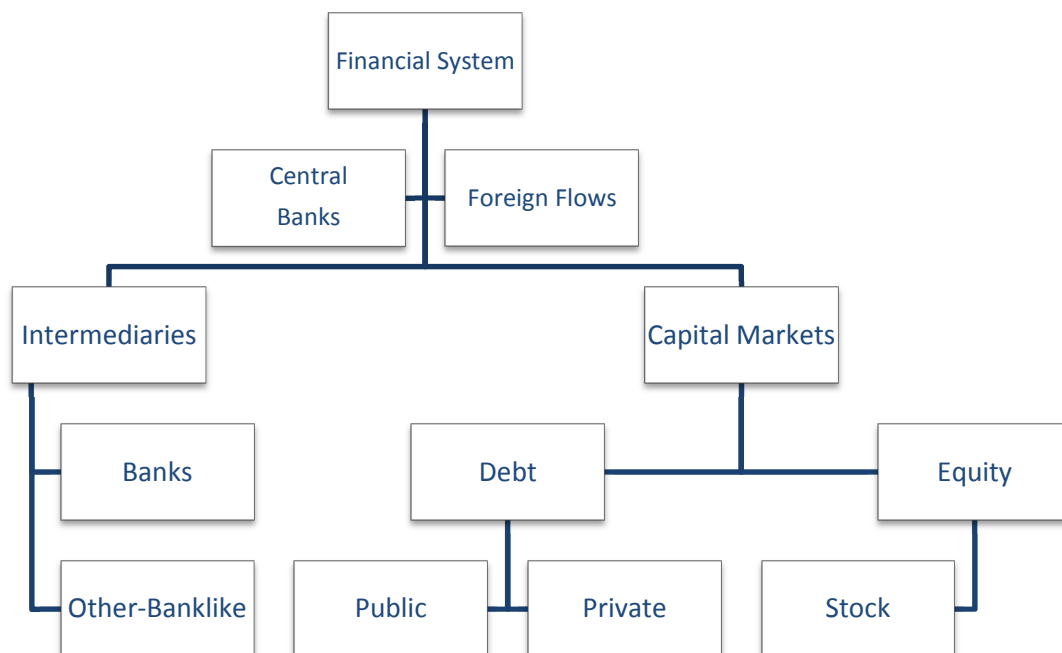


TABLE III
AGGREGATE (AI) AND SECTOR SPECIFIC (SSI) INDICATORS

Aggregate (as a ratio of GDP)	Banking Sector	Other Intermediaries Sector	Debt Markets (ratio of GDP)	Equity Markets
Central Bank Assets	Bank Credit/Bank Deposits	Insurance (Life) Premiums/GDP	International Debt Issues	Number of publicly listed companies per 10k population
Liquid Liabilities	Bank Deposits/ GDP	Insurance(Non-Life) Premiums/GDP	Loans from non-resident banks	Market Value of Total Stocks Traded/GDP
Financial System Deposits	Bank Concentration	Other Financial Institution Assets/GDP	Private Bond Market Capitalization	Stock Market Capitalization/GDP
Remittance Inflows (Openness)	Bank Cost-Income Ratio	Offshore Bank Deposits/Domestic Bank Deposits	Public Bond Market Capitalization	Turnover ratio
Private Credit by Banks and Other Financial Institutions/GDP	Deposit Money Bank Assets / (Deposit Money Banks + Central Bank Assets)			
	Net Interest Margin			
	Bank Overhead Costs/ Total Bank Assets			
	Private Credit by Banks/GDP			
	Bank Return on Assets			
	Bank Return on Equity			
	Bank Z-Score			
	Deposit Bank Assets/GDP			

A. **Financial Structures Database**²²

The database and the indicators that reside within have been discussed by the authors and surveys extensively. The data description will be recapped here briefly to maintain continuity for the readers not familiar with the literature. The data will be described here in categories as illustrated in Table 1. These indicators are also reviewed in a different light in both the theory section as well the literature review. The data sources are tabulated in a table in the appendix. The P preceding the variables during the course of these analyses indicates that the data has been expressed as a percentage from a fraction for ease of interpretation.

a. **Aggregate Indicators**

CBAGDP are Central Bank Assets as a ratio of GDP; central banks assets are the assets items on a central banks' balance sheet. This is typically the notional value of the instruments being carried such as government securities or other assets acquired by the central bank of a country. In the case of the Federal Reserve of United States they may include mortgage back securities of late. These are claims owned by the central bank on the real sector of an economy.

LLGDP, Liquid Liabilities as a ratio of GDP are simply the monetary M3 (where available) or the M2 measure dividing by the GDP. All literature and theories applicable to money should apply to this indicator.

FDGDP are deposits made throughout the entire financial system. These deposits are a liability for the institutions where they reside hence this should be considered a liability side indicator similar to LLGDP.

²² Beck et al. (2010)

PCRD BOFGDP is the total private credit extended by deposit money banks and other financial institutions relative to the GDP, this is the non-central bank private credit extended. Recall the matrix from the theory section that this measure included the financial sector but not credit extended to the public sector directly.

REMIT, the remittance inflow data is a measure for openness. This should be comparable to Foreign Direct Investments (FDI) in its effects; however, FDI and Foreign Portfolio Investments (PFI) are not part of the World Bank dataset.

b. Banking Sector Indicators

BCBD represents how much credit has been issued relative to the deposits accepted by the banks. This may be interpreted as the efficiency of intermediation. BDGDP, Banks Deposits as a ratio of GDP is the bank specific aggregate value of bank liabilities as fraction of the total national output.

CONCENTRATION merely measures the concentration ratio, which is the market share of the three largest banks as ratio of the total market. COSTINC is the ratio of Bank Costs to Bank Income which measured the efficiency of the banks.

DBACBA is a ratio of Deposit Bank Assets relative to the sum of Deposit and Central Bank Assets. This data should be on the real and non-financial sector including the public sector assets owned by the banks and the central banks. A lower ratio here had reflected a heavier hand of the central bank. DBAGDP is the sister indicator where the bank assets is a fraction of the GDP.

NETINTMARGIN is the net interest income as a ratio of the total bank assets. Lending instruments of various forms of credit are assets hence this represents the gross margin for the bank from lending activities.

OVERHEAD is the ratio of Bank Overhead Cost as a ratio of Total Bank Assets. Intuitively it is the overhead costs and not the total cost of operations as a fraction of the total notional values of credit instruments that have been extended out to the market. It at best is an indicator on Bank operation's efficiency.

PCRDBGDP was the tabulation of the sum of all the private credit extended (another asset side item) as a fraction of GDP. ROA, bank return on assets, is an indicator that measures management performance. Theoretically it should be all encompassing but is typically a lagging indicator of the financials of the intermediary.

ROE or bank return on equity is an indicator that measures the rent that the ownership of the bank is able to generate off their equity. This is a key indicator in corporate finance and it may have a negative impact if the ownership pursues an aggressive rent seeking actions which may deter expansion. Bank Z-score is measure of banking center risk and stability.

c. Other Intermediaries Sector

INSLIFE and INSNONLIFE premiums revenue represent the Insurance sector. These indicators are size of the revenue indicators as a fraction of the GDP. The insurance companies engage in several forms of lending activities from the funds earned. Their assets are these lending instruments and the liabilities may be the claims that they will pay out with a pragmatic assumption of non-actuarially fair insurance practice. Nonetheless, the larger these players become the more it intensifies the competition not only in lending but also in borrowing. OFAGDP represents the bank-like institutions and the assets it generates as a fraction of GDP.

d. Capital Markets- Debt Sector

There are two indicators that represent the openness in the debt sector INTLDEBT and NRBLOAN whereas the other two indicators measure the bond markets, private PRBOND and open (public) PUBBOND as a share of GDP.

e. Capital Markets- Equity Sector

STMKTCAP is the total value of all the outstanding shares within the given exchange(s) that trade common shares in the secondary markets. Market value of the total stocks traded, STVALTRADED, is only the value of the shares that exchanged hands; STTURNOVER is the ratio of the above two indicators. LISTCO_PC is the number of publicly listed companies per 10k population.

B. Penn World Tables²³

The macro dataset compiled formerly by the University of Pennsylvania was used for the core macro numbers, specifically, population, real GDP per capita, share of investments in real GDP per capita and trade openness; all of the values were at constant prices measured using the Laspeyres²⁴ index at 2005 international dollars. The authors have cautioned against using their compiled country growth rates.

GPOP or the population growth rate is the percentage change in the total population year to year; population is expressed in the dataset in thousands. KI, expressed in percentages, is the investment Share of PPP Converted GDP Per Capita at 2005 constant prices [RGDPL]. GRGDPL, 2005 International dollar per person (2005 I\$/person), is simply the year to year percentage change in real GDP per capital

²³ Heston et al (2011)

²⁴ McCulloch et al (1982)

expressed by the RGDPL value. Lastly OPENK, expressed in percentage, is the trade openness at constant 2005 prices. The inflation rate, IRATE, is calculated by the percentage change of price levels, year-to-year.

GNEWK is the growth rate of year-to-year percentage change in the variable IKON. IKON is the capital stock per capita also compiled by the Center for International Comparisons at the University of Pennsylvania. This is different from the variable KI in that KI is the new investment as a percentage of real GDP per capita whereas GNEWK is the growth rate of new capital accumulation per capita; while the two variables should be highly correlated they are distinct in their respective representation.

C. Educational Attainment in the World²⁵

Three human capital measures were used in model (6), the most restrictive model of the EBA. The first measure was for initial level of human capital (standard in the literature), Percentage of Complete Secondary Schooling Attained in the Population in 1960. Secondly, the average years of secondary schooling attained for the cross-section for each country.

The Barro and Lee Data set provides educational attainment data for 146 countries in 5-year intervals from 1950 to 2009. It attempts to reduce measurement error by constantly updating their estimates are constructed using recently available survey information. The two variables used from this dataset are LP, percentage of Primary Schooling Attained in Population and LSC, percentage of Complete Secondary Schooling Attained in Population. This model is also the only model that used YR_SCH_SEC, a variable that measured the average Years of Secondary Schooling Attained.

²⁵ Barro and Lee (2010)

D. Other Explanatory Determinants of Growth

Five other determinants of growth were included in the various analyses of this thesis; they include indices of corruption, democracy, coups and revolutions, creditors' rights and rule of law²⁶.

CORRUPT is a corruption index compiled by the International Country Risk Guide (ICRG). BLKXPREM is the black market exchange rate premium at 1980 as estimated by EastLev and Democracy score, DEMO, was computed for the years 1970-1994 by PIII. CRIGHTS are creditors' rights as estimated by L&F on the scale of 0-4. COUPS are the number of coups and revolution as compiled by AFDATA. Finally, RULEOFLAW, is another index estimated by the ICRG. Last but not least, TAXES, tax revenues expressed as a percentage of GDP were extracted from the OECD databases²⁷.

²⁶ Various Andrei Shleifer datasets that can be downloaded at:
<http://www.economics.harvard.edu/faculty/shleifer/dataset>

²⁷ <http://www.oecd-ilibrary.org/statistics>

IV. INDICATORS OF FINANCIAL STRUCTURES: AN EMPIRICAL EVALUATION USING PRINCIPAL COMPONENTS ANALYSIS

A. INTRODUCTION

Merton had previously defined financial development as changes in a financial structure over a period of time. The problem lies in how to measure a country's financial structure? Is it even possible? There are many facets of the financial structure of a given country, our initial review of the financial system elaborates on it. Various researchers have used a particular indicator such as bank assets or liquid liabilities to proxy for a snap shot in of a given macro economy's financial structure while others have used measures from capital markets such outstanding value of publicly traded bonds or the stock market turnover ratio to proxy for that same snap shot.

The database of the indicators of financial structures does an excellent job of bringing most of these proxies together under one dataset. These variables together give a comprehensive view of the financial structure of a macro economy. However, these variables are not very comparable with each other; some represents the magnitude of a particular aspect of the financial structure with respect to GDP; other indicators are various ratios that measure efficiency or other proxy of performance. Furthermore, all these indicators are highly correlated with each other.

This paper employs the technique of Principal Component Analysis (PCA) to reduce the dimensionality of this dataset. Specifically, it searches for indicators that best explain the overall variation within the dataset. Section II briefly describes the mathematical theory behind PCA. Section III will review what other researchers have done in he finance-growth nexus using PCA. Section IV will describe what we have done

here, why is it different and how does it help us better understand this field. Section V will go over the empirical results. Section VI discusses possible policy implications with caveats. Section VII concludes this paper emphasizing that our true contribution is merely an attempt to identify better and or more relevant proxies of financial development.

This paper does not use the principal components themselves as variables; as this neither does not help the policy makers with coming up with practical solutions nor does it helps them understand or even monitor financial development. This paper does not investigate financial development's role with respect to economic growth. We strictly make an attempt here to reduce the dimensionality of the dataset while explaining maximum variation in different countries and country income groups.

B. LITERATURE REVIEW

4. Principal Components

Saci and Holden²⁸ pioneered the work in overcoming the multicollinearity problem in the Financial Development and Economic growth context using Principal Component Regressions. They examined the relationship using panel data after computing the principal components. They also adopted estimation procedures addressing the problems of lagged dependent variables, serial correlation and endogeneity. These estimation procedures were suggested techniques²⁹ while estimating a system.

Their results showed that financial development (as measured by their principal components) had a positive effect on growth. The concerns that rest with that particular study are:

1. It chooses 10 financial structure indicators *a priori*. One of the purposes of this thesis is to document exhaustively the performance and behavior of all indicators. Choosing the 10 indicators without investigating the others indicators in the context of a 'proxy' leaves room for error.
2. On a positive note, the authors did include FDI as a measure (but not remittance) as a financial indicator, a macro metric that the Financial Structures database leaves out. The authors did not include remittances which in some countries play a bigger role than foreign direct or foreign portfolio investments. As the measures are targeted for different domestic aspects of the receiving country.
3. The paper critiques the 5-year averaging due to the fact that the averaged data reduces the business cycle variations in the result. Ironically, the human capital

²⁸ Saci and Holden (2008)

²⁹ Blundell and Bond (1998)

explanatory variable that the study uses is only available in 5-year increments.

No explanations were offered as to what methodology was used to rectify for that.

4. Only the scores were documented as results in the format of an eigenvalue matrix without any interpretation on them with or without the explanatory variables.
5. The policy-makers do not have access to real time principal components information. The study does not offer a pragmatic way for the decision-makers to monitor the economy in real time.

The paper was influential as it opened up the discussion on an avenue beyond the cross-country regressions without time series or panel methodologies. It also allowed for the possibility of reducing the dimensionality on the financial structure measuring variables. It still did leave much to be desired.

5. Indices

Jalil et al.³⁰ revisited the finance-growth nexus in China and attempted to measure the magnitude of the impact of financial development on the macroeconomic activity in China. They restricted themselves to 3 measures of financial indicator only as *a priori*. The authors then used the principal component as an index to collect statistical evidence. Their restrictive indicators included the measures of Liquid Liabilities, Private Credit (aggregate) and the ratio of commercial bank assets to the sum of commercial and central bank assets. It is important to mention that in the computation of the central bank assets by the World Bank and their database; some of the items that were used from the International Financial Statistics lines were also included in the computation of bank

³⁰ Jalil et al. (2010)

assets. Using that ratio indicator must be accompanied by an explanation of the effect of that double-counting in the results. Unfortunately, the paper did not offer any.

The paper used the eigenvalues of the principal components as weights of each of the components which is an acceptable and generally common practice. They developed an index out of these weighted sums. The biggest drawback to this approach is that in order to update or compute the value of this index at any given time for any given economy (regional or macro), an economy specific PCA must be run every time and the weights must be recomputed. This is an aspect of this index that this thesis does not foresee the policy-makers doing.

Their conclusion does however support Bagehot's³¹ view of the financial sector (specifically the banker's). They concluded that financial development among other determinants of economic growth does contribute to the development of the Chinese economy and that "the policy-makers are advised to take necessary actions to ascertain financial development." They ended by recommending actions against non-performing loans, reform of the banking and financial sector and privatization in the banking sector. No data on any of the above recommendations was included in their econometric analysis.

A working paper presented³² at the 8th International Conference on Islamic Economics and Finance in Dubai estimated a KOREAN index using principal components. The index appeared to be a sum of the principal components; the paper presents the descriptive statistics for the sum by countries limited to the countries in the Financial Development Report 2010. No other analyses were offered in this working

³¹ Bagehot (1873)

³² Author Noreen Adnan, University of Surrey Email: n.adnan@surrey.ac.uk Tel no: ++44-780-7723377

paper and the author has not at the time of this writing responded to my questions pertaining to her methodologies.

COMPOSITES

Researchers and policy makers have also realized that it may not be feasible to use a single indicator or index as a proxy to measure overall level of financial development or to capture the 'numerical value' of a financial structure at an instant of time.

"The importance of financial systems to economic growth has become even more pronounced in recent years; yet, there is still surprisingly little agreement about how to define and measure their development. To address this gap, the World Economic Forum has undertaken an ongoing initiative that aims to provide business leaders and policy-makers with a common framework for identifying and discussing the key factors in the development of global financial systems and markets³³."

The initiative in its current form refers to the Financial Development Report which for 2011 was a 427 page document. The report provides rank and scoring of the 60 top countries of the world. The report defines financial development as "financial development as the factors, policies, and institutions that lead to effective financial intermediation and markets, as well as deep and broad access to capital and financial services".

The index uses 7 pillars or main categories where each category contains several sub-categories; a brief summary is in the table below:

³³ <http://www.weforum.org/issues/financial-development/>

TABLE IV
FINANCIAL DEVELOPMENT INDEX COMPILED BY THE WORLD ECONOMIC FORUM

Pillars	Description
Institutional Environment	Encompasses financial sector liberalization, corporate governance, legal and regulatory issues, and contract enforcement
Business Environment	Considers human capital, taxes, infrastructure, and costs of doing business
Financial Stability	Captures the risk of currency crises, systemic banking crises, and sovereign debt crises
Banking Financial Services	Measures size, efficiency, and financial disclosure
Non-Banking Financial Services	Includes IPO and M&A activity, insurance, and securitization
Financial Markets	Contains foreign exchange and derivative markets, and equity and bond market development
Financial Access	Evaluates commercial and retail access

Each category is assigned a score. All categories and sub-categories have equal weights. The final score is the sum of all sub-scores and development is considered to be a positive change in the total score.

The primary method used in the compilation of this index is re-scaling the variables from 1 to 7. The higher the standardized value, the more developed that measure is considered. At the end of the standardization of all categories and sub-categories, the values are aggregated to estimate a unified measure from the entire pillar and the variables within.

The data of the scores comes partially from the same sources as the Financial Structures database and partially from various annual surveys such as the “Executive Opinion Survey” that represent the ‘level’ of ease of access to financing. It should be noted here that several of the academic advisors to this report are the same authors whose work has been referenced and cited in this thesis. They are intimately familiar with the subject and its intricacies.

Honohan³⁴ recommended have a financial development index which was a weighted sum of all aspects of a financial structure. The challenge remained on what aspects of financial structures to include and how to estimate those weights. He stated, “Each researcher had his or her own favorite explanatory variables, many of them mutually correlated, and each (if it advanced on its own) seeming to provide a considerable explanatory power. But the theories couldn’t all be alright.”

The recommendations were to measure structures x_i on which the financial system rests influenced by structural inputs z_i . The measured x_i along with other factors w_i will influence the output y_i . Examples of w_i ’s can be legal, regulatory or information aspects of the said country’s system. Examples of z_i ’s could be banking sector depth and stock market turnover; the output could be measured by GDP growth, stability of output, employment and poverty.

Honohan further stated that if such a function is linear than the x_i function can be independent of the non-financial factors w_i . He suggested a composite financial development indicator which could possibly be a weighted average of the various components.

³⁴ Honohan (2004)

C. THEORETICAL FRAMEWORK

Principal Component Analysis (PCA) requires an orthogonal transformation of an original set of possibly highly correlated X variables into a set of uncorrelated variables called Principal Components (PC). Each PC is a linear combination of the X variables. The analysis does not distinguish dependent from independent variables. We perform the analysis only the Financial Indicator Dataset as the purpose of this paper is to extract the variables that best explain the overall variation in the data points capturing all aspects of a financial system; the variables may be better proxy for the financial structure snapshots than those assumed by most researchers a priori in the past literature.

Each PC has an eigenvalue, which in a standardized dataset, corresponds to the percentage overall variation in the dataset explained by that particular PC. The PCs are typically ranked in an ordered fashion when output is displayed by statistical packages, such as SAS PRINCOMP in the case of this paper.

This means that the first PC explains more variation than the second one and the second one explains more variation than the third one and so forth. For example:

TABLE V
EIGENVALUES³⁵ OF THE CORRELATION MATRIX FOR THE STANDARDIZED
AGGREGATE VARIABLES

	Eigenvalues of the Correlation Matrix			
	Eigenvalue	Difference	Proportion	Cumulative
1	2.71229827	1.64686745	0.5425	0.5425
2	1.06543083	0.13928585	0.2131	0.7555
3	0.92614497	0.64392903	0.1852	0.9408
4	0.28221595	0.26830596	0.0564	0.9972
5	0.01390998			0.0028

Furthermore, as stated above, each PC is a linear combination of the original X variables; each variable has a coefficient or weight specific to that PC. A vector that corresponds to all the coefficients of a PC is known as an eigenvector. It is important to emphasize that these are weights within that specific component that have been placed on each X variable. For example, below is the eigenvector row for Liquid Liabilities expressed as a ratio of GDP, PLLGDP. The coefficient of PLLGDP was 0.582356 for the PC which had the eigenvalue of 0.5425 or expressed 54.25% of the variation in the dataset.

³⁵ The eigenvalues were computed for 4,073 observations and five variables.

TABLE VI
EIGENVECTORS CORRESPONDING TO THE PREVIOUS EIGENVALUES

Observations 4073
Variables 5

Eigenvectors						
		Prin1	Prin2	Prin3	Prin4	Prin5
PLL GDP	Pllgdp	0.582356	0.112693	0.111292	-0.41545	-0.68057
PCBAGDP	pcbagd	-0.12519	0.656815	0.7289	0.14322	0.033406
PFDGDP	Pfdgdp	0.592727	0.064218	0.074706	-0.32677	0.729512
INFLOW	Inflow	0.080738	0.727586	-0.66799	0.133765	-0.00132
PPCRDBOFGDP	ppcrdbofgdp	0.536046	-0.14963	0.067325	0.825965	-0.05928

We can also compute factor loadings or correlation coefficient, r_{ij} , between a component C_i and an X variable X_j with a coefficient a_{ij}

$$r_{ij} = a_{ij} \cdot (\text{Var } C_i)^{1/2}$$

Var C_i is the eigenvalue of the component i . The factor loading r_{ij} provides the relative dependence of component on each of those standardized X variables.

Many researchers turn these PCs as variables in their regressions and then make the focus of their research. While this is a good theoretical exercise, it does not help a policy maker who may wish to measure the impact of various policies on ‘financial development’. It is imperative to pay heed to the policy makers thought process that their goals tend to make the lives of people better through economic growth. Economic growth tends to be measured by the Gross Domestic Product (GDP). Making lives better by economic growth and measuring economic growth via GDP are dubious arguments to begin with and those arguments do not belong in this paper. However, should a policy

maker wish to devise a policy that may impact a certain proxy of the financial structure in hopes that the positive changes in the financial, referred to financial development, will lead to economic growth; this paper strives to provide them with appropriate proxies.

Typically the software packages compute the same number of principal components as the original variables. Since the goal was to reduce the redundancy in the dataset while retaining maximum variation explained, the question then becomes how many components to retain. Duntelman (Duntelman, 1989) offers many rules to that affect, we list a few here:

1. 80% variation explained is a common cut-off used by many researchers. Components explaining the last 20% are not retained. This is similar to the 80/20 rule where 20% of components may explain 80% of the variation.
2. Discard any components that explain $70/X$ percentage of variation; where X is the number of original variables
3. Discard any components that explain $100/X$ percentage of variation; where X is the number of original variables
4. Not retain any components that explain less than 5% of the variation
5. Mineigen criterion³⁶ - The mineigen (minimum eigenvalue) criterion states that only components with eigenvalues above 1 should be retained. In this example, only the first two components have eigenvalues greater than 1 (2.71 and 1.07), so these two should be retained. Note that this criterion should be used only with principal components analysis and not factor analysis. Components with an eigenvalue of less than 1 account for less variance than did the original variable (which had a variance of 1), and so are of little use.

³⁶ UCLA SAS

Hence, you can see that the point of principal components analysis is to redistribute the variance in the correlation matrix (using the method of eigenvalue decomposition) to redistribute the variance to first components extracted.

D. METHODOLOGY

Principal components analysis (PCA) is an exploratory technique that is very useful when independent variables have a high degree of multicollinearity. The correlation matrix of the original data suggests that is the case in this analysis. The theory of financial systems and the relationships inter and intra sectors would suggest the same. A change in money supply (referred to as liquid liabilities in the dataset) would and should have a high correlation with deposits within the financial systems (such as bank deposits or reserves) as well as the various asset prices (such as equity values etc.). This is the primary reason why most researchers in this topic do not include multiple indicators of the financial structures at the same time on the right hand side of the regression equation.

The purpose of a principal components analysis is to reduce the dimensionality of these independent and explanatory variables. The main aim of this study is to investigate which indicators can best represent their sectors in the various country income groups. The PCA technique itself is the transformation of the original variables into set of new variables or principal components. The technique does this by rotating an original plane onto a new place where the new variables, the principal components, are on the axes. Mathematically³⁷, these new variables, the principal components of the original dataset are a linear combination of the original variables. For example, in a dataset of thirty original financial structure variables, F_i for $i \in [1, n]$ and $n=30$ and principal components PC_j for $j \in [1, m]$ where m can be specified by the operator or the researcher. As a default the number of components being extracted is equal to the number of original variables.

³⁷ Hotelling (1933)

These new variables or principal components are orthogonal with each other and may or may not be orthogonal to the original variables. The set of coefficients, such as the $a_{i,j}$ coefficient above, for the j th principal component is considered the j th eigenvector. The variance that the j th principal component explains is called the eigenvalue or the variance of that principal component.

The standard PCA involves the covariance matrix. This study standardizes the original dataset by removing the means of the series and dividing the data by the sample standard deviation. There are distinct advantages to this when it comes to the interpretation of the results:

The total variance becomes simply the number of original independent variables, n . The proportion of variation explained by the principal component becomes its eigenvalue divided by n .

$$PC_j = a_{1,j} \cdot F_1 + a_{2,j} \cdot F_2 + \dots + a_{n,j} \cdot F_n \quad \forall j = 1, \dots, m$$

1. The correlation, r , between the PC_j and F_i variable is simply the $r_{i,j} = a_{i,j} \cdot (\text{Var } PC_j)^{1/2}$.
2. By standardizing the PCA is performed on the correlation matrix which also compensates for the differences in the unit of measurements of the different variables. Please note that this was not an issue in this study as variables and their values were expressed as fractions.

For a given PC_j we can also compare the $a_{i,j}$ to estimate the relative dependence of the PC_j on the standardized F_i . It may also be considered as the factor loading. It is highly desirable³⁸ to have at least three variables loading for each retained component. A

³⁸ Ibid

common practice in PCA is to use the Kaiser³⁹ criterion in determining how many components to retain⁴⁰.

The methodology employed here is as follows:

1. A PCA was conducted on the entire dataset i.e., there was no separation for different incomes groups of countries. There are two ways to conduct the analysis here:
 - a. For the combined income group of countries, PCA is performed on individual sectors and indicators that best represent the changes for their respective sectors are selected.
 - b. For the combined income group of countries, PCA is performed on the entire financial system, selecting indicators that best represent the changes in the overall variation in the data. This does severely restrict to the observation on countries that we have the most complete dataset. For example, debt markets is the most constrained variables in our dataset hence the PCA is then restricted to countries that do have the debt markets. It would leave most developing and less developed countries out of the computations. We performed the PCA both ways and analyze the difference in the resulting indicators.
2. We will be combining the mentioned criterion from above and retain components that satisfy the following:
 - a. We will retain any component that explains $70/x$ as a minimum variation explained by a component where an x is the number of original variables.

³⁹ Kaiser (1960)

⁴⁰ That is good rule of thumb in studies that proceeds to include these principal components in a regression model. The goal of this study is to compute a metric that can be obtained easily by the policy-makers. The search here is for indicators that explains the variation with severe multicollinearity. Initially, the intent is to investigate the 'importance' of these indicators.

This critical values here for 30 original variables result in retaining any component that explains 2.33% of the variation along with the Mineigen criterion discarding any components that have a value of less than one.

- b. We will retain components and use 80% of the total variation expressed as a cut-off point.
3. The original Indicators of Financial Structures are divided into sub-sets of country income groups. This is important for the standardization of the data as there should be some form of variation between different country income groups⁴¹ and their respective sample means which may distort the picture. The country income groups were organized into four categories. This is different from the extreme bounds analysis where there were five income groups. The reduction from five to four was part done due to an updated dataset at the World Bank and part for increasing the sample size within each income groups.
4. The four country income group sub-sets: High Income, Upper Middle Income, Lower Middle Income and Low Income were individually standardized within their respective statistics leaving us with new standardized variables with a mean of zero and standard deviation of one. New summary statistics were generated to verify that the standardization was successful.
5. Multiple Principal Components Analysis were performed for each of the five sectorial categories as laid out in the 'Data' section: Banking, Capital (Equity), Capital (Debt), "Other" and Aggregate.

⁴¹ An ideal methodology would be to perform a cluster analysis of all the countries and their characteristics and then to develop new country groups. Here, in this study, I use the groups as determined by the World Bank.

6. Weighted Eigenvectors: For each income group and within each income group for each of the five indicator categories, all principal components were retained in calculation to determine which indicators explained the most variation in the data. A weighted eigenvector was manually computed for all the indicators in a given category of an income group.

For example: Suppose there were only two principal components, PC1 and PC2. Furthermore PC1 explained 70% of the total variation and PC2 explained 30% of the total variation. Each PC also has 5 variables in its vector. Then the first variable's CORRESPONDING value in the weighted eigenvector would be:

$$WVF_i = (W_1 * V_1 F_i) + (W_2 * V_2 F_i)$$

7. The cumulative impact of an original variable on the retained principal components could also had been estimated via the following ways:
 - a. Using the eigenvalues of the retained principal components and the corresponding eigenvectors, total factor load can computed. This may also be viewed as total variation explained, in absolute terms, by the original variable (indicator) in the components retained.
 - b. Alternatively, correlation coefficients can also be computed or
 - c. A correlation matrix can be computed between the original variables and the retained principal component for each category for each country group.
8. This study rests on the brute force estimation using the weights of each variable on each principal component of each sector for each country income group. The variable(s) which explains the highest level of variation in that particular sector for

that particular group will be retained as a proxy for that aspect of that income group's financial structure.

9. The results are tabulated where the indicator(s) is(are) identified that best represents each sector for each income group thus concluding the exploration of our indicators using the PCA technique and comparing it to the EBA preceding this discussion.
10. An additional final test would be to check for multicollinearity amongst the final chosen proxies in the final composite step.

E. EMPIRICAL RESULTS

1. All Countries, 1980-2009

The standardization was verified and the results were sorted in the ascending order of the number of observation of data; notice that the debt numbers are most restrictive. For example, Liquid Liabilities, here expressed as PLLGDP has the coefficients in the eigenvector as 0.264, 0.040, 0.037, 0.018, 0.178 and 0.066 respectively for the first six principal components. Those six principal components in turn have an eigenvalue which explains the total variation in the proportion of 0.411, 0.142, 0.097, 0.063, 0.059, and 0.039 expressed as a fraction.

TABLE VII
EIGENVALUES OF THE ALL COUNTRIES PCA, 1980-2009

Eigenvalues of the Correlation Matrix				
Component	Eigenvalue	Difference	Proportion	Cumulative
1	12.324	8.079	0.411	0.411
2	4.245	1.338	0.142	0.552
3	2.907	1.028	0.097	0.649
4	1.879	0.121	0.063	0.712
5	1.757	0.597	0.059	0.770
6	1.161	0.154	0.039	0.809
7	1.007	0.089	0.034	0.843
8	0.918	0.080	0.031	0.873
9	0.837	0.256	0.028	0.901
10	0.581	0.112	0.019	0.921
11	0.470	0.028	0.016	0.936
12	0.442	0.118	0.015	0.951
13	0.324	0.085	0.011	0.962
14	0.238	0.015	0.008	0.970
15	0.224	0.043	0.008	0.977
16	0.181	0.068	0.006	0.983
17	0.113	0.003	0.004	0.987
18	0.110	0.036	0.004	0.991
19	0.074	0.018	0.003	0.993
20	0.056	0.011	0.002	0.995
21	0.045	0.005	0.002	0.996
22	0.040	0.014	0.001	0.998
23	0.026	0.011	0.001	0.999
24	0.016	0.005	0.001	0.999
25	0.010	0.004	0.000	1.000
26	0.006	0.003	0.000	1.000
27	0.003	0.000	0.000	1.000
28	0.003	0.001	0.000	1.000
29	0.002	0.001	0.000	1.000
30	0.000		0.000	1.000

TABLE VIII
EIGENVECTORS OF THE ALL COUNTRIES PCA, 1980-2009

		Eigenvectors					
		Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
PLLGDP	pllgdp	0.264	0.047	0.037	0.018	-0.178	0.066
PCBAGDP	pcbagd	-0.045	0.310	0.030	-0.045	-0.498	0.120
PFDGDP	pfdgdp	0.269	0.005	-0.005	-0.069	-0.137	-0.045
PREMIT	premit	-0.091	-0.141	-0.031	0.046	0.076	0.589
PPCRDBOFGDP	ppcrdbofgdp	0.274	0.074	-0.042	-0.024	0.096	0.021
PBCBD	pbcdb	0.044	-0.393	0.014	-0.079	0.151	0.056
PBDGDP	pbdgdp	0.270	0.053	0.046	-0.028	-0.151	0.072
PCONCENTRATION	pconcentration	0.005	-0.249	0.293	0.035	-0.189	-0.066
PCOSTINC	pcostinc	-0.102	0.031	-0.458	0.089	-0.102	0.079
PDBACBA	pdacba	0.121	-0.327	-0.046	-0.081	0.320	0.157
PNETINTMARGIN	pnetintmargin	-0.176	0.218	0.183	-0.206	-0.105	0.021
POVERHEAD	poverhead	-0.235	0.101	-0.119	-0.115	-0.003	0.135
PPCRDBGDP	ppcrdbgdp	0.247	-0.179	0.091	-0.035	-0.104	-0.050
PROA	proa	-0.058	0.195	0.459	-0.097	0.167	-0.079
PROE	proe	-0.043	0.171	0.433	-0.081	0.183	-0.039
PDBAGDP	pdagd	0.228	-0.125	0.118	-0.080	-0.258	0.073
ZSCORE	zscore	0.066	-0.211	0.251	0.335	-0.152	0.141
PINTLDEBT	pintldebt	0.034	0.217	-0.086	0.499	-0.100	-0.093
PINTLDEBTNET	pintldebtnet	0.082	0.042	0.078	0.307	0.323	0.243
PNRBLOAN	pnrbloan	0.128	-0.104	0.123	0.517	-0.165	0.028
PPRBOND	pprbond	0.231	0.222	-0.132	0.009	0.121	0.006
PPUBOND	ppubond	0.166	0.242	0.142	-0.071	-0.026	0.377
LISTCO_PC	listco_pc	0.210	-0.114	0.001	-0.021	0.001	-0.367
PSTVALTRADED	pstvaltraded	0.224	0.202	-0.121	0.020	0.131	0.036
PSTMKTCAP	pstmktcap	0.196	0.104	0.103	-0.163	0.022	0.226
PSTTURNOVER	pstturnover	0.215	0.066	-0.180	-0.044	0.062	-0.261
POFAGDP	pofagd	0.241	0.173	-0.064	-0.018	0.178	0.078
POFFDEP	poffdep	-0.158	0.157	0.176	0.302	0.261	-0.217
PINSLIFE	pinslife	0.207	-0.102	0.065	-0.184	-0.004	-0.123
PINSNONLIFE	pinsnonlife	0.233	0.177	-0.033	0.075	0.204	-0.001

We can compute the weighted co-efficient of this variable using:

$$\sum_{i=1}^6 W_i * EV_i F1 \nabla F1 = PLLGDP = (W1 * EV1 F1) + (W2 * EV2 F1) + \dots ;$$

The above expression yields the numerical weighted eigenvector weighted value of 0.1117671222 for PLLGDP. These computations are repeated and tabulated below in descending order for each of the indicators in Table IX.

We can interpret the above results as follows, 80% of the variation explained the first six principal components would have a coefficient of 0.1238 for PPCRDBOFGDP; 0.1238 represents that Private Credit issued by Debit Banks Other Financial entities as a ratio of GDP changes 12.38% for every 80% change in financial structural variation. The positive polarity of the value indicates that the change in the structural variation is in the same direction of increase as the overall structural change.

This can also be interpreted as a + .15475% increase corresponds to a 1% change in the overall structure. This can also be stated as that the change of 16 basis points in the Private Credit Issued by Deposit banks as a percentage of GDP explains 1% of the variation change in the overall financial structure as measured by the indicators of financial structure.

Each category has dominant indicator(s) which may serve as a good proxy. Among the aggregate indicators, Total Private Credit Issued and Central Bank Assets, both expressed as a ratio of GDP were the dominant indicators that may serve as good proxies.

TABLE IX
WEIGHTED EIGENVECTOR COEFFICIENTS FROM THE ALL COUNTRIES
PCA, 1980-2009

Indicator type	Indicator name	Exp.	Eigenvector
Aggregate	Central Bank Assets /GDP	+	0.001
	Liquid Liabilities / GDP	+	0.112
	Financial System Deposits / GDP	+	0.097
	Private Credit by Banks and Other Financial Institutions/GDP	+	0.124
	Remittance Inflows (Openness)	+	-0.030
Banking Sector	Bank Credit/Bank Deposits	+	-0.030
	Bank Deposits/ GDP	+	0.115
	Bank Concentration	-	-0.016
	Bank Cost-Income Ratio	-	-0.079
	Deposit Money Bank Assets / (Deposit Money Banks + Central Bank Assets)	+	0.019
	Net Interest Margin	-	-0.042
	Bank Overhead Costs/ Total Bank Assets	-	-0.096
	Private Credit by Banks/GDP	+	0.075
	Bank Return on Assets	+	0.049
	Bank Return on Equity	+	0.052
	Bank Z-Score	+	0.039
	Deposit Bank Assets/GDP	+	0.070
	Insurance (Life) Premiums/GDP	+	0.060
Other Intermediaries Sector	Insurance(Non-Life) Premiums/GDP	+	0.134
	Other Financial Institution Assets/GDP	+	0.129
	Offshore Bank Deposits/Domestic Bank Deposits	+	0.000
Debt Markets (ratio of GDP)	International Debt Issues	+	0.058
	International Debt Issues (Net)	+	0.095
	Loans from non-resident banks	+	0.074
	Private Bond Market Capitalization	+	0.122
	Public Bond Market Capitalization	+	0.125
Equity Markets	Number of publicly listed companies per 10k population	+	0.055
	Market Value of Total Stocks Traded/GDP	+	0.119
	Stock Market Capitalization/GDP	+	0.105
	Turnover ratio (ratio of the preceding two indicators)	+	0.071

For the banking sector, Bank Deposits as a ratio of GDP is the dominant indicator that best represents the sector. Bank Credits as a ratio of Bank Deposits was the sole contradiction of the analysis. Theory had anticipated that the ratio has a positive relation with the overall structure.

$$F(\text{Structure, Bank Credits/Bank Deposits}) < 0;$$

where

$$F(\text{Structure, Bank Deposits}) > 0;$$

This may indicate that not all Bank Credit goes back into one of our measureable indicators of the Financial Structure. This credit may leak the system in the form of private equity investments or derivatives.

Non-Life Insurance is the most dominant indicator in the other intermediaries sector followed by a close Other Financial Intermediaries Assets, both expressed as a ratio of GDP.

Private and Bond Market Capitalization as a ratio of GDP were the dominant indicators in the debt markets that contributed to explaining the variation in the overall structure. The indicators representing the international debt measures had much smaller coefficients. There may be an omitted variable bias here; due to the inclusion of the bond markets that in the data are only present for the higher income countries, the results maybe representing the characteristics of the higher income countries where foreign capital inflows may play a lesser role.

For capital equity markets, the market capitalization of total stocks traded and the stock market capitalization, both expressed as a ratio of GDP are the most representative of all proxy indicators.

Listing these final indicators:

1. Private Credit Issued (this includes the banks)- Assets
2. Liquid Liabilities- Liabilities
3. Bank Deposits- Liabilities
4. Deposit Bank Assets- Assets
5. Non-Life Insurance Premiums- Assets
6. Other Financial Assets- Assets
7. Public/Private Bonds- Liabilities
8. Stock Market Capitalization
9. Stock Market Traded Volume Value

However, the policy-makers can reduce these indicators further by not observing the variables that are highly correlated with each. The Pearson Correlation Coefficients of the Indicators with the largest coefficients for the six components explaining 80% of the variation in the dataset; the Pearson Correlation Coefficients of this list further inspected below in Table X.

TABLE X
PEARSON CORRELATION COEFFICIENTS OF THE INDICATORS WITH THE LARGEST COEFFICIENTS

INDICATORS	PLLGD	PPCRDBOFGDP	PBDGDP	PDBAGDP	PPRBOND	PPUBOND	PSTVALTRADED	PSTMKTCAP	POFAGDP	PINSNONLIFE
PLLGD	1.000	0.850	0.980	0.838	0.766	0.654	0.712	0.567	0.715	0.714
PPCRDBOFGDP	0.850	1.000	0.895	0.668	0.888	0.587	0.859	0.757	0.950	0.887
PBDGDP	0.980	0.895	1.000	0.851	0.775	0.645	0.757	0.676	0.774	0.738
PDBAGDP	0.838	0.668	0.851	1.000	0.401	0.476	0.420	0.492	0.457	0.441
PPRBOND	0.766	0.888	0.775	0.401	1.000	0.634	0.900	0.576	0.904	0.886
PPUBOND	0.654	0.587	0.645	0.476	0.634	1.000	0.561	0.562	0.624	0.684
PSTVALTRADED	0.712	0.859	0.757	0.420	0.900	0.561	1.000	0.653	0.875	0.786
PSTMKTCAP	0.567	0.757	0.676	0.492	0.576	0.562	0.653	1.000	0.793	0.618
POFAGDP	0.715	0.950	0.774	0.457	0.904	0.624	0.875	0.793	1.000	0.922

These variables are still highly correlated each other except for the Public Bond Markets. Liquid Liabilities, Total Private Credit and Bank Deposits, Stock Market Traded Value, Other Financial Assets and Insurance Non-Life are also other indicators that are highly correlated with each other.

Deposit Bank Assets and Capital Markets while important in their own merit are not good proxy measures for the over financial structure of a system. The stocks and bond markets should be inclusive in any analysis but they cannot serve as representative indicators. This reduces our original list to 6 probably proxies:

1. Total Private Credit Issued/GDP
2. Liquid Liabilities/GDP
3. Bank Deposits/GDP
4. Non-Life Insurance Premiums/GDP
5. Other Financial Assets/GDP
6. Stock Market Traded Volume Value/GDP

Any analysis will also need to separately consider the capital market indicators:

- A. Public Bonds Market Capitalization/ GDP
- B. Private Bonds Market Capitalization/ GDP
- C. Stock Market Capitalization/ GDP

The above provides evidence that the Total Private Credit Issued indicator may be a reasonable proxy to represent the non-capital market aspect of the financial system. However, it disagrees with the original analysis done by King and Levine in which it Bank Assets were included as proxies along with Liquid Liabilities.

2. By Country Income Groups, 1960-2009

i. Low Income Countries

The aggregate indicators had over 566 observations and three indicators explained most of the variation in this aspect of their financial structures: Remittances, Liquid Liabilities and Financial System Deposits. The latter two are a measure of the size and both are from the liability side of a macro balance sheet. Not surprisingly they are highly correlated with each other with a correlation coefficient of 0.936. Both of these indicators also had a weighted variation coefficient (WVC) of 0.2997 and 0.2826 respectively.

The most dominant indicator however in this category was Remittances with a WVC of 0.389. This again is not surprising as low income countries often depend heavily of capital flowing in one form or another. A reminder here that the Financial Structures database did not include capital flows or even Foreign Direct Investments (FDI) which I would suspect would not explain the openness but also be a better measure of these capital flows of financial openness.

The intermediaries or the banking sector (with 175 observations) came in with banking stability or the z-score explaining majority of the variation here. This is intuitive that the developments in the banking structure of the low income countries rely more heavily on the institutions stability and the perceived soundness than anything else.

Private credit extended and bank assets both asset-type indicators had the highest coefficients next at 0.193 and 0.189 respectively. The two were almost perfectly collinear at a correlation coefficient of 0.958 between them.

A liability item of Bank Deposit was also instrumental in explaining the variation at 0.176. Bank deposits were also highly correlated with the asset measurement indicators above. This is not surprising as the rules of accounting dictates asset must equal liabilities for a balanced account give or take. Hence, this indicator maybe included in the construct of a liabilities only metric but not in one where both assets and liabilities are incorporated together.

Liquidity was the driving indicator in the equity markets (with 128 observations) and interestingly enough was not correlated with traded volume or market cap in its own. Market cap was the runner up

here coming in at WVC of 0.08 and Total Traded Value at 0.077 with a correlation coefficient between the two of 0.750.

There were no data on the bond markets present in the low income country group. This perhaps was the most glaring observation of all in this category. The remain three indicators of debt and international loans were perfectly collinear; however given that there were only 2 observations, the results will not be given further consideration in this study.

Other Financial Assets (with 15 observations) was the dominant indicator of the 'Other' category with WVC of 0.719 and was highly correlated with the Insurance sector indicators. On the following pages are illustrations of how the principal components vary in their explanatory powers even within the aggregate and the sectorial categories.

FIGURE 3
Principal Components of Low Income Aggregate Indicators

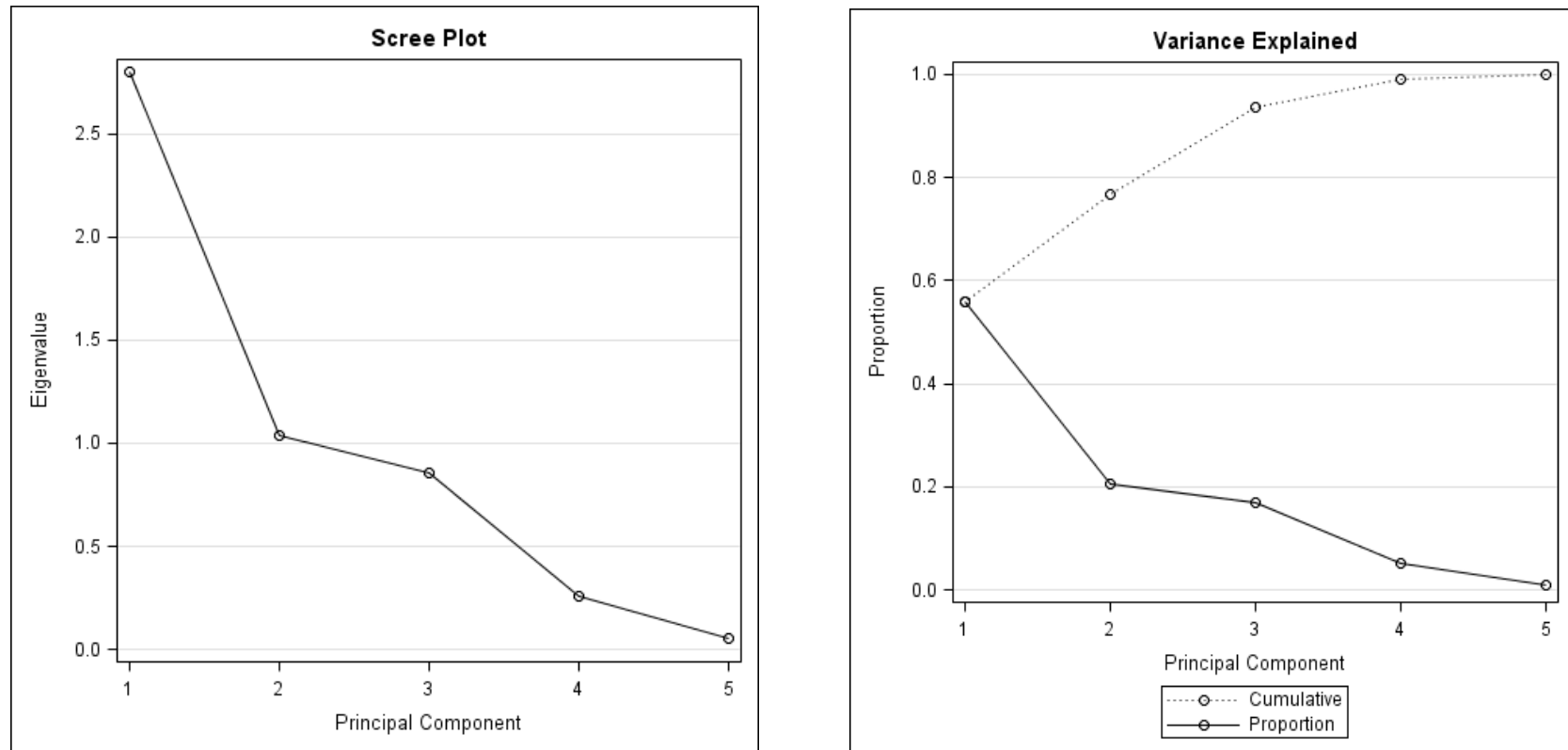


FIGURE 4
Principal Components of Low Income Equity Indicators

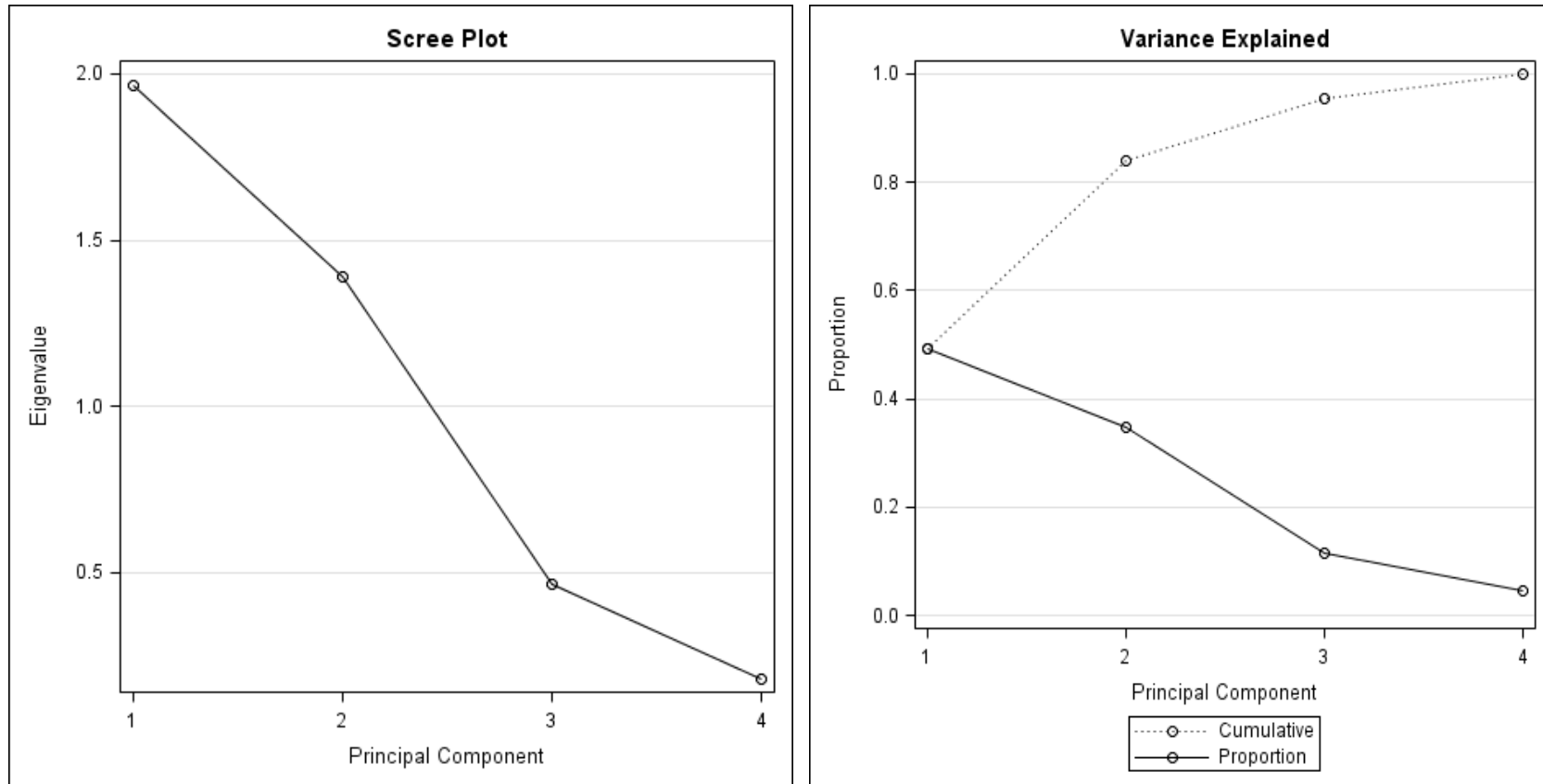


FIGURE 5
Principal Components of Low Income Banking Indicators

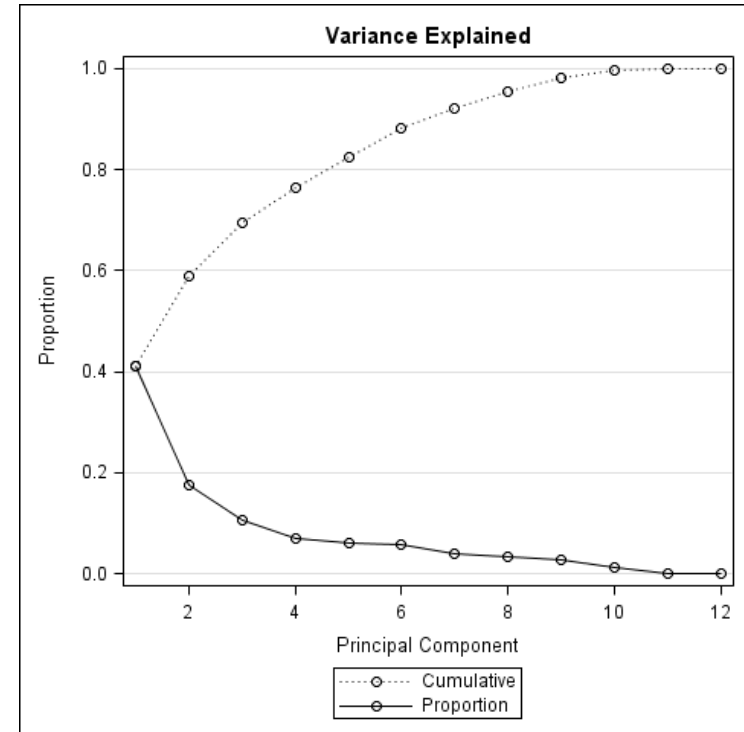
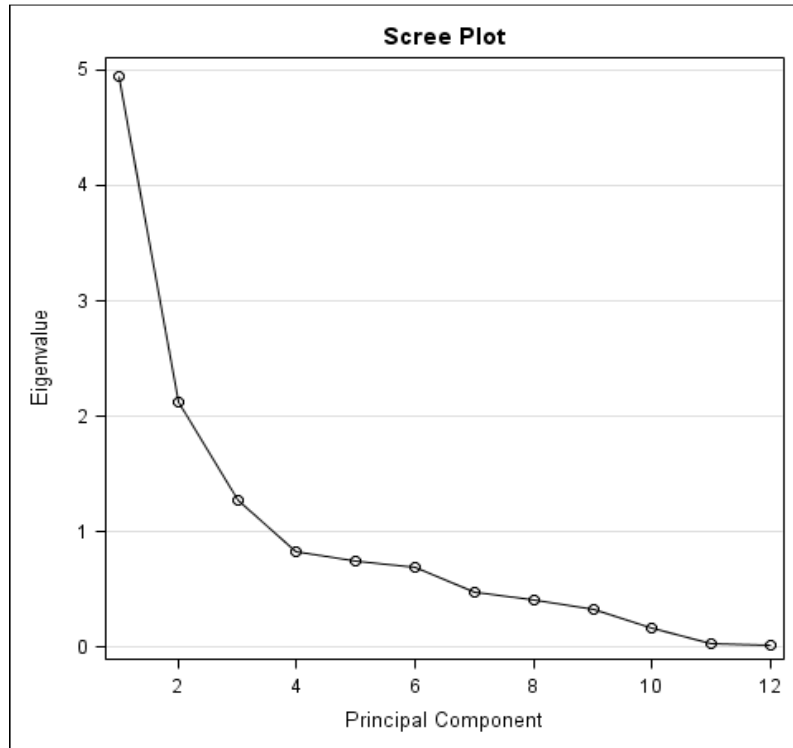
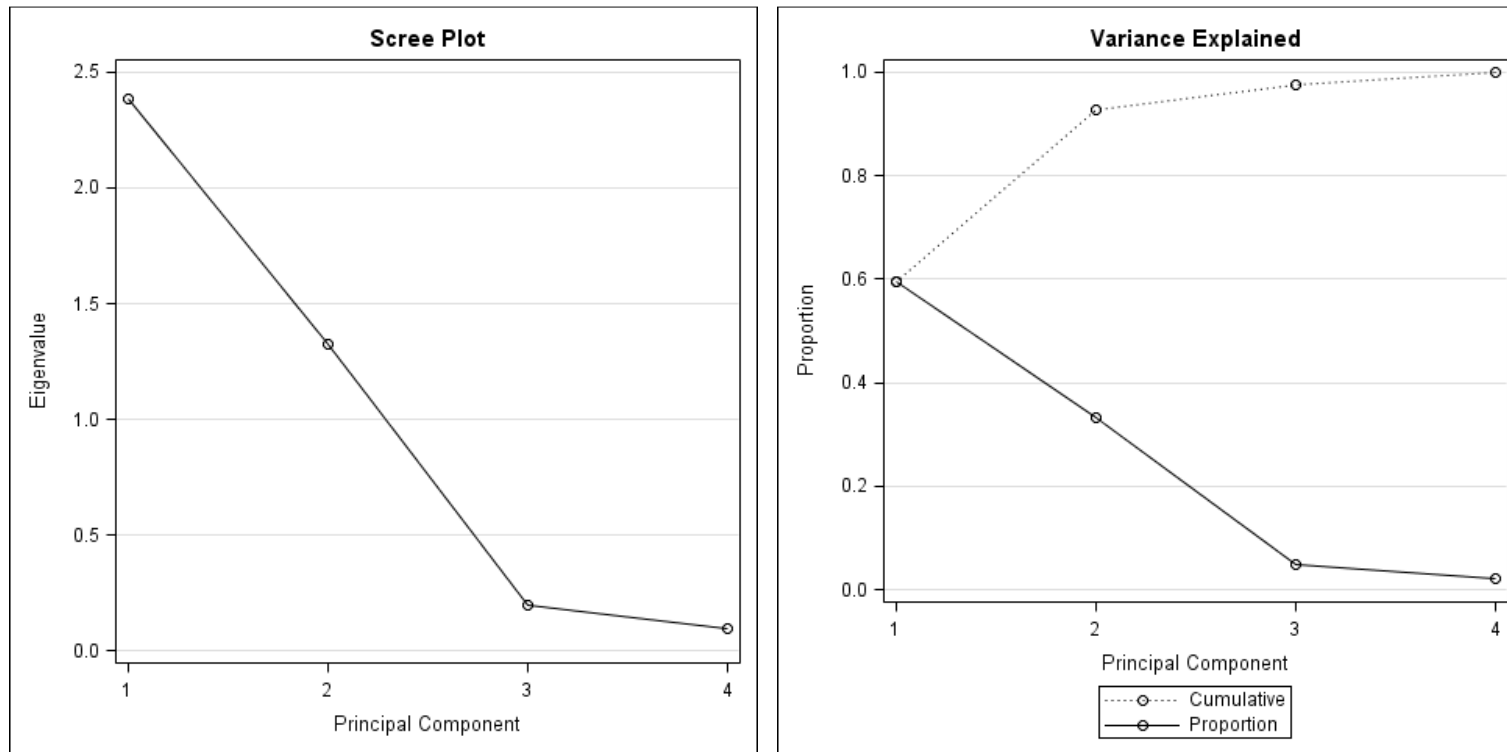


FIGURE 6
Principal Components of Low Income 'Other' Intermediaries Indicators



Low Income 'Other' Financial Institutions Indicators- These other indicators include offshore deposits, other financial assets, and life and non-life insurance premiums. Offshore deposits do not explain any variation in this category of indicators and hence moving forward is eliminated from consideration in this thesis as far as changes in the financial structure are concerned which is the focus of this study here.

TABLE XI
LOW INCOME COUNTRIES DOMINANT AGGREGATE INDICATORS

Low Income Countries					
Sector	Indicators	Type	Obs.	Variation	Comments
Aggregate	PREMIT	Openness	566	0.381	
Aggregate	PLLGDGP	Size (L)	566	0.300	Corr (PLLGDGP,PFDGDGP) =0.936
Aggregate	PFDGDGP	Size (L)	566	0.283	Corr (PLLGDGP,PFDGDGP) =0.936
Intermediaries	ZSCORE	Stability	175	0.212	
Intermediaries	PPCRDBGDP	Size (A)	175	0.193	Corr (PPCRDBGDP,PDBAGDP)=0.958
Intermediaries	PDBAGDP	Size (A)	175	0.189	Corr (PPCRDBGDP,PDBAGDP)=0.9578, Corr (PDBAGDP,PBDGDGP)=0.950
Intermediaries	PBDGDGP	Size (L)	175	0.176	Corr (PPCRDBGDP,PBDGDGP)=0.9009, Corr (PDBAGDP,PBDGDGP)=0.950
Capital (Equity)	PSTTURNOVER	Liquidity	128	0.084	
Capital (Equity)	PSTMKTCAP	Size	128	0.080	Corr (PSTMKTCAP,PSTVALTRADED)= 0.750
Capital (Equity)	PSTVALTRADED	Size	128	0.077	Corr (PSTMKTCAP,PSTVALTRADED)= 0.750
Capital (Debt)	see comments	Openness and Bond	2	0.577	There are no debt markets data. Without bond markets PCA had identical explanatory powers for the remaining 3 debt variables and Prin1 explained it all. The 3 variables also suffered from perfect multicollinearity. Only 2 observations. Suspect data.
Other	POFAGDP	Size (A)	15	0.719	High Corr. with insurance indicators

Below is a sample computation for the Low Income Country group's Liquid Liabilities value computation:

TABLE XII
LOW INCOME COUNTRIES AGGREGATE INDICATORS' EIGENVECTOR

Eigenvectors						
		Prin1	Prin2	Prin3	Prin4	Prin5
PLLGD	pll	0.571	0.098	-0.061	-0.442	-0.683
PCBAGDP	pcb	-0.015	0.942	-0.298	0.142	0.058
PFDGDP	pfd	0.574	-0.024	-0.135	-0.361	0.722
PREMIT	pre	0.294	0.249	0.893	0.227	0.054
PPCRDBOFGDP	ppc	0.508	-0.200	-0.304	0.777	-0.079

TABLE XIII
LOW INCOME COUNTRIES AGGREGATE INDICATORS' EIGENVALUES

Eigenvalues of the Correlation Matrix				
	Eigenvalue	Difference	Proportion	Cumulative
1	2.801	1.767	0.560	0.560
2	1.034	0.181	0.207	0.767
3	0.854	0.594	0.171	0.938
4	0.259	0.208	0.052	0.990
5	0.051		0.010	1.000

Using the previously derived formula:

$$WV_iF_i = (W_1 * V_1F_i) + (W_2 * V_2F_i)$$

And the correlation matrix of this step:

TABLE XIV
CORRELATION MATRIX FOR THE LOW INCOME AGGREGATE INDICATORS

Correlation Matrix						
		PLLGDGP	PCBAGDP	PFDGDP	PREMIT	PPCRDBOFGDP
PLLGDGP	pllgdgdp	1.000				
PCBAGDP	pcbagdgp	0.069	1.000			
PFDGDP	pfdgdp	0.938	-0.024	1.000		
PREMIT	premit	0.421	0.012	0.345	1.000	
PPCRDBOFGDP	ppcrdbofgdp	0.722	-0.110	0.781	0.180	1.000

TABLE XV
SAMPLE RESULTING COMPUTATIONS FOR THE PLLGDGP INDICATOR

Sector	Indicators	Type	Obs.	Variation	Comments
Aggregate	PLLGDGP	Size (L)	566	0.2997	Corr (PLLGDGP,PFDGDP) =0.936
Aggregate	PFDGDP	Size (L)	566	0.2826	Corr (PLLGDGP,PFDGDP) =0.936
Intermediaries	ZSCORE	Stability	175	0.2120	

ii. Lower Middle Income Countries

The remittance phenomenon is no longer observed to be explaining the aggregate variations of the macro financial structure. Total private credit issued by the financial system has replaced it as one of the top three indicators with a WVC OF 0.261. This is correlated with the other two indicators of Liquid Liabilities and Financial System deposits with a correlation coefficient of 0.717 and 0.751 respectively. Notice all three of these items are considered to be the liability side indicators. The WVC of Liquid Liabilities and Financial System Deposits are 0.318 and 0.312 respectively; the above results were estimated given 1002 observations in this specific sample.

Banking Stability measured in the form of z-scores drops out as well in the intermediaries' analysis of 384 observations. Private credit, bank assets (both in the form of as a ratio of GDP and as a ratio of central bank assets) are observed along with private credit issued by the banks. Private credit issued explained the most variation with WVC of 0.210 and closely following were Bank Assets (both ratios GDP/CBA) at 0.188/0.171 and Bank Deposits (the liability side) with WVC of 0.163. All indicators suffer from very high correlations (correlation coefficients greater than 0.837) here except Bank Assets as a ratio of Central Bank Assets.

The capital markets in the equity sector had a sample size of 479 observations where the Value of the Trading volume dominated with a WVC of 0.321. A 'barriers to entry' measure of listed companies per 10,000 persons in population emerged as a close second with a WVC of 0.305 in explaining the changes in the equity aspect of the market structure. Liquidity had a WVC of 0.288 and finished third place but naturally had a mild correlation (a correlation coefficient. of 0.528) with the value traded indicator as the value traded indicator is the numerator of the turnover (liquidity) ratio.

The debt sector of the capital markets had a better presence in this category than the low income country group. It was still a small sample of 37 observations with the net international debt explaining most of the variation with a WVC of 0.345 and the public bond sector explaining it with a WVC of 0.291. I purposefully omit the international debt indicator as it has high correlation with the net international debt indicator and explains less.

The 'Other' sector is explained best by the Other Financial Sector Assets with a WVC of 0.2063. This indicator in this country income group was not correlated with the indicators representing the insurance sectors in this PCA of 54 observations.

FIGURE 7
Principal Components of Lower Middle Income Aggregate Indicators

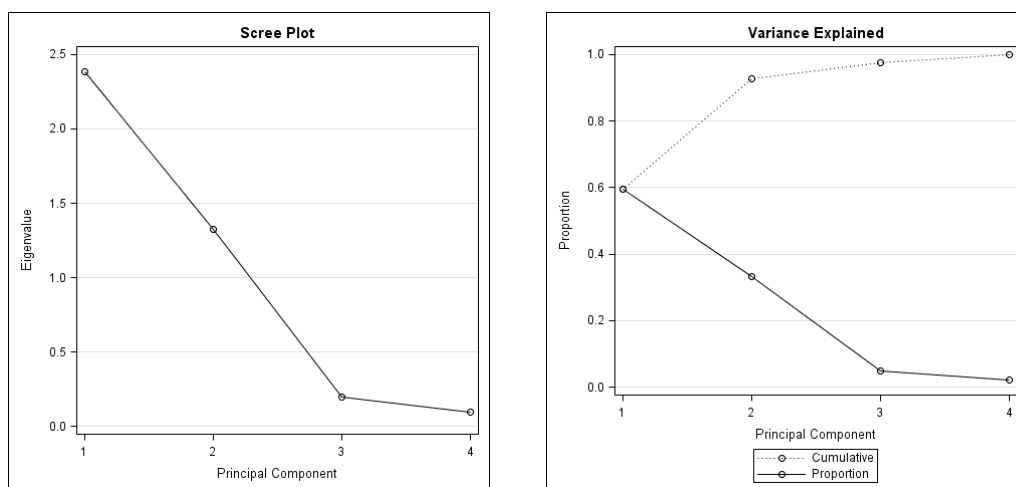


FIGURE 8
Principal Components of Lower Middle Income Banking Indicators

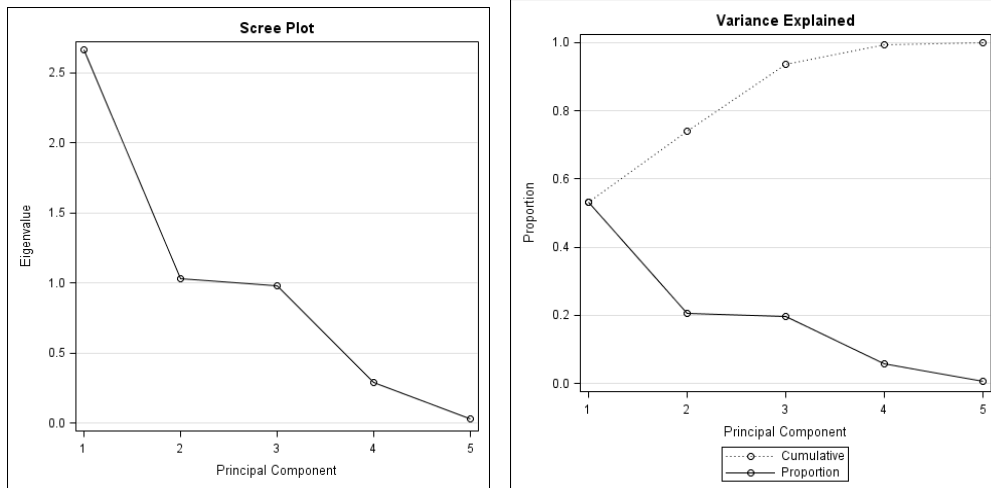


FIGURE 9
Principal Components of Lower Middle Income Debt Indicators

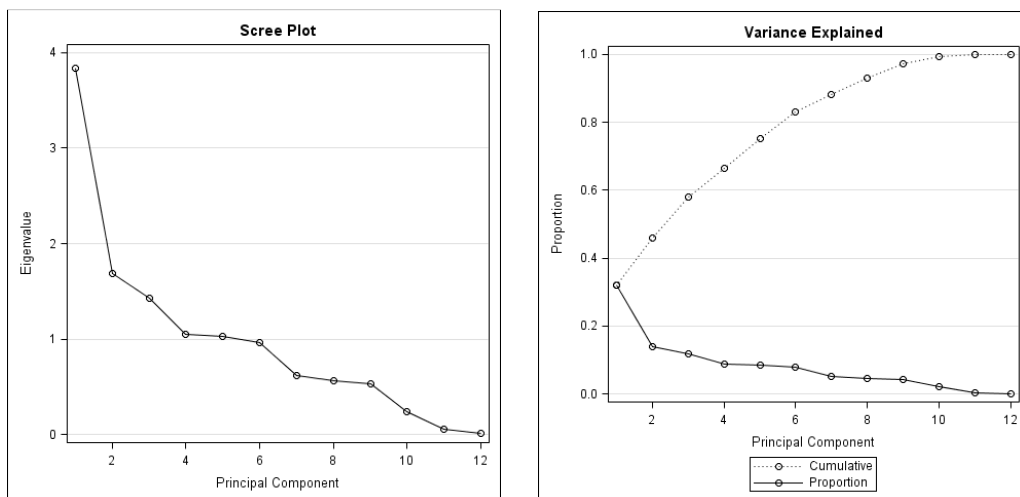


FIGURE 10
Principal Components of Lower Middle Income Equity Indicators

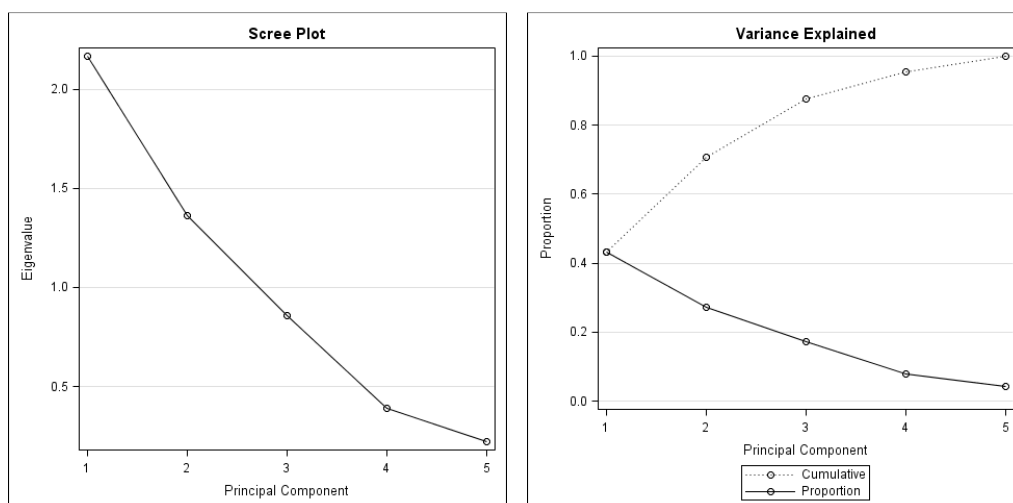


FIGURE 11
Principal Components of Lower Middle Income 'Other' Intermediaries Indicators

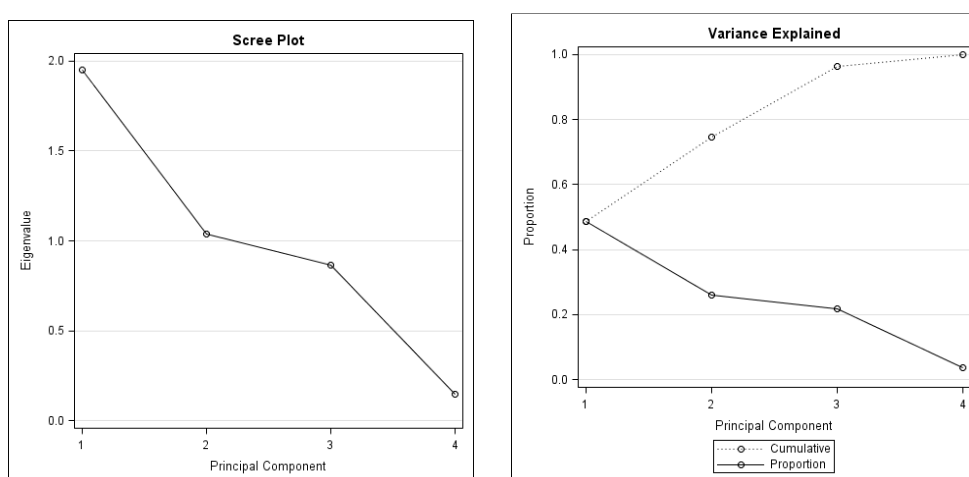


TABLE XVI
DOMINANT INDICATORS FOR LOWER MIDDLE INCOME COUNTRIES

Sector	Indicators	Type	Obs.	Variation	Comments
Aggregate	PLLGD	Size (L)	1002	0.318	Corr (PLLGD,PFDGD) =0.966
Aggregate	PFDGD	Size (L)	1002	0.312	Corr (PLLGD,PFDGD) =0.966
Aggregate	PPCRDBOFGD	Size (L)	1002	0.261	Corr (PPCRDBOFGD,PLLGD,PFDGD) =0.717,0.751
Intermediaries	PPCRDBGD	Size (A)	384	0.210	
Intermediaries	PDBAGD	Size (A)	384	0.188	
Intermediaries	PDBACBA	Size (A)	384	0.171	
Intermediaries	PBDGD	Size (L)	384	0.163	
Capital (Equity)	PSTVALTRADED	Size	479	0.321	Corr (PSTVALTRADED,PSTTURNOVER) = 0.528
Capital (Equity)	LISTCO_PC	Barriers to entry	479	0.305	
Capital (Equity)	PSTTURNOVER	Liquidity	479	0.288	Corr (PSTVALTRADED,PSTTURNOVER) = 0.528
Capital (Debt)	PINTLDEBTNET	Openness and Bond	37	0.345	Corr (PINTLDEBTNET,PINTLDEBT) =0.639
Capital (Debt)	PINTLDEBT	Openness and Bond	37	0.300	Corr (PINTLDEBTNET,PINTLDEBT) =0.639
Capital (Debt)	PPUBOND	Bond	37	0.291	
Other	POFAGD	Size (A)	54	0.206	? High Corr. with Insurance Indicators? Not an issue for this group.

iii. Upper Middle Income Countries

For the banking sector or intermediaries, private credit issued by banks explained the most variation with a WVC of 0.215 followed by deposit bank assets at 0.201. Efficiency of operations measured by how much bank credit is issued as a ratio of bank deposits came in at 0.1650. The bank deposits themselves as a ratio to GDP had a WVC of 0.157 looking at 308 observations but was highly correlated with private credit ($r=0.856$) and bank assets ($r=0.929$).

In the equity markets (with 503 observations), barriers to entry indicator, listed companies per 10,000 persons led the way with a WVC of 0.369. This followed by Stock market cap and value traded with a respective WVC of 0.358 and 0.257 for each. The latter two also suffered from a high degree of multicollinearity with a correlation coefficient of 0.792.

In the debt markets (with 72 observations), international debt explained the most variation with a WVC of 0.325 and an international loan measure with 0.257. Private bond issues had a WVC of 0.221 and a correlation coefficient of 0.567 with the international loan measure. This could mean that a certain financial openness with respect to capital inflows may be taking place in this country income groups where international loans are being made to domestic actors and these international investors may also be the ones that are stimulating the market of private bond issues.

In the 'Other' sector (with 142 observations) insurance indicators appeared to play a larger role in the financial system along with the 'Other Financial Assets' class. Non-life insurance premiums explained variation with a WVC of 0.398, life insurance premiums were close with a WVC of 0.392; note that the correlation coefficient was only

0.651 between the two indicators. Other financial assets explained with a WVC of 0.381 and a correlation coefficient with non-insurance life premiums of 0.624.

FIGURE 12
Principal Components of Upper Middle Income Aggregate Indicators

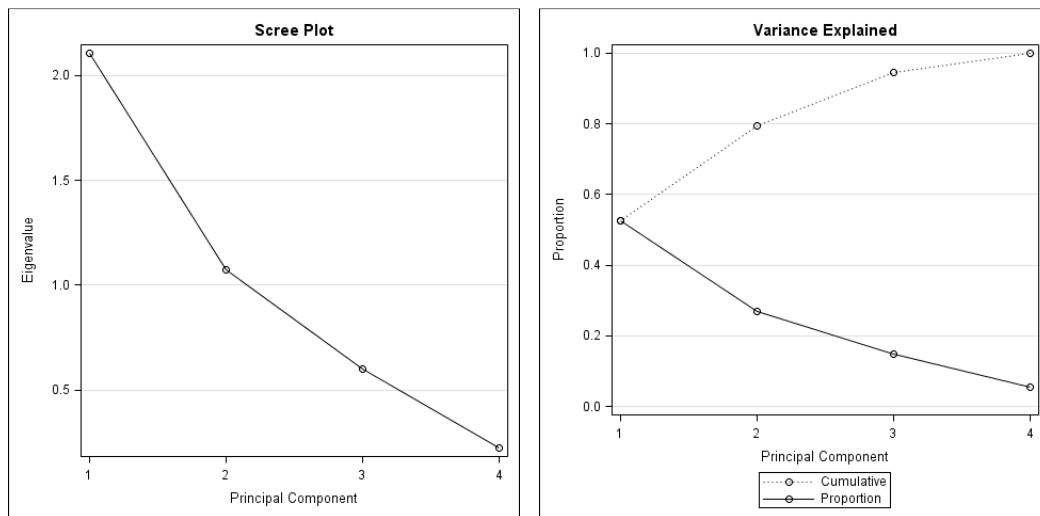


FIGURE 13
Principal Components of Upper Middle Income Banking Indicators

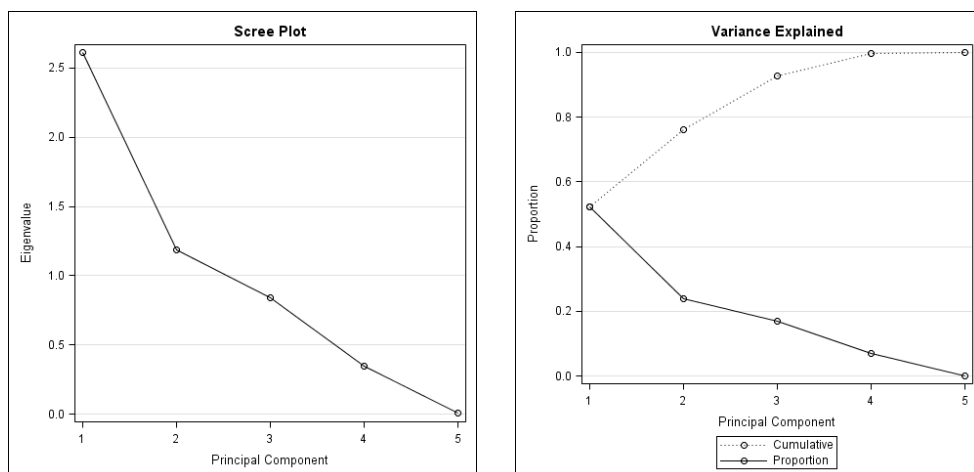


FIGURE 14
Principal Components of Upper Middle Income Debt Indicators

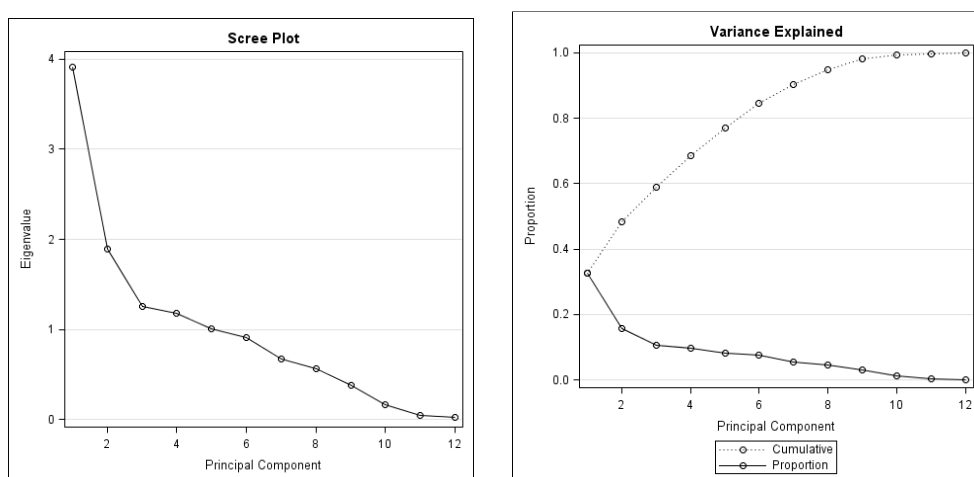


FIGURE 15
Principal Components of Upper Middle Income Equity Indicators

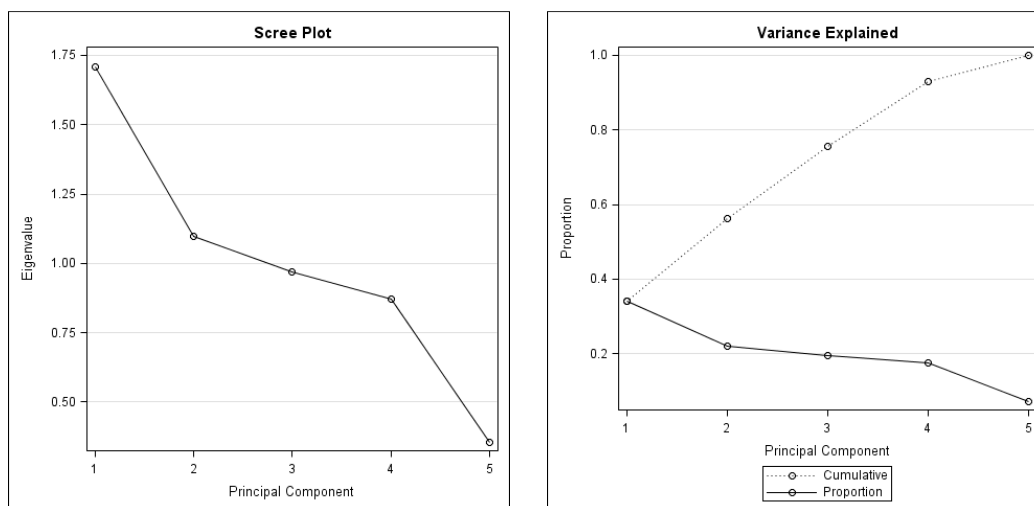


FIGURE 16
Principal Components of Upper Middle Income 'Other' Intermediaries Indicators

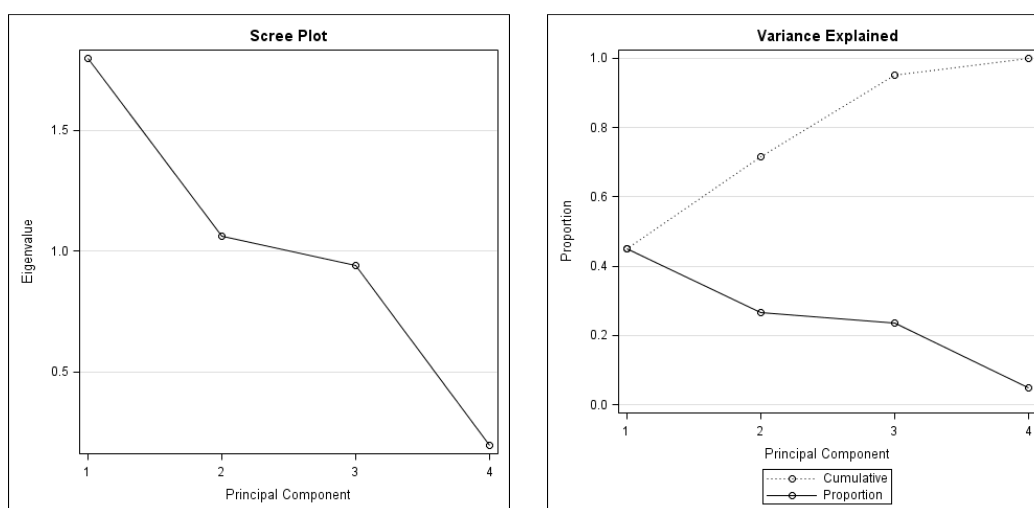


TABLE XVII
DOMINANT INDICATORS FOR UPPER MIDDLE INCOME COUNTRIES

Sector	Indicators	Type	Obs.	Variation	Comments
Aggregate	PLLGD	Size (L)	803	0.310	Corr (PLLGD,PFDGD) =0.985
Aggregate	PCBAGD	Size (A)	803	0.304	
Aggregate	PFDGD	Size (L)	803	0.295	Corr (PLLGD,PFDGD) =0.985
Aggregate	PPCRDBOFGD	Size (L)	803	0.276	Corr (PLLGD,PPCRDBOFGD) =0.666
Intermediaries	PPCRDBGD	Size (A)	308	0.215	Corr (PBDGD,PPCRDBGD,PDBAGD) = 0.856, 0.929
Intermediaries	PDBAGD	Size (A)	308	0.201	Corr (PBDGD,PPCRDBGD,PDBAGD) = 0.856, 0.929
Intermediaries	PBCBD	Efficiency	308	0.165	
Intermediaries	PBDGD	Size (L)	308	0.157	Corr (PBDGD,PPCRDBGD,PDBAGD) = 0.856, 0.929
Capital (Equity)	LISTCO_PC	Barriers to entry	503	0.369	
Capital (Equity)	PSTMKTCAP	Size	503	0.358	Corr (PSTVALTRADED, PSTMKTCAP) = 0.792
Capital (Equity)	PSTVALTRADED	Size	503	0.257	Corr (PSTVALTRADED, PSTMKTCAP) = 0.792
Capital (Debt)	PINTLDEBT	Openness and Bond	72	0.325	
Capital (Debt)	PNRBLOAN	Openness and Bond	72	0.257	Corr (PNRBLOAN, PPRBOND) = 0.567
Capital (Debt)	PPRBOND	Bond	72	0.221	Corr (PNRBLOAN, PPRBOND) = 0.567
Other	PINSNONLIFE	Size (A)	142	0.396	Corr (PINSNONLIFE, PINS LIFE, POFAGD) = 0.651, 0.624
Other	PINS LIFE	Size (A)	142	0.392	Corr (PINSNONLIFE, PINS LIFE, POFAGD) = 0.651, 0.624
Other	POFAGD	Size (A)	142	0.381	Corr (PINSNONLIFE, PINS LIFE, POFAGD) = 0.651, 0.624

iv. High Income Countries

Moving into the high income countries sample, similar patterns are observed. For the aggregate (921 observations) indicators, financial system deposits and liquid liabilities lead the way in explaining the variance using the PCA with a WVC of 0.320 and 0.315 respectively ($r=0.983$).

Remittances come back in the picture with a WVC of 0.2826. Private credit explains with a WVC of 0.2705 and a correlation coefficient with financial system deposits of 0.6956.

In the banking sector the two asset categories continue to dominate when it came to explaining the variations in the intermediary aspect of the financial structures. Private Credit with a WVC of 0.2002 and Bank Assets (as a ratio of GDP) with a WVC of 0.1910; they both had a correlation coefficient amongst them of 0.9511. These two indicators were followed by a measure of return on assets which in finance theory tends to monitor the performance of management with a WVC of 0.1740 and no multicollinearity implications.

For the capital markets, specifically the equity sector, barriers to entry measure, listed companies per 10,000 in population again held immense explanatory powers at a WVC of 0.4090. This was followed by the stock market indicators of the market capitalization as a ratio of GDP and the value traded as a ratio of the GDP. The market cap measure had a WVC of 0.3521 and the value traded measure had a WVC of 0.2660 with a correlation coefficient of $r=0.6589$ between the two measures.

The bond markets also continued to exhibit similar patterns with the private bond market explaining most variation with a WVC of 0.3662 followed by international debt and

the net international debt with WVCs of 0.2642 and 0.2514. The latter two also exhibited high correlation between them and a value of $r = 0.7143$. The private bond market was also correlated with the two international debt measures with r values of 0.6081 and 0.5456.

The 'Other' category included the two insurance sub-sector variables and the other financial assets. The non-life insurance variable seems to explain more of the variation and here again with a WVC of 0.4437 while the life insurance measure had a WVC of 0.1984. The two also had a correlation coefficient between them of 0.4728.

The other financial assets had a WVC of 0.4029. It was correlated with non-life insurance premiums with a correlation coefficient of 0.65. The insurance measures like the bond measure appear to be good candidates of being combined together into one measure.

FIGURE 17
Principal Components of High Income Aggregate Indicators

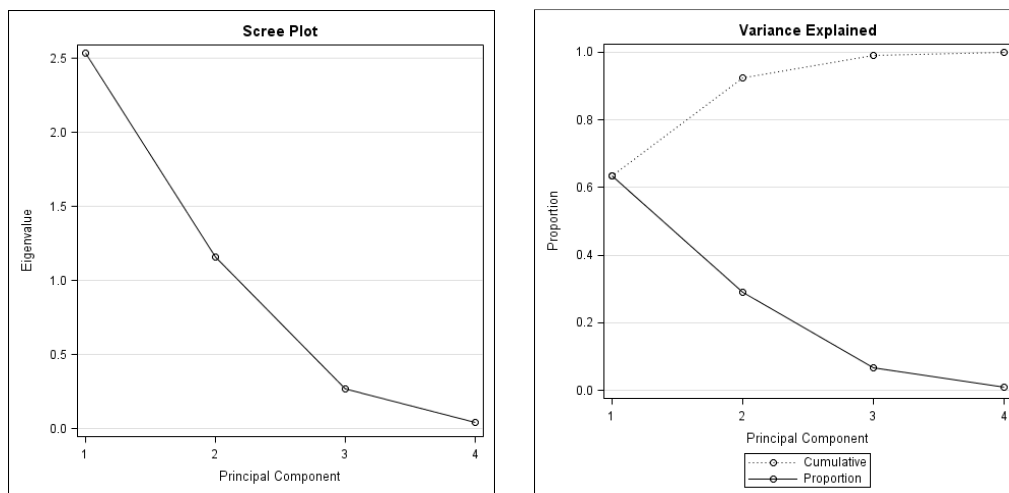


FIGURE 18
Principal Components of High Income Banking Indicators

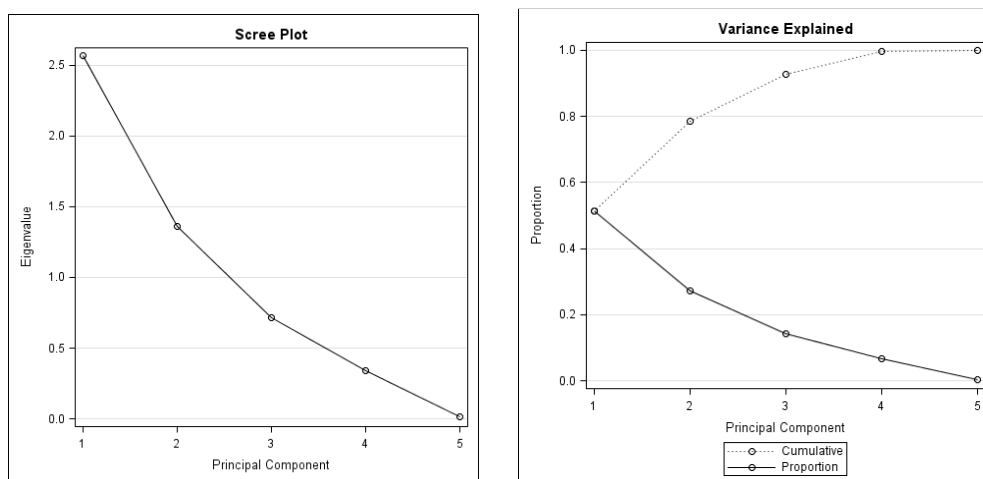


FIGURE 19
Principal Components of High Income Equity Indicators

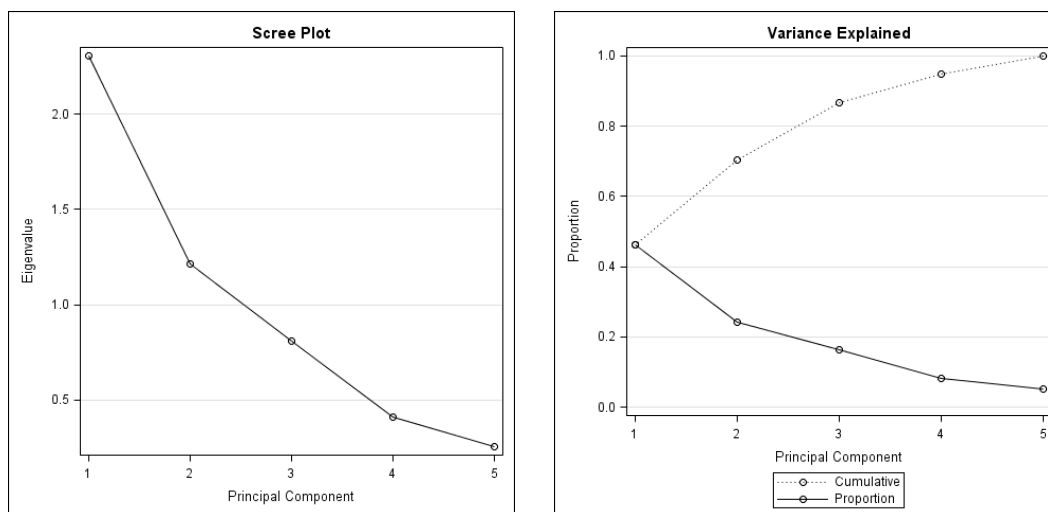


FIGURE 20
Principal Components of High Income Debt Indicators

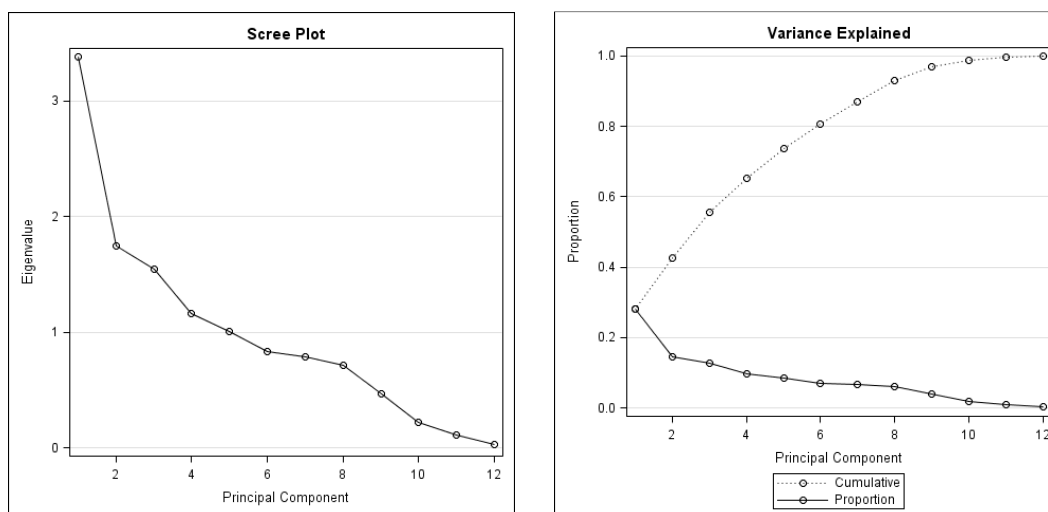


FIGURE 21
Principal Components of High Income 'Other' Intermediaries Indicators

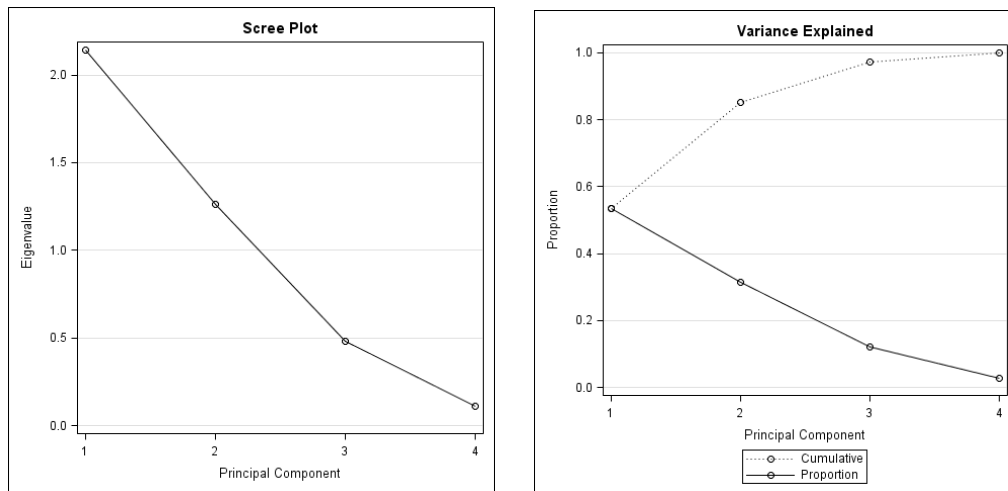


TABLE XVIII
DOMINANT INDICATORS FOR HIGH INCOME COUNTRIES

Sector	Indicators	Type	Obs.	Variation	Comments
Aggregate	PFDGDP	Size (L)	921	0.320	Corr (PFDGDP, PLLGDP, PPCRDBOFGDP)=0.983,0.696
Aggregate	PLLGDP	Size (L)	921	0.315	Corr (PFDGDP, PLLGDP, PPCRDBOFGDP)=0.983,0.696
Aggregate	PREMIT	Openness	921	0.283	
Aggregate	PPCRDBOFGDP	Size (A)	921	0.270	Corr (PFDGDP, PLLGDP, PPCRDBOFGDP)=0.983,0.696
Intermediaries	PPCRDBGDP	Size (A)	520	0.200	Corr (PPCRDBGDP, PDBAGDP) = 0.951
Intermediaries	PDBAGDP	Size (A)	520	0.191	Corr (PPCRDBGDP, PDBAGDP) = 0.951
Intermediaries	PROA	Efficiency	520	0.174	
Capital (Equity)	LISTCO_PC	Barriers to entry	819	0.409	
Capital (Equity)	PSTMKTCAP	Size	819	0.352	Corr (PSTMKTCAP, PSTVALTRADED) = 0.659
Capital (Equity)	PSTVALTRADED	Size	819	0.266	Corr (PSTMKTCAP, PSTVALTRADED) = 0.659
Capital (Debt)	PPRBOND	Bond	270	0.366	Corr (PPRBOND, PINTLDEBT, PINTLDEBTNET) = 0.608,0.546
Capital (Debt)	PINTLDEBT	Openness and Bond	270	0.264	Corr (PINTLDEBT, PINTLDEBTNET)= 0.714
Capital (Debt)	PINTLDEBTNET	Openness and Bond	270	0.251	Corr (PINTLDEBT, PINTLDEBTNET)= 0.714
Other	PINSNONLIFE	Size (A)	121	0.444	Corr (PINSNONLIFE, PINS LIFE, POFAGDP) = 0.473, 0.650
Other	POFAGDP	Size (A)	121	0.403	Corr (PINSNONLIFE, PINS LIFE, POFAGDP) = 0.473, 0.650
Other	PINS LIFE	Size (A)	121	0.198	Corr (PINSNONLIFE, PINS LIFE, POFAGDP) = 0.473, 0.650

F. CONCLUSIONS

There is no single commonly metric to-date that measures the financial structure of a country. While this paper does not claim to develop one, it provides future researchers with the best proxy for the changes in financial structures, as defined by the variations in the Financial Structure Database, for their country or groups of countries of their interest, collectively as well by income groups defined by the World Bank data sets. The database is the most comprehensive compilation of indicators that capture various dimensions of the final structure of a country. Indicators that explain the most variation within the data set are considered better proxies of changes in the financial structure or financial development.

The literature on financial development and economic growth has historically used the following six indicators, expressed as a fraction of GDP, Deposit Bank Assets, Other Financial Assets, Central Bank Assets, Total Private Credit, Liquid Liabilities and Stock Market Value Traded as proxies for financial structures. This study makes no a priori assumptions about the indicators. It evaluates not only the validity of the above proxies but also evaluates all the other indicators in the Financial Structure Database as well using principal component analysis and suggests additional potential indicators that could serve as proxies for measuring financial development.

In the study sample of all countries over the period of 1980-2009, Other Financial Assets, Total Private Credit, Stock Market Value Traded and Liquid Liabilities accounted for 16.18%⁴², 15.5%, 14.9% and 13.9% respectively of the total variation in the data set. Deposit Bank as well as the Central Bank Assets performed with 8.7% and near-zero

⁴² The percentages represent the weighted coefficient from the components. A percentage of 25 implies that the co-efficient of the variable in the component was 0.25.

percent respectively; the latter two indicators would not be strong proxy in financial development research. Non-life Insurance Premiums, Public and Private Bond Market Capitalizations and Bank Deposits are possibly other good alternative proxies explaining 16.8%, 15.6%, 15.2% and 14.4% respectively.

As countries move through the various phases of their developmental cycle, the aggregate proxies that best represent them changed as well. Low income countries⁴³, financial development is best characterized by the level of remittances followed by liquid liabilities- an indicator that is highly correlated with financial system wide deposits. Liquid Liabilities, still highly correlated with Financial System Deposits continue to be the best proxy in the Lower Middle Income⁴⁴ category- explaining 31% of the total variation in the Financial Structure data set. Total Private Credit also makes a strong appearance with 26.1% while Remittances play a secondary but strong role explaining 22.9% of the total variation.

The best proxy in the Upper Middle Income countries⁴⁵ was a close three way tie between Liquid Liabilities, Central Bank Assets and Financial System Deposits- each explaining 31%, 30.4% and 29.5% of the variations. Total Private Credit indicator plays an important role here as well, explaining 27.6% of the total variation. Evolving through this category to the High Income group, Financial System Deposits and Liquid Liabilities, explain the variations the best with 32% and 31.5% while still being highly correlated with

⁴³ such as Pakistan

⁴⁴ such as India

⁴⁵ such as Brazil, Turkey

each other⁴⁶. Total Private Credit explained 27% of the variation and Remittances make a strong appearance explaining 28.3%.

Similar analyses conducted on the individual sectors Intermediaries, Capital Markets and the 'Other' sector revealed a similar trend where the dominant indicators changed as the countries evolved through the various phases of economic development. The low income countries did not have well developed debt markets and relied more on remittances and bank stability as defined by the Z-score⁴⁷ explaining 21,2% of the total variation. Other forms of international debt, such as the International Debt Net (35.5%⁴⁸) indicator, Stock Market Value Traded (32.1%) and the Turnover ratio (28.8%) played a dominant role in the sectors along with the Public Bond markets (29.1%) appear to show presence as well but not the Private Bond markets⁴⁹ in the lower middle income countries. Barriers to entry measure, listed public companies per 1,000 in population also explained 30.5% of the variation in the equity sector.

While the above indicators continue in their respective strength in the upper middle income countries, the development of the 'Other' sector was an apparent phenomenon in this stage. The Insurance sector appear to develop in this stage, particularly the Non-Life Insurance Premiums indicator explained 39.6% of the variation in the 'Other' sector. The strength of this measure continues in the High Income group, gaining more dominance with explaining 44.4% of the sector variation. Barrier to entry measure becomes more important in the equity market explaining 40.9% of the Equity sectors' variation and the

⁴⁶ The correlation co-efficient between Financial System Deposits and Liquid Liabilities in the High Income Country group was 0.983.

⁴⁷ See the Data section for more on the Z-score.

⁴⁸ The percentages explained for within the sector indicator do not represent the overall changes in the financial structure but the rather the percentage change within the sector.

⁴⁹ See individual tables for the weighted coefficients.

Private Bond Markets play an important role explaining 36.6% of the Debt Market variations in the high income countries.

The above conclusions strongly suggest that the choice of an appropriate proxy in a financial development and economic growth study should vary with the income characteristics of the countries of research interest. The results outlined in this study should be viewed as a starting point upon which the researcher can build upon.

V. FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: CROSS-COUNTRY ANALYSIS USING EXTREME BOUNDS: 1960-2009

A. INTRODUCTION

The topic of financial development and economic growth to those familiar with the literature may sound like a cliché but it is a very serious topic with some very serious consequences that have been witnessed over the last few years. Most surveys of the subject begin with quotes from Robinson⁵⁰ arguing “where enterprise leads finance follows” and Lucas⁵¹ ‘dismissing’ finance as an “over-stressed determinant of economic growth. In all fairness, Lucas follows up on his now famous quote by stating that because of the existing focus on the importance of financial matters, he is “not inclined to be apologetic for going to the other extreme”; furthermore he states that he has “no clear idea as to how badly” financial institutions are a limiting factor and “one cannot theorize about everything at once”.

Lee Myung-bak, South Korea’s president, proclaimed last year⁵² that the nuclear reactor exports would become a powerful growth engine for the South Korean economy. He predicted atomic exports to reach US \$400 billion by the year 2030. Despite Korea Electric Power Corp. winning an unexpected contract from Abu Dhabi, they are struggling to convince potential buyers that they can finance the completion of the projects at this scale. Hwang Jang-soo, head of the Future Management Research Institute said that, “the international markets have no confidence in Korea’s financing capability.

⁵⁰ Robinson (1952)

⁵¹ Lucas (1988)

⁵² “Seoul’s nuclear ambitions wane”. Published: April 26 2011 in Financial Times

Korea has no big international banks to fund the deals". Closer to home, the former chairman of the Federal Reserve, Alan Greenspan praises the contribution of finance to economic growth, in the main stream media⁵³.

The big debate here is two folds:

- (1) Does financial development influences economic growth?
- (2) How is financial development measured?

King and Levine (KL) had responded to Leamer's suggestion of sensitivity analysis on cross-country regression analysis. Cross-country analyses have had equal number of opponents and proponents in the past. The KL approach of extreme bounds had many merits and was able to gain some traction in the literature. Levine also made significant contributions to the field of financial development and economic growth. However, these two major contributions to empirical economic growth and financial development literature never crossed paths. In this paper, we endeavor to do just that.

This study also goes further and seconds the conclusions of Cecchetti and Kharroubi⁵⁴, Tao Sun et al⁵⁵ and Aghion et al⁵⁶, that the level of financial development's impact on economic growth is limited. It is limited to the developmental phase that an economy is in. Furthermore, a financial structural indicator such as remittances may influence economic growth in the fewer developing countries but may have negligible effect on the more developed OECD nations.

We review some of the theoretical rationale behind how each one of these indicators may play a part in the development of an economy in section 2. We then review in section 3 some of the existing literature in the field specific to the cross-country

⁵³ "Dodd-Frank fails to meet test of our times" by Alan Greenspan. Published: March 29 2011 in Financial Times

⁵⁴ Cecchetti and Kharroubi, BIS working paper, July 2012

⁵⁵ IMF's Global Financial Stability Report, Chapter 4, October 2012

⁵⁶ Aghion et al (2005)

methodology or more specifically the cross-sectional empirical approach. The paper refers to studies which are panel in nature as well to support some of its conclusions. This is done to provide support to the argument that the cross-country comparisons while broader in nature, may lead to the same general conclusions as their more econometrically intensive siblings. We also review some of the other robust determinants of economic growth to provide support not only to our variables of interest but also the strength and validity of our control variables.

The paper first studies the all countries scenarios from 1980-2009 using three models testing for robustness of the financial indicators. The paper then splits the countries into income groups as specified by the World Bank and then evaluate each indicator over six different models, testing for robustness. We then report the conclusions and compare the results, seeking consistency.

We do find support for the Total Private Credit and Bank Assets measures used by the various existing studies to serve as proxy for financial development. We also find that other measures such as Bank or Financial System Deposits can serve as equally important proxies. Indicators that represent various bank behaviors such as Net Interest Margins or Bank Overheads also play a statistically significant and consistent role in explaining economic growth in our large sample. We did not find robust support for the various capital market indicators but we did find support for Inflows, sum of Foreign Direct Investments and Remittances, in countries at the lower range of the national income spectrum.

B. THEORETICAL FRAMEWORK

At its core, the premise of financial development influencing economic growth is that it enables an efficient allocation. The allocation decision could be faced either by households with savings or firms with cash-in-hand, a phenomenon which currently has reached historic highs⁵⁷ due to uncertainty. The function of a financial system is to facilitate the decision-making in these resource allocation considerations.

Financial system or financial development tends to be used as a catch-all phrase so let's begin by clarifying a few terms. The financial system of a country is a complex aggregate⁵⁸ of private sector financial institutions, including banks, insurance companies, mutual funds, finance companies, investment banks and the various money and capital markets (including derivatives) etc. The above entities are typically classified as either financial intermediaries or financial markets. A financial system's core components are the intermediaries and the various forms of markets. Intermediaries encompasses of the banking sector, bank-like (development banks, offshore entities) and non-bank institutions (insurance com., pension funds, mutual funds, hedge funds). There are a rapidly developing fields within the banking sector i.e., shadow banking and derivatives that are not adequately present in our financial system representation per se. The markets consist of capital and money markets whereas the capital markets can be further divided into debt (bond) and equity (stock) markets.

A financial structure at a given point of time is a mix of these financials instruments, intermediaries and markets (components of its financial systems). Financial development is referred to as the evolution of this mix over time. This is a normative term

⁵⁷ "Companies Still Hoarding Tons of Cash" by Catherine Rampell. Published: September 17 2010 in the NY Times

⁵⁸ Mishkin (2010)

as it implies that development is positive and there is no defined ideal structure for an economy. There is vast literature that evaluates the merits of bank-based (where banks are the dominant agents in the system) versus the merits of market-based (where markets are the dominant agents in the system).

The core needs served by the financial system are⁵⁹:

1. Methods of clearing and settling payments, supporting the basic functions of money
2. Mechanisms for pooling of resources, enabling the channeling of funds from those with excess (saver lenders) to those demanding it (borrowers)
3. Ways to transfer economic resources through time and across distance, allowing for inter-temporal consumption smoothing (provides support for the permanent income hypothesis)
4. Methods of managing risk via asset transformation (transforming low risk demand deposits into riskier ventures, spreading the risk)
5. Price information to help coordinate decentralized decision-making across the various sectors of the economy
6. Ways of dealing with incentive problems (adverse selection, moral hazard) created when one party to transaction is privy to information (information asymmetry) that another party does not or when party acts as an agent for another (principle-agent, agency problems)

A detailed discussion of these merits can be found in several excellent surveys⁶⁰.

⁵⁹ Merton (1995)

⁶⁰ Barro and Sala-i-Martin (2004), Levine (2005)

In the past decade or so due to legislative changes, the lines between the banks and the active market participants have blurred. Retail banks through their investment banking arms routinely participate in capital market activities. This universal banking model, which allows for retail banks to provide underwriting and advising services to its clients, has been the norm in Europe but in the United States was not permitted after the great depression (Glass-Steagall Act) until more recently when it was repealed, ironically before the crash of the dot com bubble.

The challenge for the policy makers becomes one of how to determine that the financial structure of an economy is evolving in the right direction. Policy makers can pass legislation to influence certain financial structure of a country but they cannot pass legislation dictating the degree or the level of financial development. How a country's financial structure is then measured? What aspects of their structure matters most to their particular country type given their respective endowments? Unfortunately this inquiry begs more questions than it provides answers.

The second matter of interest of this particular paper is how financial development or its level is measured. Scholars⁶¹ have been limited in the past few decades by data and technology yet they still chugged long in attempts to demystify this empirical linkage. They relied on a few measures that they deemed adequate and studied them as an acceptable proxy. With time, as more data became available and technology more advanced, capital market indicators were introduced and researched.

The compilation of the Financial Development and Structure database⁶² support Goldman's original ambition of reducing the barriers to entry for conducting research of

⁶¹ Goldman (1969), McKinnon (1973), Gurley and Shaw (1955), Roubini and Sala-i-Martin (1991), Atje and Jovanovic (1993), King and Levine (1993), Levine and Zervos (1998)

⁶² Beck and Demirgüç-Kunt (2000, 2010)

this field. Some scholars⁶³ have called for as well as roughly outlined a composite representing financial development. Studying the indicators and their empirical linkage to long run economic growth in a simple cross-country framework is a solid first step towards reaching the goal of a composite and (possibly) a universal model which could be used for future country (case) or a regional based time-series or panel comparative studies. To quote Leamer's joke⁶⁴ about the Lawyer who once remarked that "when I was a young man I lost many cases that I should have won, but when I grew older I won many that I should have lost, so on the average justice was done." Ericsson⁶⁵ does an excellent job of characterizing the original Leamer and Leonard's mathematical model. This paper follows the tradition of the modified extreme bounds as proposed by Levine and Renelt for the 95% critical values where

$$Y = \beta_i I + \beta_m M + \beta_z Z + \mu;$$

I variables are always included in each regression; they are the initial real GDP per capital, initial human capital endowment and Population growth rate. The I variables in the equation above were the original M variables of the Levine and Renelt paper. M variables, referred to as f variables in our study, are included one at a time in the regressions and these are the variables of our interest; there are 30 total indicators in the financial structure database. Z variables are other determinants that influence growth or real GDP per capita of a country.

⁶³ Honohan (2004)

⁶⁴ Leamer (1983)

⁶⁵ Ericsson (2208)

The modified Levine and Renelt's extreme bounds are approximately:

$$[\beta_{\min} - 2\sigma_{\beta_{\min}}, \beta_{\max} + 2\sigma_{\beta_{\max}}]$$

where β is the estimate minimum and maximum coefficients from various Z-variables linear combinations. Henceforth,

$$\beta_L = \beta_{\min} - 2\sigma_{\beta_{\min}}$$

$$B_H = \beta_{\max} + 2\sigma_{\beta_{\max}}$$

Where the β_L and B_H are the lower and upper bounds of the estimated coefficient for the indicator. The conditions for robustness that exist are if

If

$$\text{Sign } \beta_L = \text{Sign } B_H$$

Then the indicator is robust otherwise it is fragile.

C. LITERATURE REVIEW

1. Determinants of Economic Growth

Sala-I-Martin⁶⁶ estimates the following model for 62 possible determinants of growth going back to 1960:

$$y = a_j + \beta_{yj}y + \beta_{zj}z + \beta_{xj}x_j + \varepsilon;$$

The author then allowed for combinations of the explanatory variables to change except three of them: the level of income in 1960 (to control for the conditional convergence effect), life expectancy in 1960 and primary school enrollment rate in 1960 (the latter two representing initial human capital states). For each of the 62 variables he estimates 30,856 ($58!/(3!55!)$) models.

The author ran regressions first with the above 3 variables as fixed and then ran the regressions again with investments being one of the fixed variables as well; investments being a proxy for capital formation. Initially 22 of the 62 'determinants' of growth were significant, a few determinants dropped out (no longer significant) once investments were included while others became significant. The summary of the Sala-I-Martin's findings are tabulated below for the possibly explanatory variables or the determinants of economic growth:

⁶⁶ Sala-I-Martin (1997)

TABLE XIX
CONCLUSIONS FROM SALA-I-MARTIN'S TWO MILLION REGRESSIONS

Variable	Data Source	Exp. Sign	Comments
Sub-Saharan Africa dummy	Barro and Lee (1993)	-	
Latin America dummy	Barro and Lee (1993)	-	
Absolute Latitude	Barro and Lee (1993)	- / +	Closer to further from equator
Rule of Law	Barro and Lee (1993)	+	
Political Rights	Barro and Lee (1993)	+	Large value less rights
Civil Liberties	Barro and Lee (1993)	+	Large value less liberties
Real Exchange Rate Distortions	Barro and Lee (1993)	-	Distortions in the foreign markets
Std. deviation from Black market premiums	Barro and Lee (1993)	-	Sign of economic uncertainty
Fixed (Equipment) Investments	WDI	+	
Confucius	Barro (1996)	+	Possible East Asian Miracle dummies
Muslims	Barro (1996)	+	Possible oil correlation
Protestant	Barro (1996)	-	
Fraction of primary products in exports	Sachs and Warner (1995)	-	
Fraction of GDP in mining	Hall and Jones (1996)	+	
Economy years open 1950-1990	Sachs and Warner (1996)	+	Only openness metric significant
Govt investments	PWT 7.0	-	I_{pvt} preferred over I_{pub}
Inflation rate	PWT 7.0		NOT SIGNIFICANT
Population growth rate	PWT 7.0		NOT SIGNIFICANT
Govt spending	PWT 7.0		NOT SIGNIFICANT
Trade balance	PWT 7.0		NOT SIGNIFICANT
LLGDP	PWT 7.0		SIGNIFICANT
Initial GDP 1960	PWT 7.0		SIGNIFICANT

2. Financial Development

The literature review first covers the existing literature pertaining directly to the Financial Structures database and the cross-country analysis framework. It then covers the brief work that has been done using Principal Components Analysis to overcome the correlation problem among the indicators of the dataset. The review moves onto the various possible indices that are either currently existing or the theoretical proposals that are made regarding their constructs. The review briefly covers the consensus on the other determinants of economic growth. Lastly, the review covers the technique of partial least squares.

This sub-section pertains to the general review of the financial development and economic growth literature specific to the financial structures database and cross-country growth regressions and is organized as follows:

1. It focuses on the cross-country literature documenting the aspects of financial (structure) development and growth (economic development) and
2. It distinguishes between studies documenting correlation and studies establishing causation and highlights the investigators choice of proxy representative of financial development and the corresponding sector of the financial system.

There are two noteworthy points here; the first being that the criticisms of cross-country studies applies to the respective cross-country comparisons⁶⁷ and secondly, recent studies⁶⁸ on the topic have focused more on causation using various econometric techniques (panel and time-series methodologies employing either the IV or the GMM

⁶⁷ Levine and Renelt (1992), Slemrod et al (1995)

⁶⁸ For example: Hassan et al (2011)

estimators). The variables used in this paper that are comparable to the literature are shown in upper case and bold type.

Goldman⁶⁹ used simple correlations, graphs and charts to document a positive relation between the changes in the choice proxy of market value of the financial intermediary assets and economic development for 35 countries over the period of 1860-1963. That proxy indicator is represented in this paper's dataset as the sum of CBAGDP, DBAGDP and OFAGDP. This was a herculean six-year effort that followed Robinson's "where enterprise leads finance follows" argument that; interestingly the notion of financial innovation was yet to gain popularity where finance became both the enterprise (innovations) and the resource means to achieve it. Prior to Goldman's study others⁷⁰ had rejected, albeit more informally, the notion that the finance-growth nexus can be safely ignored.

Goldman, in the regression models, did not control (condition) for other explanatory variables of growth and used national income per capita as the explained variable. Studies that followed established a tradition of productivity growth and capital stock per capita growth as being alternative measures of the explained variable. However, the most serious infraction of this study was to confine itself to the size measure of the intermediaries and not include any representative measures of the capital markets; in Goldman's defense, this was primarily due to the data availability. Goldman did compute the correlations by country type dividing them into Non-socialist, Developed and Less Developed countries.

⁶⁹ Goldman (1969)

⁷⁰ Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955)

King and Levine⁷¹ was a synthesis of Goldman, Barro⁷² and Levine and Renelt⁷³. They extended Goldman's work on investigating the empirical linkages between financial indicators and growth using Barro's growth regression model subjecting it to the sensitivity analysis as outlined in Levine and Renelt. They compiled 4 indicators as a possible proxy of the level of financial development in a country as a regressor. The study then regresses each one of the four indicators to three possible growth regressand, real gross domestic per capita growth, real capital stock per capita growth and a computed productivity growth for a total of twelve regressions. They expanded their dataset to 77 countries over the period of 1960-89. Their full model was as follows:

$$G(j) = \alpha + \beta * F(i) + \gamma X + \epsilon;$$

Where

F (i) = ith financial indicator averaged over the study period;

G (j) = jth growth indicator;

X= Conditioning matrix;

These regressands were described above where productivity is computed as:

Real per capita gross domestic growth – 0.3 (real per capita capital stock growth)

The conditioning matrix included log of initial income (controlling and testing for conditional convergence), human capital endowment (initial secondary school enrollment as a proxy), ratio of government expenditure to GDP, inflation rate and ratio of exports plus imports to GDP. The proxy indicators constructed are as follows (this study's comparable variables given in parenthesis):

⁷¹ King and Levine (1993)

⁷² Barro (1991)

⁷³ Levine and Renelt (1992)

LLGDP, Liquid Liabilities have been referred to the literature as the financial 'depth' of the overall size of the sector derived from IFS⁷⁴ line 551 corresponding to the now discontinued M3 or line 351 corresponding to M2.

LLY= Liquid Liabilities / GDP;

BANK = Deposit Money Bank Assets / (Deposit Money Bank + Central Bank Assets);

DBACBA, There is a discrepancy that should be pointed out to avoid confusion for the readers, the earlier literature survey⁷⁵ has described this variable as ratio of bank credit divided by bank credit plus central bank domestic assets whereas the authors have described this as a ratio of the bank assets divided by the sum of domestic and central bank assets. More recently⁷⁶ these assets were described as claims on the non-financial sector (including government). For the purpose of the review of this study, the original author's definition is relied upon.

PRIVATE= Claims on pvt non-financial sector / tot. Dom. credit (excl. credit to banks)

PRIVY = Claims on pvt non-financial sector / GDP; (PCROFGDP) this is simply the claims above divided by the gross domestic product.

This variable excluded the credit extended to government and agencies plus it adjusted for credit issued by the entire financial system whereas BANK reflected money banks. This study does not have a comparable measure, later surveys⁷⁷ dropped this measure.

Initially the study did divide the countries into very fast, fast, slow and very slow subsets and determine their correlation with growth to be highly significant, however, like Goldman this initial result was without any other explanatory variables in the model. The

⁷⁴ International Monetary Fund's International Financial Statistics

⁷⁵ Levine (1997)

⁷⁶ Beck and Demirgüç-Kunt (2009)

⁷⁷ Levine (2005)

results after including the control variables were still significant (all results are documented in the appendix).

The paper had two other unique notable contributions here: They used the initial level of financial development as a proxy (only measure by “LLY”) while keeping the conditioning set at 1960 levels on growth and found it significant as well. Secondly, they performed an extreme bound analysis (EBA) on their findings adding revolutions and coups, standard deviation of inflation, growth rate of domestic credit and the standard deviation of the growth rate of domestic credit and concluded their findings to be robust. All analysis done within the full model did not separate their results by the originally proposed country groups. The study did account for financial markets.

La Porta et al⁷⁸ use the degree of government ownership of commercial banks as an alternative indicator representing the efficiency of the banking sector. They utilize this efficiency indicator to provide direct evidence on the link between economic growth and the services provided by the financial intermediaries.

Demirguc-Kunt and Levine⁷⁹ observe the non-bank intermediaries’ development over the 1990’s using histograms. They document that as countries get richer, the role of the non-bank institutions increases relative to the role of Bank-Like institutions in the economies. Their analysis is broken down by country income groups.

For Insurance Companies, the private credit extended by the companies decreases moving from Low Income to Lower Middle Income and then rises through Upper Middle and High Income countries. The same phenomenon was observed in the measure of penetration defined as Penetration which is equal Premiums Received divided by GDP.

⁷⁸ La Porta et al (2002)

⁷⁹ Beck et al (2001)

INSLIFE+INSNONLIFE, They also document the correlations of all the indicators of financial structures from the database compiled by the World Bank to economic growth as express by real gross domestic product per capita. However their initial correlations documentation prior to the use of instrumental variable techniques did not use any condition matrix or control variables. The correlation values provide a base line to more complete models. The correlations were not grouped by countries but there were separate indicators for each sector.

Atje and Jovanovic⁸⁰ searched for level and growth effects in their own growth model with no diminishing returns and a modified model per Mankiw, Romer and Weil⁸¹. The explained variable was real gross domestic product per capita and the explanatory variables were:

S = Stock Market Total Value Traded / GDP; (STVALTRADED)

B= Claims on the private sector by money and central banks / GDP;
(DBAGDP+CBAGDP)

The growth regression was conditioned for the growth rate of the working age population, investment as a percentage of output, percentage of the working age population in secondary school and initial values of the two variables of interest. In conclusion, the study found a large effect of stock markets on development but failed to find a similar effect of bank lending.

Bhide⁸² has however argued that the stock market liquidity comes at a price of corporate governance. Whereas previously the investors (principal) were able to hold the agent accountable, now due to increase liquidity, the shareholder bodies has become fragmented and they face higher information asymmetry. The paper however was

⁸⁰ Atje and Jovanovic (1993)

⁸¹ Mankiw et al (1992)

⁸² Bhide (1993)

theoretical without any empirical evidence to support the hypothesis and highlighted the regulatory functions of the Securities and Exchange Commission.

Levine and Zervos⁸³ built on all of the aforementioned studies. Their econometric methodology was consistent with the Barro-type growth regression model. The dependent variables were the three growth rates from King and Levine plus a measure of private savings and the independent variables were constructed as market liquidity and a measure of banking development while controlling for initial output (this time logarithmically defined as in per capita terms), enrollment (log of the initial secondary school enrollment rate), revolutions and coups representing political stability, initial values of government consumption expenditure, inflation rate and exchange rate black market premium. Two different conditioning conventions are: That the black market premium has replaced here the ratio of total trade / gross domestic product and the initial values of government is being used.

The study covered a maximum number of 45 countries (based on their Table 6) over the period of 1976-93. It deviates again from the traditional contemporaneous regressions and instead employs the indicators as regressor at their initial 1976 level. The argument was that this is a better measure that predicts growth rather than contemporaneously reacting to shocks, a common criticism of the tradition cross-country comparisons. Bank Credit was the common indicator in all the regressions along with the conditioning matrix while the indicators representing the stock markets along with the dependent variables were altered for a total of 16 regressions.

Bank Credit = Initial bank loans (credit) to private enterprises / GDP; (DBAGDP)

Turnover = Initial market value of the traded volume / market capitalization;
(STTURNOVER)

⁸³ Levine and Zervos (1998)

Value Traded = Initial market value of the traded volume / GDP; (STVALTRADED)

Capitalization = Initial market capitalization / GDP; (STMKTCAP)

The results document the government expenditure, black market exchange rate premium, inflation rate and the savings rate to be insignificant. Bank Credit, Turnover, and Value Traded were significant but Capitalization was not robustly significant. The study makes stronger predictions but not formally with causality. The liquidity measure is nominal in the sense that it does not adjust for the dissemination of information across time zones and possibilities of spatial arbitrages. The study does neither accommodate the broader banking sector indicators nor the bond market indicators.

Beck et al⁸⁴ show that in many countries the public bond markets are larger than the stock markets and the private bond markets are greater than half the size of the stock market. The study also documented that in many countries over the period of 1980-95, private bond issues were greater than the stock market initial public offerings.

Fink, Haiss and Hristoforova⁸⁵ examined 13 countries over the period of 1950-2000. This was a causality determining study using Granger causality tests and co-integration methods. Their evidence indicated that the development of the debt markets nearly the private and public bond sector influences real economic activity.

The World Bank's Financial Structure Database has reduced the barriers to entry to research on the empirical linkages between Financial Structures and Economic Development; sophisticated econometric methodologies and computing power allows us to harness the two resources together and develop meaningful solutions to the policy issues that is faced by most countries in this post global recession era dominated by the shadow banking sector and derivatives.

⁸⁴ Beck et al (2001)

⁸⁵ Fink et al (2003)

The literature post the Financial Structure Database continues to use the traditional measures that were used to proxy the level of financial development. Scholars⁸⁶ have called for a more complete measure that represents the financial structure of a nation state. As this brief literature review has demonstrated that multiple sectors of a financial system have shown strong correlations with economic development but this is still *post hoc ergo propter hoc*; the road to develop a sound causal understanding must begin by incorporating all sectors of the financial system, institutions, property rights and international influences.

Cecchetti and Kharroubi⁸⁷ recently assessed the impact of finance on growth and concluded that the level of financial development is good only up to a point; their study for conducted over 50 advance and emerging countries over 1980-2209. They constructed 5 year averages of GDP per worker growth as the dependent variables. They used Private Credit / GDP and Bank Credit /GDP as proxies for the level of financial development. The control variables used were population growth rate, openness to trade, government consumption and CPI inflation; give years averages were also constructed for these variables.

The study attempted to provide additional observations by not created one averaged value. The authors did not mention the fact that not all business cycles are in-sync and occur every 5 years, neither did they discussed the implication of using this methodology.

This study however introduced a human resource based indicator measure the level of the financial structure. They constructed a ratio of the financial sector employment to the economy's total employment. While this particular measure poses

⁸⁶ Honohan (2004)

⁸⁷ Cecchetti and Kharroubi, BIS Working paper 2012

serious data quality concerns among other concerns, the results yielded were similar to other measures of the study.

The study determined that the financial sector size has an inverted U-effect on productivity growth. The low income countries experience productivity gains from the development of the financial sector but the benefits plateau out because the financial sector, which competes with rest of the economy for the same scarce resources, after a certain point begin affecting the economy adversely. This phenomenon indicates that the financial sector growth may be a drag on productivity growth.

The authors emphasize the pressing need to understand the linkages between financial structure and productivity gains in the contemporary financial systems. They concluded their study with a final determination that “more finance is definitely not always better”.

Tao Sun et al examined whether the changing global financial structures could improve economic outcomes in a study of 58 developed and emerging economies over the period of 1998-2010. In some ways, their work at the IMF was a response to the questions posed in the BIS working paper. Their claim, like the previous author has been that the empirical linkage between the structures of a financial system has not been as intensely studied as the level of financial development has been with respect to better economic outcomes or simply economic growth and development.

They stressed the limitations of using proxies and concluded that some financial structures are more likely to be associated with better economic outcomes than others. They caveated this by stating that no single financial system model as a result of their study can ensure the best economic outcomes in all circumstances, that no optimal financial structure mix exists that can maintain both financial stability and best economic outcomes.

They further suggested that a trade-off may exist between financial stability and economic growth and they could not claim that certain specific characteristics of a financial system will always be associated with economic growth. Systems dominated =====by non-traditional intermediation in some cases have been observed with adverse economic outcomes.

They determined that protective financial buffers are associated with better economic outcomes provided the buffers consist of high quality capital and truly liquid assets. They also emphasized a lot on the various measures of competition and industry concentration and cautioned that due to the fact that these measures are so frequently influenced by authorities that it makes it difficult for the data to truly capture the consistent and true impact of those indicators.

Lastly, they concluded that policy-makers need to reconsider the role that the financial systems play in achieving positive economic outcomes. Furthermore, the growth impact is negligible in countries with very low level of national income and it only becomes statistically significant at the 75th percentile of income. Specifically, the coefficient of Private Credit is twice as large as the co-efficient of developing countries. The size of this coefficient increases as national increases.

D. METHODOLOGY

1 . All Countries, 1980-2009

In the tradition of Levine and Renelt⁸⁸, we determine a set of I, M and Z variables of the familiar equation:

$$Y = \beta_i I + \beta_m M + \beta_z Z + \mu$$

I variables are always included in each regression; they are the initial real GDP per capital, initial human capital endowment and Population growth rate. Our I variables were the original M variables in the Levine and Renelt paper. M variables, referred to as f variables in our study, are included one at a time in the regressions and these are the variables of our interest; there are 30 total indicators in the financial structure database. Z variables are other determinants that influence growth or real GDP per capita of a country, they are as follows:

1. Government's share in real GDP, govt
2. Investment's share in real GDP (I/Y)
3. Trade Openness which is Import + Export expressed as a fraction of GDP, openk
4. Inflation rate, as derived from respective CPIs, irate
5. Taxes, taxes

We use the following three models for the regression of all countries. This is for the sake of expediency since Levine and Renelt had fewer variables of interest and we use more models later in this paper when we conduct the analysis within each country income groups.

⁸⁸ Levine and Renelt (1992)

$$(1) g_i = \alpha + \beta_j f_j + \delta_1 y1980_i + \delta_2 lp1980_i + \varepsilon_{ij};$$

$$(2) g_i = \alpha + \beta_j f_j + \delta_1 y1980_i + \delta_2 lp1980_i + \delta_3 gpop_i + \gamma_1 govt_i + \varepsilon_{ijT};$$

$$(3) g_i = \alpha + \beta_j f_j + \delta_1 y1980_i + \delta_2 lp1980_i + \delta_3 gpop_i + \gamma_1 govt_i + \gamma_2 openk_i + \gamma_3 irate_i + \varepsilon_{ijT};$$

In (1) model we include the initial conditions for each observation to control for a country's initial endowment of human capital and income, in this case the real per capita GDP and primary school enrollment in 1980. This will be considered the **base model**.

In the more complete and restrictive model, we include other determinants of growth. There are a few points that must be made here:

1. Studies have typically included Investment's share in real GDP as a Z variables. Sala-i-Martin had also found it to be a robust determinant of growth. However it is not included here because of high theoretical correlation with these indicators that are measured here the financial structure which captures the level of investments executed by the financial system.
2. As a corollary to the point made above, accumulation of physical capital is a very strong determinant of economic growth. It is being excluded here from the models for the same reasons as investment's share in real GDP; very high correlation with the financial indicators.
3. Model (4) was created as an extension to Model (3) to incorporate for the effect of taxes. It was separated because of the limited data on taxes, only 33 observations and also because of the high possible theoretical correlation between tax revenues and government expenditures.
4. Some of the other Z variables that are not included in this study but were part of the original Levine and Renelt papers are: standard deviation of inflation, revolutions and coups, black market exchange-rate premium and standard

deviation of credit growth. This was mostly due to the either lack of the availability of data or the lack of a priori theoretical foundation.

The data was averaged between 1980-2009 for all of the above variables except initial primary school enrollment and initial real GDP per capita, both the values from 1980.

The results were tabulated and the principles of extreme bounds were applied where the upper and lower bounds were computed by adding and subtracting twice the standard deviation from the coefficient value. If the resulting value had the same sign, the variable is to be considered robust, otherwise fragile. The test is meant to gauge the strength of the directionality of the impact of the particular variables on economic growth beyond the shadow of a doubt. Only variables that are statistically significant with a non-zero co-efficient will be subject to further testing using models (2) and (3).

2 . **By Country Income Groups, 1960-2009**

The Financial Development and Structure data was expressed in a fractional format. Those values were converted into percentages for ease of interpretation of the estimation results. Data from all the sources along with the newly constructed variables were compiled into one master database. Initial income has been included in all the models, even the least restrictive one, to control for conditional convergence. Criticisms of measurement errors that bias⁸⁹ its coefficient to be negative were addressed by taking the average of two years (1960-61) as initial income to control for the conditional convergence and reduce the potential bias.

⁸⁹ Romer (1990)

The indicators were evaluated for significance in three different ways:

1. 6 different variants⁹⁰ of the models from the literature were estimated for the cross-section of the 210 countries for the period 1960-2009 (data permitting) using each indicator (30 in total) as a potential proxy for financial development. The results from these 180 individual regressions are documented and tabulated (see Table 2) from least to most restrictive models.
2. Similar to Levine and Renelt, a variant of EBA was used to test for robustness. Given the results of the median and the least and most restrictive models, lower and upper bounds were estimated and relationships declared robust or fragile to the long run economic growth (see Table 3).
3. A median model from (1) was estimated the significance of each of the indicators in different country income groups was documented. This should provide an insight on how the indicators behave for different levels of income (see Table 4).

The study utilized the combined master dataset and follows the convention of previous studies of using a Barro-type growth regression; growth rate (of either real gross domestic product per capita, real capita stock per capita or productivity) as the regressand and on the right hand side there is a proxy of financial development and a conditioning matrix.

The conditioning matrix has two components: it has macro variables that are always included in all the regression and it has a set of control variables. The control variables are drawn from a pool of possible control variables and this rotation of the various control variables tests for robustness of the model.

⁹⁰ Beck (2009)

The Financial Structure Database contains a matrix of indicators that measure different aspects of a financial structure of a country in a given year. This study documents the significance and the correlation of each of the variables across all possible countries using a cross-sectional technique. Average values are computed for each financial structure indicator by country over the study period of 1960-2009. Missing observations and incomplete information varies the number of countries analyzed by indicator and model type. Six possible models that were analyzed are below:

- (1) $g_i = \alpha + \beta f_i + \delta_1 y_{1960_i} + \varepsilon_{ij};$
- (2) $g_i = \alpha + \beta f_i + \delta_1 y_{1960_i} + \delta_2 lsc_{1960_i} + \varepsilon_{ij};$
- (3) $g_i = \alpha + \beta f_i + \gamma_1 rcons_i + \gamma_2 rinv_i + \gamma_3 rgov_i + \gamma_4 ropen_i + \delta_1 y_{1960_i} + \delta_2 lsc_{1960_i} + \varepsilon_{ij};$
- (4) $g_i = \alpha + \beta f_i + \gamma_1 rcons_i + \gamma_2 rinv_i + \gamma_3 rgov_i + \gamma_4 ropen_i + \gamma_5 gpop_i + \delta_1 y_{1960_i} + \delta_2 lsc_{1960_i} + \varepsilon_{ij};$
- (5) $g_i = \alpha + \beta f_i + \gamma_1 gpop_i + \gamma_2 irate_i + \gamma_3 govt_i + \gamma_4 realopenness_i + \gamma_5 coups_i + \delta_1 y_{1960_i} + \delta_2 lsc_{1960_i} + \varepsilon_{ij};$
- (6) $g_i = \alpha + \beta f_i + \gamma_1 gpop_i + \gamma_2 irate_i + \gamma_3 govt_i + \gamma_4 realopenness_i + \gamma_5 coups_i + \gamma_6 ruleoflaw_i + \gamma_7 crights_i + \gamma_8 blkxpren_i + \gamma_9 corrupt_i + \gamma_{10} demo_i + \gamma_{11} currsecsch_i + \delta_1 y_{1960_i} + \delta_2 lsc_{1960_i} + \varepsilon_{ij};$

g_i = growth rate of real gross domestic per capita of country i ; **GRGDPL**

f_i = financial indicator measuring a unique aspect of the financial structure of country i

Other terms on the right hand side are the various combinations of control variables of the conditioning matrix prevalent in the Finance-Growth literature. Model (1) is the least restrictive whereas Model (6) is the most restrictive. The correlation coefficient, standard errors, significance and the adjusted R^2 is documented for each variable for each model specification in a cross-section of all countries.

The results from the above models were used to perform an extreme bound analysis (EBA) to develop the upper and lower bounds estimates for each of the financial structure indicators. The lowest and highest coefficients identified amongst the various models that were estimated. To compute the lower bound, a value of twice the standard deviation was subtracted from the lowest coefficient. Similarly, to compute the upper bound, a value of twice the standard deviation was added to the highest coefficient. If the signs of the base regression and lower and upper bounds are the same, the relationship is classified as robust, otherwise fragile. In line with the traditional methodology of EBA, the findings are systematically evaluated for the robustness of the partial correlation between per capita growth rates and the financial indicators.

The study then also documents the correlation coefficient, standard errors, significance and the adjusted R^2 is documented for each variable for a 'base' model by the five World Bank Income Groups. The purpose was to observe the significance of each aspect of the financial system for countries of various national incomes.

E. EMPIRICAL RESULTS

If a financial indicator failed to be statistically significant in model (1) or have a coefficient smaller than 0.00, it was not considered for additional sensitivity analysis using models (2) and (3). Bank Credit / Bank Deposits proved to be such an indicator.

$$(1) \ g_i = \alpha + \beta_j * f_{ij} + \delta_1 * y1980_i + \delta_2 * lp1980_i + \varepsilon_{ij};$$

1. All Countries, 1980-2009

i. Robust Indicators

Bank Deposits, Bank Assets, Financial System Deposits, Life Insurance Premium, Liquid Liabilities, Private Credit by Banks, Private Credit by Bank and Other Financial Institutions and Stock Market Capitalization- all expressed as a fraction of GDP were found to be robustly correlated with economic growth.

Bank Concentration, Bank Assets as a ratio of the sum of Bank and Central Assets, Publicly Listed Companies per 10k of Population, Net Interest Margin, Offshore Deposits as a ratio Domestic Bank Deposits and Bank Return on Equity. The Bank Concentration Ratio, Net Interest Margin and Bank Return on Equity have a robust, negative and statistically significant relationship with economic growth whereas all other indicators had a robust, positive and statistically significant relationship.

The size of the negative co-efficient Net Interest Margin's is much larger, -0.262 % corresponds to a 1% change in the growth rate of real GDP/capita. The largest positive robust coefficients belong to the No. of listed companies per 10k of population and Life Insurance Premiums as a ratio of GDP at 0.752 and 0.149 respectively. It is worth mentioning that the correlation coefficient between Life Insurance Premiums and Non-Life Insurance Premiums is 0.592.

FIGURE 22
Growth Rates in Brazil, India, South Korea, Turkey and United Kingdom, 1980-2009

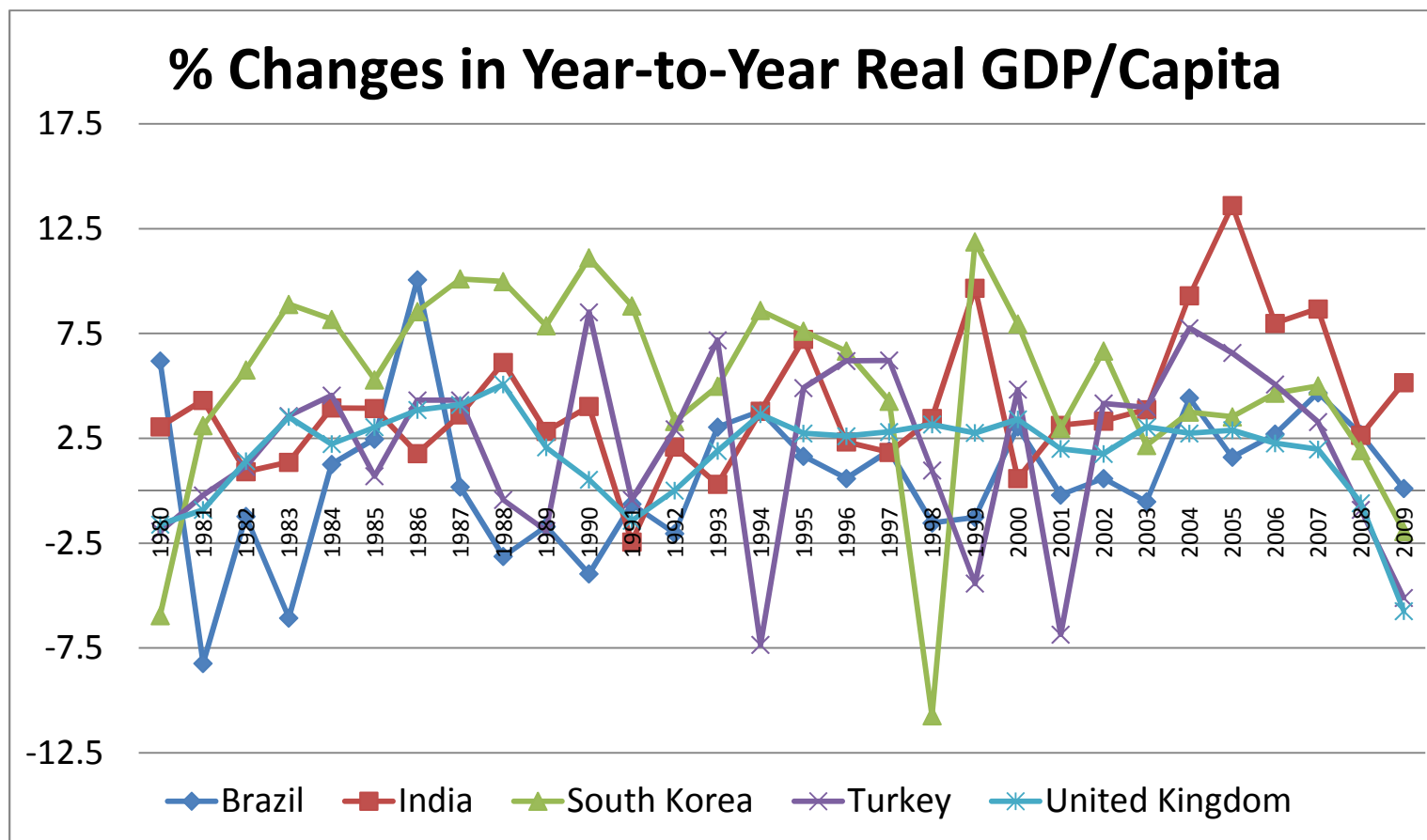
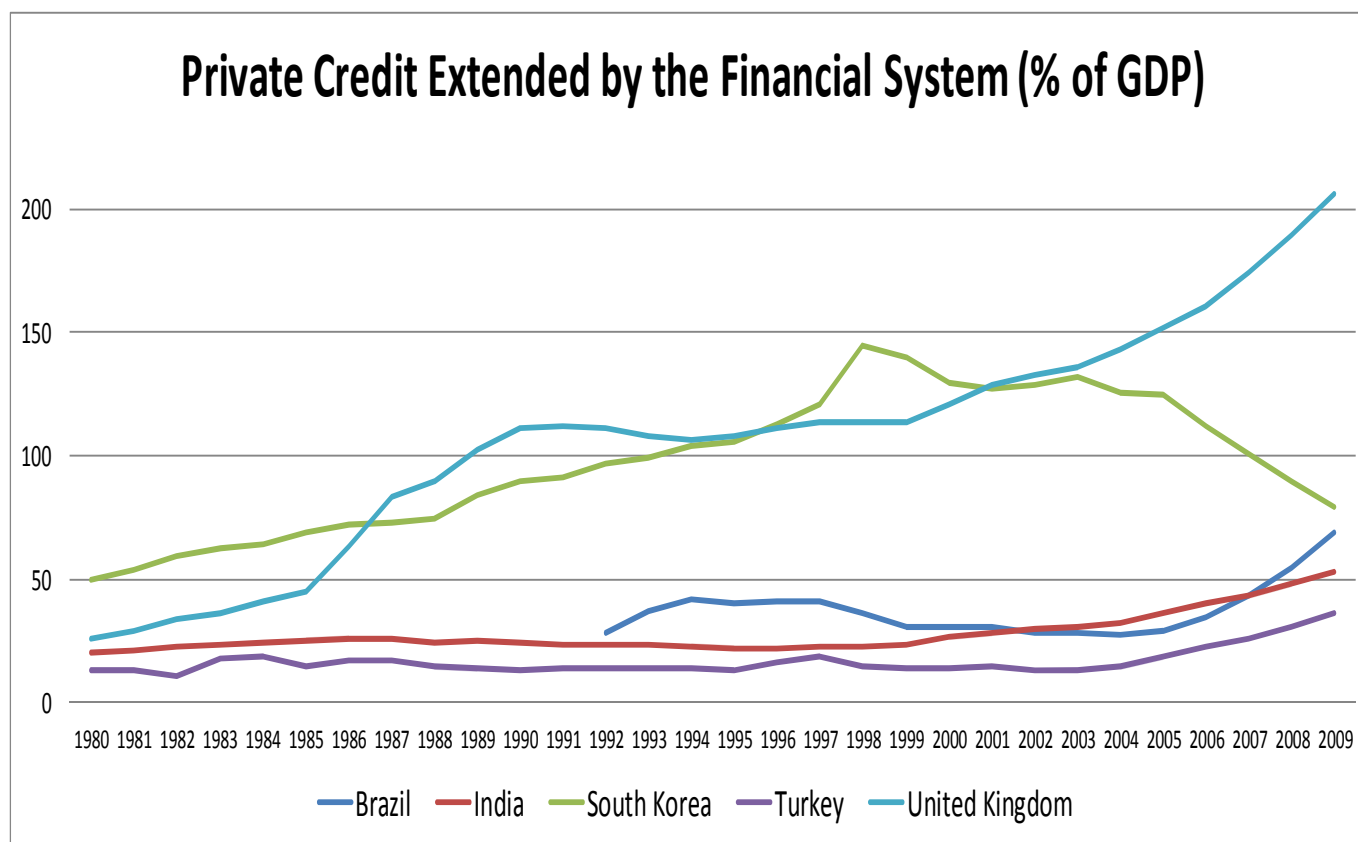


FIGURE 23
Private Credit as percentage of GDP in Brazil, India, South Korea, Turkey and United Kingdom, 1980-2009



The Offshore Deposits/Bank Deposits have a co-efficient of only “-0.0001459” corresponding to each 1% of growth rate; due to the small size of the co-efficient, it will be excused from the investigations using the other models. Bank Assets and Private Credit issued by banks tied with a 0.023 and 0.022. Financial Systems Deposits and Bank Deposits were close at 0.016. Liquid Liabilities and Stock Market Capitalization were robust, each with positive co-efficient of 0.014 and 0.008; both also statistically significant. The complete results are tabulated in the table below.

TABLE XX
EBA ROBUST INDICATORS FOR ALL COUNTRIES, 1980-2009

Financial Indicator	Lower Bound	Upper Bound
Bank Assets / (Bank + Central Bank) Assets	0.004	0.041
Private Credit by Deposit Money Banks / GDP	0.004	0.032
Private Credit by Banks and Other Financial Institutions / GDP	0.003	0.031
Deposit Money Bank Assets / GDP	0.002	0.027
Financial System Deposits / GDP	0.002	0.024
Bank Deposits / GDP	0.002	0.024
Bank Concentration	-0.036	-0.001
Net Interest Margin	-0.348	-0.108
Bank Overhead Costs / Total Assets	-0.438	-0.173

ii. **Fragile Indicators**

Bank Z-Score had a β of 0.018 with an upper bound of 0.050 and lower bound of -0.020 with a low t-statistic value over 97 observations. Similarly International Debt Issues, Inflows, Turnover, Other Financial Assets, Value Traded, Private Bond Market, Bank ROA, Loans from non-resident banks, Non-Life Insurance Premiums, Bank Credit/Bank Deposits, Public Bond Market, Central Bank Assets, Remittance, Cost-Income ratio and Overheads, all had statistical characteristics that did not satisfied additional evaluation criteria of a cross-country based extreme bounds analysis methodology.

Bank Overheads, Cost-Income Ratio and Turnover are three indicators that were statistically significant with β of -0.339, -0.019 and 0.008 respectively; however they were all deemed fragile. Bank Z-score discussed above is another indicator that had a rather β but had a low t-score of 0.95. International Debt, Inflow, Value Traded, Other Financial Institutions and Private Bond Market shared a similar fate in the regression analysis.

Similar analyses were performed on the second and third models and the results in the corresponding tables.

$$(1) \quad g_i = \alpha + \beta_j f_j + \delta_1 y_{1980_i} + \delta_2 lp_{1980_i} + \delta_3 gpop_i + \gamma_1 govt_i + \epsilon_{ijt};$$

$$(2) \quad g_i = \alpha + \beta_j f_j + \delta_1 y_{1980_i} + \delta_2 lp_{1980_i} + \delta_3 gpop_i + \gamma_1 govt_i + \gamma_2 openk_i + \gamma_3 irate_i + \epsilon_{ijt};$$

Twenty two out of our thirty one indicators had a fragile relationship with economic growth. They are not a good proxy for financial development when used in a cross-sectional analysis of countries of mixed income levels. Bank Z-scores, remittances, central bank assets, liquid liabilities, bond markets and the stock markets indicators. Several of these indicators have been used as proxies of financial development or in their own rights, a determinant of economic growth.

Bank Assets as a ratio of the sum of Bank and Central assets proved to be the strongest indicator of the financial structures. This can be considered along with the fragile indicators of liquid liabilities and central. Private Credit, either directly of the deposit banks or of the entire financial system, two other perennial favorite indicators of financial development had the second and third largest impact on economic growth among all indicators. This provides support for the evidence that the previous researchers have provided where financial development is correlated with economic growth.

Bank Assets, a financial indicator used first by King and Levine stood the robustness tests. At the upper end, its impact is 4 basis points for each 1% increase in the economic growth rate. Financial System and Bank Deposits are also strong financial indicators with respect to economic growth. However, these indicators are not seen in the literature as proxies of the financial structure or financial development.

TABLE XXI
EBA FRAGILE INDICATORS FOR ALL COUNTRIES, 1980-2009

Fragile Financial Structural Indicators of Economic Growth		
Financial Indicator	Lower Bound	Upper Bound
Bank Cost-Income Ratio	-0.040	0.008
Bank Credit / Bank Deposits	-0.011	0.009
Bank Return On Assets	-0.002	0.005
Bank Return On Equity	-0.035	0.001
Bank Z-Score	-0.044	0.055
Central Bank Assets / GDP	-0.045	0.015
Inflow (Remittance + Foreign Direct Investment) / GDP	-0.015	0.027
International debt issues/GDP	-0.005	0.031
Life Insurance Premium Volume / GDP	-0.045	0.275
Liquid Liabilities / GDP	0.000	0.021
Loans from non-resident banks (amt outstanding)/GDP	-0.001	0.000
Loans from non-resident banks (net)/GDP	-0.154	0.154
No. of listed companies per 10k population (barriers 2 entry)	-0.256	1.551
Non-Life Insurance Premium Volume / GDP	-0.453	0.350
Offshore Bank Deposits / Domestic Bank Deposits	0.000	0.000
Other Financial Institutions Assets / GDP	-0.024	0.033
Private Bond Market Capitalization / GDP	-0.012	0.018
Public Bond Market Capitalization / GDP	-0.025	0.008
Remittance Inflows / GDP	-0.052	0.008
Stock Market Capitalization / GDP	-0.003	0.017
Stock Market Total Value Traded / GDP	-0.005	0.014
Stock Market Turnover Ratio	-0.003	0.019

The Banking sector has the last three financial indicators, establishing soundly the importance of the sector and the role it plays in influencing economic growth. The concentration ratio, with its robust negative coefficient, emphasizes how the lack of a competitive landscape can influence the economy in an adverse fashion. Net interest margin, as defined as how much of the bank's revenue is generated by interest income, may provide an insight to the damage a bank may inflict on economic growth in their pursuit for extracting economic rent.

The last banking sector indicator, banking overhead costs, lays out a similar story where an increase in the banking overhead costs has a negative relationship with economic growth. This may be a precursor where as banks lose control of their overhead expenses, they may attempt to recoup some of their profits via the extraction of rents as stated earlier. In ways, an increase in bank overhead costs may lead to a push for higher income via interest charged and possibly at a higher risk. The tables below show the results from the individual models that lead to the lower and upper bounds of the individual indicators.

TABLE XXII
ALL COUNTRIES EBA LOWER AND UPPER BOUNDS, 1980-2009

Variable	Model (1)		Model (2)		Model (3)		EBA
bcbd	0.007	-0.011	0.006	-0.011	0.009	-0.008	Fragile
cbagdp	0.015	-0.042	0.010	-0.045	0.013	-0.040	Fragile
concentration	-0.002	-0.032	-0.001	-0.030	-0.008	-0.036	Fragile
costinc	0.000	-0.037	-0.005	-0.040	0.008	-0.029	Fragile
inflow	0.026	-0.005	0.027	-0.004	0.016	-0.015	Fragile
inslife	0.275	0.022	0.256	0.008	0.187	-0.045	Fragile
insnonlife	0.350	-0.354	0.305	-0.394	0.167	-0.453	Fragile
intldebt	0.031	-0.003	0.029	-0.003	0.023	-0.005	Fragile
intldebtnet	0.124	-0.137	0.154	-0.108	0.074	-0.154	Fragile
listco_pc	1.500	0.004	1.551	0.124	1.140	-0.256	Fragile
llgdp	0.021	0.006	0.020	0.005	0.016	0.000	Fragile
nrbloan	0.000	-0.001	0.000	-0.001	0.000	-0.001	Fragile
ofagdp	0.033	-0.017	0.026	-0.024	0.018	-0.021	Fragile
offdep	0.000	0.000	0.000	0.000	0.000	0.000	Fragile
prbond	0.018	-0.010	0.017	-0.012	0.012	-0.010	Fragile
pubond	0.008	-0.022	0.008	-0.025	-0.001	-0.024	Fragile
remit	0.008	-0.042	0.004	-0.045	-0.004	-0.052	Fragile
roa	0.005	-0.001	0.004	-0.001	0.004	-0.002	Fragile
roe	-0.003	-0.035	0.001	-0.031	0.000	-0.030	Fragile
stmktcap	0.016	0.001	0.017	0.002	0.011	-0.003	Fragile
stturnover	0.017	-0.001	0.015	-0.003	0.019	0.003	Fragile
stvaltraded	0.014	-0.004	0.013	-0.005	0.013	-0.003	Fragile
zscore	0.055	-0.020	0.047	-0.025	0.026	-0.044	Fragile
bdgdp	0.024	0.008	0.022	0.007	0.019	0.002	Robust
dbacba	0.039	0.007	0.041	0.009	0.035	0.004	Robust
dbagdp	0.027	0.009	0.024	0.006	0.020	0.002	Robust
fdgdp	0.024	0.008	0.023	0.007	0.019	0.002	Robust
netintmargin	-0.176	-0.348	-0.151	-0.325	-0.108	-0.287	Robust
overhead	-0.241	-0.438	-0.222	-0.415	-0.173	-0.381	Robust
pcrdbgdp	0.032	0.011	0.029	0.008	0.025	0.004	Robust
pcrdbofgdp	0.031	0.010	0.028	0.008	0.024	0.003	Robust

TABLE XXIII
ALL COUNTRIES EBA RESULTS FOR MODEL (1), 1980-2009

Description	Countries	Adj. R ²	β	Upper	Lower	Std. Err.	t	p > t	EBA	Other t > 2
Bank Credit / Bank Deposits	102	0.017	-0.002	0.007	-0.011	0.005	-0.470	0.636	Fragile	lp80
Bank Deposits / GDP	95	0.179	0.016	0.024	0.008	0.004	4.080	0.000	Robust	lp80, y80
Central Bank Assets / GDP	95	0.038	-0.013	0.015	-0.042	0.014	-0.930	0.356	Fragile	lp80
Bank Concentration	97	0.064	-0.017	-0.002	-0.032	0.007	-2.300	0.024	Robust	
Bank Cost-Income Ratio	97	0.053	-0.019	0.000	-0.037	0.009	-2.020	0.046	Fragile	lp80
Deposit Money Bank Assets / (Deposit Money + Central) Bank Assets	102	0.094	0.023	0.039	0.007	0.008	2.940	0.004	Robust	
Deposit Money Bank Assets / GDP	95	0.178	0.018	0.027	0.009	0.004	4.060	0.000	Robust	lp80, y80
Financial System Deposits / GDP	95	0.185	0.016	0.024	0.008	0.004	4.170	0.000	Robust	lp80, y80
(Remittance + Foreign Direct Investment) / GDP	103	0.035	0.011	0.026	-0.005	0.008	1.410	0.160	Fragile	
Life Insurance Premium Volume / GDP	68	0.041	0.149	0.275	0.022	0.063	2.350	0.022	Robust	
Non-Life Insurance Premium Volume / GDP	68	-0.042	-0.002	0.350	-0.354	0.176	-0.010	0.992	Fragile	
International debt issues/GDP	68	0.024	0.014	0.031	-0.003	0.009	1.640	0.106	Fragile	
Loans from non-resident banks (net)/GDP	61	-0.037	-0.007	0.124	-0.137	0.065	-0.100	0.920	Fragile	
No. of listed companies per 10k population	77	0.014	0.752	1.500	0.004	0.374	2.010	0.048	Robust	
Liquid Liabilities / GDP	93	0.148	0.014	0.021	0.006	0.004	3.570	0.001	Robust	lp80
Net Interest Margin	96	0.292	-0.262	-0.176	-0.348	0.043	-6.080	0.000	Robust	lp80, y80
Loans from non-resident banks (amt outstanding)/GDP	102	0.029	0.000	0.000	-0.001	0.000	-1.180	0.242	Fragile	
Other Financial Institutions Assets / GDP	34	-0.053	0.008	0.033	-0.017	0.013	0.610	0.545	Fragile	
Offshore Bank Deposits / Domestic Bank Deposits	101	0.048	0.000	0.000	0.000	0.000	-1.920	0.058	Robust	
Bank Overhead Costs / Total Assets	97	0.346	-0.339	-0.241	-0.438	0.049	-6.900	0.000	Fragile	lp80, y80
Private Credit by Deposit Money Banks / GDP	95	0.185	0.022	0.032	0.011	0.005	4.170	0.000	Robust	lp80, y80
Private Credit by Deposit Money Banks and Other Financial Institutions / GDP	95	0.180	0.020	0.031	0.010	0.005	4.080	0.000	Robust	lp80, y80
Private Bond Market Capitalization / GDP	35	0.098	0.004	0.018	-0.010	0.007	0.530	0.601	Fragile	y80
Public Bond Market Capitalization / GDP	38	0.085	-0.007	0.008	-0.022	0.008	-0.980	0.334	Fragile	
Remittance Inflows / GDP	96	0.028	-0.017	0.008	-0.042	0.013	-1.370	0.174	Fragile	
Bank Return On Assets	97	0.026	0.002	0.005	-0.001	0.002	1.190	0.235	Fragile	lp80
Bank Return On Equity	97	0.069	-0.019	-0.003	-0.035	0.008	-2.400	0.018	Robust	
Stock Market Capitalization / GDP	76	0.025	0.008	0.016	0.001	0.004	2.210	0.030	Robust	
Stock Market Turnover Ratio	75	0.007	0.008	0.017	-0.001	0.004	1.840	0.070	Fragile	
Stock Market Total Value Traded / GDP	75	-0.020	0.005	0.014	-0.004	0.004	1.190	0.237	Fragile	
Bank Z-Score	97	0.024	0.018	0.055	-0.020	0.019	0.950	0.345	Fragile	

TABLE XXIV
ALL COUNTRIES EBA RESULTS FOR MODEL (2), 1980-2009

Description	Countries	Adj. R ²	β	Std. Err.	t	p > t	Upper	Lower	EBA	Other t ≥ 2
Bank Credit / Bank Deposits	102	0.060	-0.002	0.004	-0.560	0.577	0.006	-0.011	Fragile	gpop (-)
Bank Deposits / GDP	95	0.234	0.015	0.004	3.780	0.000	0.022	0.007	Robust	gpop (-), y80 (-)
Central Bank Assets / GDP	95	0.127	-0.018	0.014	-1.280	0.205	0.010	-0.045	Fragile	gpop (-)
Bank Concentration	97	0.137	-0.015	0.007	-2.070	0.041	-0.001	-0.030	Robust	gpop (-)
Bank Cost-Income Ratio	97	0.158	-0.023	0.009	-2.580	0.012	-0.005	-0.040	Robust	gpop (-)
Deposit Money Bank Assets / (Deposit Money + Central) Bank Assets	102	0.146	0.025	0.008	3.160	0.002	0.041	0.009	Robust	gpop (-), y80 (-)
Deposit Money Bank Assets / GDP	95	0.209	0.015	0.005	3.320	0.001	0.024	0.006	Robust	gpop (-), y80 (-)
Financial System Deposits / GDP	95	0.243	0.015	0.004	3.930	0.000	0.023	0.007	Robust	gpop (-), y80 (-)
(Remittance + Foreign Direct Investment) / GDP	103	0.077	0.012	0.008	1.520	0.131	0.027	-0.004	Fragile	gpop (-)
Life Insurance Premium Volume / GDP	68	0.093	0.132	0.062	2.130	0.037	0.256	0.008	Robust	y80 (-)
Non-Life Insurance Premium Volume / GDP	68	0.028	-0.044	0.175	-0.250	0.800	0.305	-0.394	Fragile	gpop (-)
International debt issues/GDP	68	0.120	0.013	0.008	1.580	0.119	0.029	-0.003	Fragile	gpop (-), y80 (-)
Loans from non-resident banks (net)/GDP	61	0.006	0.023	0.065	0.350	0.727	0.154	-0.108	Fragile	gpop (-)
No. of listed companies per 10k population (barriers 2 entry)	77	0.110	0.838	0.357	2.350	0.022	1.551	0.124	Robust	gpop (-), y80 (-)
Liquid Liabilities / GDP	93	0.204	0.012	0.004	3.280	0.001	0.020	0.005	Robust	gpop (-), y80 (-)
Net Interest Margin	96	0.317	-0.238	0.044	-5.460	0.000	-0.151	-0.325	Robust	gpop (-), y80 (-)
Loans from non-resident banks (amt outstanding)/GDP	102	0.068	0.000	0.000	-1.110	0.271	0.000	-0.001	Fragile	gpop (-)
Other Financial Institutions Assets / GDP	34	0.032	0.001	0.013	0.070	0.941	0.026	-0.024	Fragile	gpop (-)
Offshore Bank Deposits / Domestic Bank Deposits	101	0.089	0.000	0.000	-1.970	0.052	0.000	0.000	Robust	gpop (-)
Bank Overhead Costs / Total Assets	97	0.389	-0.319	0.048	-6.600	0.000	-0.222	-0.415	Robust	gpop (-), y80 (-)
Private Credit by Deposit Money Banks / GDP	95	0.224	0.019	0.005	3.610	0.001	0.029	0.008	Robust	gpop (-), y80 (-)
Private Credit by Deposit Money Banks and Other Financial Institutions / GDP	95	0.223	0.018	0.005	3.580	0.001	0.028	0.008	Robust	gpop (-), y80 (-)
Private Bond Market Capitalization / GDP	35	0.066	0.002	0.007	0.310	0.759	0.017	-0.012	Fragile	
Public Bond Market Capitalization / GDP	38	0.049	-0.008	0.008	-1.030	0.312	0.008	-0.025	Fragile	
Remittance Inflows / GDP	96	0.073	-0.021	0.012	-1.660	0.101	0.004	-0.045	Fragile	gpop (-)
Bank Return On Assets	97	0.107	0.001	0.001	1.010	0.313	0.004	-0.001	Fragile	gpop (-)
Bank Return On Equity	97	0.131	-0.015	0.008	-1.880	0.063	0.001	-0.031	Fragile	gpop (-)
Stock Market Capitalization / GDP	76	0.114	0.009	0.004	2.520	0.014	0.017	0.002	Robust	gpop (-), y80 (-)
Stock Market Turnover Ratio	75	0.037	0.006	0.005	1.250	0.215	0.015	-0.003	Fragile	
Stock Market Total Value Traded / GDP	75	0.026	0.004	0.004	0.870	0.389	0.013	-0.005	Fragile	gpop (-)
Bank Z-Score	97	0.106	0.011	0.018	0.600	0.552	0.047	-0.025	Fragile	gpop (-)

TABLE XXV
ALL COUNTRIES EBA RESULTS FOR MODEL (3), 1980-2009

Description	Countries	Adj. R ²	β	Std. Err.	t	p > t	Upper	Lower	EBA	Other t > 2
Bank Credit / Bank Deposits	102	0.191	0.001	0.004	0.150	0.879	0.009	-0.008	Fragile	openk (+), gpop (-), y80 (-)
Bank Deposits / GDP	95	0.271	0.010	0.004	2.420	0.017	0.019	0.002	Robust	openk (+), gpop (-), y80 (-)
Central Bank Assets / GDP	95	0.231	-0.014	0.013	-1.040	0.301	0.013	-0.040	Fragile	openk (+), gpop (-), y80 (-)
Bank Concentration	97	0.297	-0.022	0.007	-3.230	0.002	-0.008	-0.036	Robust	openk (+), gpop (-), y80 (-)
Bank Cost-Income Ratio	97	0.226	-0.010	0.009	-1.130	0.262	0.008	-0.029	Fragile	openk (+), gpop (-), y80 (-)
Deposit Money Bank Assets / (Deposit Money + Central Bank Assets)	102	0.243	0.020	0.008	2.530	0.013	0.035	0.004	Robust	openk (+), gpop (-), y80 (-)
Deposit Money Bank Assets / GDP	95	0.274	0.011	0.005	2.510	0.014	0.020	0.002	Robust	openk (+), gpop (-), y80 (-)
Financial System Deposits / GDP	95	0.273	0.011	0.004	2.480	0.015	0.019	0.002	Robust	openk (+), gpop (-), y80 (-)
(Remittance + Foreign Direct Investment) / GDP	103	0.191	0.000	0.008	0.050	0.956	0.016	-0.015	Fragile	openk (+), gpop (-), y80 (-)
Life Insurance Premium Volume / GDP	68	0.265	0.071	0.058	1.230	0.223	0.187	-0.045	Fragile	openk (+), gpop (-), y80 (-)
Non-Life Insurance Premium Volume / GDP	68	0.257	-0.143	0.155	-0.920	0.360	0.167	-0.453	Fragile	openk (+), gpop (-), y80 (-)
International debt issues/GDP	68	0.349	0.009	0.007	1.250	0.215	0.023	-0.005	Fragile	openk (+), gpop (-), y80 (-)
Loans from non-resident banks (net)/GDP	61	0.282	-0.040	0.057	-0.700	0.487	0.074	-0.154	Fragile	openk (+), gpop (-), y80 (-)
Loans from non-resident banks (amt. of listed companies per 10k population (barriers to entry))	77	0.239	0.442	0.349	1.270	0.209	1.140	-0.256	Fragile	openk (+), gpop (-), y80 (-)
Liquid Liabilities / GDP	93	0.247	0.008	0.004	1.960	0.053	0.016	0.000	Robust	openk (+), gpop (-), y80 (-)
Net Interest Margin	96	0.358	-0.198	0.045	-4.420	0.000	-0.108	-0.287	Robust	openk (+), gpop (-), y80 (-)
Loans from non-resident banks (amt. of listed companies per 10k population (barriers to entry))	102	0.222	-0.001	0.000	-1.930	0.057	0.000	-0.001	Fragile	openk (+), gpop (-), y80 (-)
Other Financial Institutions Assets / GDP	34	0.415	-0.001	0.010	-0.120	0.904	0.018	-0.021	Fragile	openk (+), gpop (-)
Offshore Bank Deposits / Domestic Bank Deposits	101	0.237	0.000	0.000	-2.290	0.024	0.000	0.000	Robust	openk (+), gpop (-), y80 (-)
Bank Overhead Costs / Total Assets	97	0.405	-0.277	0.052	-5.340	0.000	-0.173	-0.381	Robust	openk (+), gpop (-), y80 (-)
Private Credit by Deposit Money Banks / GDP	95	0.284	0.014	0.005	2.750	0.007	0.025	0.004	Robust	openk (+), gpop (-), y80 (-)
Private Credit by Deposit Money Banks and Other Financial Institutions / GDP	95	0.281	0.013	0.005	2.680	0.009	0.024	0.003	Robust	openk (+), gpop (-), y80 (-)
Private Bond Market Capitalization / GDP	35	0.476	0.001	0.006	0.240	0.814	0.012	-0.010	Fragile	openk (+), y80 (-)
Public Bond Market Capitalization / GDP	38	0.524	-0.013	0.006	-2.170	0.038	-0.001	-0.024	Robust	openk (+), y80 (-)
Remittance Inflows / GDP	96	0.192	-0.028	0.012	-2.350	0.021	-0.004	-0.052	Robust	openk (+), gpop (-), y80 (-)
Bank Return On Assets	97	0.220	0.001	0.001	0.800	0.424	0.004	-0.002	Fragile	openk (+), gpop (-), y80 (-)
Bank Return On Equity	97	0.251	-0.015	0.007	-2.070	0.042	0.000	-0.030	Fragile	openk (+), gpop (-), y80 (-)
Stock Market Capitalization / GDP	76	0.234	0.004	0.004	1.090	0.280	0.011	-0.003	Fragile	openk (+), gpop (-), y80 (-)
Stock Market Turnover Ratio	75	0.287	0.011	0.004	2.680	0.009	0.019	0.003	Robust	openk (+), gpop (-), y80 (-)
Stock Market Total Value Traded / GDP	75	0.228	0.005	0.004	1.210	0.231	0.013	-0.003	Fragile	openk (+), gpop (-), y80 (-)
Bank Z-Score	97	0.218	-0.009	0.018	-0.510	0.611	0.026	-0.044	Fragile	openk (+), gpop (-), y80 (-)

3. **By Country Income Groups, 1960-2009**

Using the Barro growth regression, the cross-sectional data's correlation coefficients and the significance were estimated one at a time for six different models with varying degrees of restrictions and parameters; these models are prevalent in the Finance-Growth literature. Furthermore the results of those six models were compared with results obtained from the extreme bound sensitivity analysis and the evidence from the results of the base model when estimated for countries within specific income group.

The aggregate indicator CBAGDP (Central Bank Assets / GDP) entered negatively to growth in all the models. However it was significant only in the least restrictive model and only in the high income countries. Furthermore, in the sensitivity analysis (EBA), its relationship to growth was fragile. On the other hand, the aggregate indicator FDGDP (Financial System Deposits / GDP) entered positively and significantly in all the six models and was determined to have a robust relationship. Both these findings were expected and confirmed previous results but its performance was mixed in the non-high income countries; It had a positive correlation with the upper middle income and middle income countries and a negative in the lower middle and low income countries where it was weakly significant at the 10% level.

The third aggregate indicator LLGDP (Liquid Liabilities / GDP) was the ratio of M3 (or M2) to GDP. This liquidity measure had a fragile relationship in the EBA and it was positively significant only in the most restrictive model. In the non-significant result models, it entered negatively except the least restrictive model. It was also significantly positive for high income countries and positive but insignificant on low and lower middle income countries and positive but insignificant in the upper middle and middle income countries.

TABLE XXVI
ALL COUNTRIES REGRESSION RESULTS FOR MODELS (1) AND (2), 1960-2009

Sector	Variable (j)	Description	Proxy type	Model (1)					Model (2)				
				Obs.	Adj. R ²	Co-eff.	Std. Err.	p-values	Obs.	Adj. R ²	Co-eff.	Std. Err.	p-values
Aggregate	Size	Central Bank Assets / GDP	Size	134	0.017	-.026***	0.015	0.010	110	0.076	-.0178	0.014	0.202
Aggregate	Size	Financial System Deposits / GDP	Size	135	0.216	.0235***	0.004	0.000	110	0.237	.0239***	0.005	0.000
Aggregate	Liquidity	Liquid Liabilities / GDP	Size	133	-0.005	.0000149	0.001	0.987	108	0.054	-.00029	0.001	0.704
Aggregate	Openness	Remittance Inflows / GDP	Size & Openness	141	-0.007	.00268	0.006	0.628	110	0.093	-.024**	0.011	0.032
Banking	Efficiency	Bank Credit / Bank Deposits	Efficiency	149	-0.007	-.0018	0.004	0.633	117	0.086	-.0013	0.004	0.745
Banking	Size	Bank Deposits / GDP	Size	135	0.212	.0234***	0.004	0.000	110	0.232	.0236***	0.005	0.000
Banking	Efficiency	Bank Concentration	Efficiency	127	0.013	-.0126*	0.007	0.061	110	0.063	-.012*	0.007	0.070
Banking	Efficiency	Bank Cost-Income Ratio	Efficiency	127	0.052	-.0238***	0.008	0.004	110	0.111	-.024***	0.008	0.003
Banking	Size	Deposit Money Bank Assets / (Deposit Money + Central) Bank Assets	Size	147	0.135	.0364***	0.007	0.000	117	0.220	.0319***	0.007	0.000
Banking	Size	Deposit Money Bank Assets / GDP	Size	134	0.223	.0265***	0.004	0.000	117	0.220	.0319***	0.007	0.000
Banking	Efficiency	Net Interest Margin	Efficiency	126	0.210	-.2305***	0.039	0.000	109	0.222	-.1999***	0.040	0.000
Banking	Efficiency	Bank Overhead Costs / Total Assets	Efficiency	127	0.210	-.276***	0.046	0.000	110	0.232	-.2499***	0.048	0.000
Banking	Size	Private Credit by Deposit Money Banks / GDP	Size	135	0.204	.0297***	0.005	0.000	110	0.249	.0284***	0.006	0.000
Banking	Efficiency	Bank Return On Assets	Efficiency	127	-0.014	.0006	0.002	0.703	110	0.034	.0005	0.001	0.725
Banking	Efficiency	Bank Return On Equity	Efficiency	127	0.047	-.0224***	0.008	0.005	110	0.109	-.02197***	0.007	0.003
Banking	Stability	Bank Z-Score	Eff. & Liquidity	126	1.288	.0004***	0.000	0.002	109	0.077	.00036**	0.000	0.034
Debt Markets	Openness	International debt issues/GDP	Size & Openness	89	0.025	.0093	0.008	0.250	77	0.067	.0134	0.008	0.101
Debt Markets	Openness	Loans from non-resident banks (net)/GDP	Size & Openness	77	0.064	.0411	0.051	0.422	69	0.047	.031	0.062	0.616
Debt Markets	Openness	Loans from non-resident banks (amt outstanding)/GDP	Size & Openness	150	0.011	-.0003*	0.000	0.097	118	0.120	-.0006*	0.000	0.067
Debt Markets	Size	Private Bond Market Capitalization / GDP	Size	40	0.240	.01319*	0.007	0.076	38	0.214	.0124*	0.007	0.067
Debt Markets	Size	Public Bond Market Capitalization / GDP	Size	44	0.163	.00038	0.008	0.963	41	0.113	.00365	0.008	0.666
Equity Markets	Liquidity	No. of listed companies per 10k population (barriers 2 entry)	Liquidity	96	0.080	.0075***	0.003	0.006	87	0.069	.008**	0.004	0.030
Equity Markets	Size	Stock Market Capitalization / GDP	Size	92	0.113	.0098***	0.003	0.001	85	0.094	.0099***	0.004	0.009
Equity Markets	Liquidity	Stock Market Turnover Ratio	Liquidity	92	0.162	.0132***	0.003	0.000	84	0.185	.0128***	0.003	0.000
Equity Markets	Liquidity	Stock Market Total Value Traded / GDP	Liquidity	92	0.101	.0102***	0.003	0.002	84	0.107	.0096***	0.003	0.005
Intermediaries	Size	Private Credit by Deposit Money Banks and Other Financial Institutions / GDP	Size	135	0.190	.02657***	0.005	0.000	110	0.230	.0253***	0.005	0.000
Other Banklike	Size	Non-Life Insurance Premium Volume / GDP	Size	85	0.008	.088	0.165	0.595	78	0.043	.176	0.162	0.282
Other Banklike	Size	Other Financial Institutions Assets / GDP	Size	44	0.020	.0172	0.011	0.132	39	0.010	.0167	0.012	0.172
Other Banklike	Size	Offshore Bank Deposits / Domestic Bank Deposits	Size & Openness	145	0.033	-.0002**	0.000	0.014	116	0.145	-.0002***	0.000	0.007

TABLE XXVII
ALL COUNTRIES REGRESSION RESULTS FOR MODELS (3) AND (4), 1960-2009

Sector	Variable (j)	Description	Proxy type	Model (3)					Model (4)				
				Obs.	Adj. R ²	Co-eff.	Std. Err.	p-values	Obs.	Adj. R ²	Co-eff.	Std. Err.	p-values
Aggregate	cbagdp	Central Bank Assets / GDP	Size	110	0.300	-.0117	0.012	0.338	110	0.429	-.016	0.011	0.14
Aggregate	fdgdp	Financial System Deposits / GDP	Size	110	0.343	.0145***	0.005	0.006	110	0.437	.009	0.005	0.06
Aggregate	llgdp	Liquid Liabilities / GDP	Size	108	0.284	-.0007	0.001	0.293	108	0.402	-.001	0.001	0.35
Aggregate	remit	Remittance Inflows / GDP	Size &	110	0.314	-.0259**	0.011	0.020	110	0.424	-.024	0.010	0.02
Sector: Banking	bcbd	Bank Credit / Bank Deposits	Efficiency	117	0.304	-.0002	0.003	0.942	117	0.424	-.000	0.003	0.83
Sector: Banking	bdgdp	Bank Deposits / GDP	Size	110	0.344	.0145***	0.005	0.006	110	0.436	.009	0.005	0.07
Sector: Banking	concentration	Bank Concentration	Efficiency	110	0.274	-.014**	0.006	0.025	110	0.451	-.016	0.005	0.00
Sector: Banking	costinc	Bank Cost-Income Ratio	Efficiency	110	0.244	-.008	0.009	0.332	110	0.411	-.008	0.007	0.28
Sector: Banking	dbacba	Deposit Money Bank Assets / (Deposit Money + Central) Bank Assets	Size	117	0.348	.0196***	0.007	0.008	117	0.454	.016	0.007	0.02
Sector: Banking	dbagdp	Deposit Money Bank Assets / GDP	Size	110	0.363	.0164***	0.005	0.001	110	0.442	.010	0.005	0.04
Sector: Banking	netintmargin	Net Interest Margin	Efficiency	109	0.353	-.156***	0.038	0.000	109	0.480	-.127	0.034	0.00
Sector: Banking	overhead	Bank Overhead Costs / Total Assets	Efficiency	110	0.326	-.1768***	0.048	0.000	110	0.467	-.148	0.043	0.00
Sector: Banking	pcrdbgdp	Private Credit by Deposit Money Banks / GDP	Size	110	0.361	.0185***	0.006	0.001	110	0.442	.0117	0.005	0.03
Sector: Banking	roa	Bank Return On Assets	Efficiency	110	0.239	.0006	0.001	0.636	110	0.405	.000	0.001	0.83
Sector: Banking	roe	Bank Return On Equity	Efficiency	110	0.299	-.0197***	0.007	0.003	110	0.439	-.015	0.006	0.02
Sector: Banking	zscore	Bank Z-Score	Eff. & Liquidity	109	0.265	.0001	0.000	0.345	109	0.423	-.000	0.000	0.95
Sector: Debt Markets	intkdebt	International debt issues/GDP	Size &	77	0.231	.0143*	0.007	0.055	77	0.433	.004	0.007	0.59
Sector: Debt Markets	intkdebtnet	Loans from non-resident banks (net)/GDP	Size &	69	0.259	-.0267	0.059	0.653	69	0.459	-.035	0.051	0.49
Sector: Debt Markets	nrbloan	Loans from non-resident banks (amt outstanding)/GDP	Size & Openness	118	0.329	-.0007**	0.000	0.024	118	0.446	-.001	0.000	0.01
Sector: Debt Markets	prbond	Private Bond Market Capitalization / GDP	Size	38	0.611	.0044	0.005	0.369	38	0.631	.005	0.005	0.28
Sector: Debt Markets	pubond	Public Bond Market Capitalization / GDP	Size	41	0.578	-.0042	0.006	0.491	41	0.637	-.008	0.006	0.18
Sector: Equity Markets	listco_pc	No. of listed companies per 10k population (barriers 2 entry)	Liquidity	87	0.239	.0014	0.004	0.687	87	0.394	.002	0.003	0.56
Sector: Equity Markets	stmktcap	Stock Market Capitalization / GDP	Size	85	0.259	.0039	0.004	0.293	85	0.441	.0063	0.003	0.05
Sector: Equity Markets	stturnover	Stock Market Turnover Ratio	Liquidity	84	0.474	.015***	0.003	0.000	84	0.585	.0133	0.002	0.00
Sector: Equity Markets	stvaltraded	Stock Market Total Value Traded / GDP	Liquidity	84	0.341	.009***	0.003	0.002	84	0.502	.009	0.003	0.00
Sector: Intermediaries	pcrdbofgdp	Private Credit by Deposit Money Banks and Other Financial Institutions / GDP	Size	110	0.348	.0157***	0.005	0.004	110	0.439	.0102	0.005	0.05
Sector: Other Banklike	insnonlife	Non-Life Insurance Premium Volume / GDP	Size	78	0.244	.023	0.160	0.886	78	0.423	-.048	0.137	0.73
Sector: Other Banklike	ofagdp	Other Financial Institutions Assets / GDP	Size	39	0.292	.0119	0.011	0.284	39	0.423	.012	0.009	0.19
Sector: Other Banklike	offdep	Offshore Bank Deposits / Domestic Bank Deposits	Size &	116	0.348	-.00017***	0.000	0.008	116	0.462	-.000	0.000	0.01
Sector: Other Banklike	inslife	Life Insurance Premium Volume / GDP	Size	78	0.322	.140***	0.049	0.006	78	0.472	.111	0.043	0.01

TABLE XXVIII
ALL COUNTRIES REGRESSION RESULTS FOR MODELS (5) AND (6), 1960-2009

Sector	Variable (j)	Description	Proxy type	Model (5)					Model (6)				
				Obs.	Adj. R ²	Co-eff.	Std. Err.	p-values	Obs.	Adj. R ²	Co-eff.	Std. Err.	p-values
Aggregate	cbagdp	Central Bank Assets / GDP	Size	39	0.488	-0.31	0.030	0.321	37	0.426	-.0066	0.041	0.874
Aggregate	fdgdp	Financial System Deposits / GDP	Size	39	0.568	0.0128**	0.005	0.014	37	0.523	.0116**	0.006	0.045
Aggregate	llgdp	Liquid Liabilities / GDP	Size	39	0.481	-0.0003	0.000	0.439	37	0.531	.0117**	0.005	0.036
Aggregate	remit	Remittance Inflows / GDP	Size & Openness	38	0.182	-0.00668	0.057	0.908	36	0.114	-.0527	0.142	0.714
Sector: Banking	bcdb	Bank Credit / Bank Deposits	Efficiency	40	0.352	0.007	0.008	0.360	38	0.303	.0054	0.008	0.521
Sector: Banking	bdgdp	Bank Deposits / GDP	Size	39	0.577	0.013***	0.004	0.010	37	0.532	.0125**	0.006	0.035
Sector: Banking	concentration	Bank Concentration	Efficiency	40	0.420	-0.021**	0.009	0.040	38	0.343	-.0166	0.012	0.186
Sector: Banking	costinc	Bank Cost-Income Ratio	Efficiency	40	0.336	0.003	0.011	0.810	38	0.345	.0195	0.014	0.180
Sector: Banking	dbacba	Deposit Money Bank Assets / (Deposit Money + Central) Bank Assets	Size	40	0.462	0.044**	0.016	0.011	38	0.391	.04*	0.021	0.063
Sector: Banking	dbagdp	Deposit Money Bank Assets / GDP	Size	39	0.592	0.012***	0.004	0.005	37	0.549	.011**	0.005	0.022
Sector: Banking	netintmargin	Net Interest Margin	Efficiency	40	0.613	-0.1811***	0.038	0.000	38	0.589	-.181***	0.044	0.000
Sector: Banking	overhead	Bank Overhead Costs / Total Assets	Efficiency	40	0.564	-0.2869***	0.071	0.000	38	0.481	-.243***	0.084	0.008
Sector: Banking	pcrdbgdp	Private Credit by Deposit Money Banks / GDP	Size	39	0.599	0.0147***	0.005	0.004	37	0.562	.01399**	0.005	0.015
Sector: Banking	roa	Bank Return On Assets	Efficiency	40	0.336	0.0002	0.001	0.791	38	0.309	.0009	0.001	0.441
Sector: Banking	roe	Bank Return On Equity	Efficiency	40	0.552	-0.02457***	0.006	0.001	38	0.607	-.0266***	0.006	0.000
Sector: Banking	zscore	Bank Z-Score	Eff. & Liquidity	40	0.353	0.0002	0.000	0.353	38	0.293	.00008	0.000	0.777
Sector: Debt Markets	intldebt	International debt issues/GDP	Size & Openness	40	0.341	-0.007	0.013	0.577	38	0.329	-.0165	0.014	0.262
Sector: Debt Markets	intldebtnt	Loans from non-resident banks (net)/GDP	Size & Openness	40	0.335	-0.016	0.113	0.888	38	0.295	-.0798	0.197	0.689
Sector: Debt Markets	nrbloan	Loans from non-resident banks (amt outstanding)/GDP	Size & Openness	40	0.335	0.001	0.005	0.829	38	0.292	-.0012	0.006	0.829
Sector: Debt Markets	prbond	Private Bond Market Capitalization / GDP	Size	32	0.540	0.0012	0.007	0.860	31	0.597	-.0065	0.007	0.356
Sector: Debt Markets	pubond	Public Bond Market Capitalization / GDP	Size	34	0.578	-0.0069	0.006	0.264	33	0.610	-.005	0.006	0.417
Sector: Equity Markets	listco_pc	No. of listed companies per 10k population (barriers 2 entry)	Liquidity	40	0.407	0.017*	0.008	0.060	38	0.393	.022*	0.011	0.061
Sector: Equity Markets	stmkcap	Stock Market Capitalization / GDP	Size	40	0.360	0.004	0.004	0.277	38	0.308	.0038	0.005	0.448
Sector: Equity Markets	stturnover	Stock Market Turnover Ratio	Liquidity	40	0.484	0.01379***	0.005	0.005	38	0.497	.015***	0.005	0.005
Sector: Equity Markets	stvaltraded	Stock Market Total Value Traded / GDP	Liquidity	40	0.382	0.0064	0.004	0.133	38	0.338	.0058	0.005	0.209
Sector: Intermediaries	pcrdbofgdp	Private Credit by Deposit Money Banks and Other Financial Institutions / GDP	Size	39	0.553	0.01185**	0.005	0.025	37	0.514	.0117*	0.006	0.058
Sector: Other Banklike	insnonlife	Non-Life Insurance Premium Volume / GDP	Size	40	0.346	-0.154	0.205	0.457	38	0.360	-.368	0.232	0.128
Sector: Other Banklike	ofagdp	Other Financial Institutions Assets / GDP	Size	22	0.538	-0.008	0.014	0.553	20	0.854	-.02	0.017	0.282
Sector: Other Banklike	offdep	Offshore Bank Deposits / Domestic Bank Deposits	Size & Openness	40	0.492	-0.0186***	0.006	0.004	38	0.420	-.0187**	0.008	0.033

The final aggregate measure in this study is also a measure of openness of capital flows, particularly inflows and complements the literature on foreign direct investments. This measure REMIT (Remittances Inflow / GDP) was not significant in the least or most restrictive of the models but was significant and negative in the median models. However, this relation proved to be fragile in the sensitivity analysis and the measure was again not significant when the investigation was carried out by country income groups.

The banking sector is the most dominant sector in the financial intermediaries; the first indicator for this sector in the investigation was BCBD (Bank Credit / Bank Deposits). This was not significant in the 'all-countries' models; it appeared insignificantly and negatively in four of the models and insignificantly and positively in two of the models. Its relationship with economic growth proved to be fragile and ambiguous as it appeared positively in the high income and upper high income countries and negatively in the middle through low income countries.

The second banking sector indicator studied was BDGDP (Bank Deposits / GDP); this measure was significant in all save on median model (4). It was consistently positive in all the six all-countries models and was robust in the EBA. However, the model proved to be significant only for the high income countries when studied by income groups.

The third measure was CONCENTRATION (market share of the top 3 banking firms in the overall sector); the measure was significant in models (4) and (5) which are on the restrictive spectrums but in the by income group study was only negative and significant for high income countries. It remained negative in all income groups but the overall relationship proved to be deemed fragile.

The COSTINC (Costs / Income ratio) was significant at the 1% level in the least restrictive models it dropped to the 5% significance one level up restrictiveness and then became insignificant in all the more restrictive model. The relationship to growth was fragile and it was significant at the 5% level only in the high income countries.

For brevity sake, this point onwards, the only indicators that will be reviewed are the ones that displayed a minimum significance at the 5% level in at least three of the all-country models. The appendix for complete documentations of all the results by models, income groups and sensitivity types for a total of 13 unique findings for each indicator!

DBAGDP (Money Deposit Bank Assets / GDP) is a frequently used proxy of financial development along with Liquid Liabilities and Private Credit. An important point to highlight here is that this indicator has a correlation with LLGDP (above) of -0.36 and with PCRDBGDP (below) 0.98, for more details please see the Correlation Matrix of the Indicators of Financial Structure in the appendix. The results support the findings of previous studies; the indicator was significant in all the six all-countries models.

Furthermore, its relationship with real per capita income growth was robust. However, the income group analysis was positive and significant at the 5% level for high income countries and at the 10% level for low income countries. It was positive yet not significant for middle and lower middle income countries and negative but not significant for upper middle income countries. DBACBA (Deposit Money Bank Assets / Central Bank Assets) is a derived measure from the DBAGDP and CBAGDP which was significant and positive in all the models and robust in the EBA; it was strongly significant on only the high income countries.

NETINTMARGIN (Net Interest Margin) does not receive deserving much attention in the literature; it was significant and negative in all the models; it was robust and significant and negative in the high income countries. It produced mixed evidence in

the other income groups (see the appendix for more details). OVERHEAD (Bank Overhead Costs / Total Assets) is a related measure, the two measures shed some light on each other, their correlation is 0.826 and they both represent possible inefficiencies in the organizational structure. It was also significant and negative in all the models and robust in the EBA.

PCRDBGDP (Private Credit extended by Deposit Money Banks / GDP) is the workhorse measure of the financial development literature along with Bank Assets and Liquid Liabilities as mentioned earlier. It was, as expected, significant and positive and significant in the six all-countries model. An interesting comment on Private Credit; when the other intermediaries were included, the resulting indicator PCRDBOFGDP was positively significant in only the three least restrictive models. The underlying indicator of Private Credit extended lost significance in its role in the long run economic growth. This warrants a deeper investigation into other financial intermediaries. Both the indicators were robust in their respective extreme bound sensitivity analysis. Both indicators were again only positively significant in the high income countries.

ROE (Bank Return on Equity) of the Banking Sector proved to be a coincidental indicator of long run economic growth by being negative and significant in all the six models. The pursuit of gains in equity and capital gains is channeling a damping effect on economic growth; this could be due to excessive risk-taking and the adverse impact of asymmetric information between the banking sector and the main stream investors. This relationship remained robust in the EBA and was negative and significant in the upper middle income countries and not significant with mixed signs in the other income groups.

The other intermediaries in the financial system had less conclusive evidence. The OFFDEP (Offshore Bank Deposits / Domestic Bank Deposits) indicator was significant and negative in the six all-countries models but proved to have had a fragile

relationship in the EBA; it was also not significant in any of the income groups and appeared with mixed signs. This could be an argument for stability and other regulatory influences leading to capital flight.

INSLIFE (Life Insurance Premium Volume / GDP) was positive and significant in the first four least restrictive models and was negative but insignificant in two of the most restrictive models. Its relationship with long run economic growth in the sensitivity analysis resulted to be fragile. Furthermore in the income-group analysis, it was positive and significant only in the high income countries. This indicator is a logical coincidental indicator and may shed some light on the elasticity of the aggregate population's demand of life insurance as a function of income.

The equity sector in the study was represented by four possible indicators that may possibly be the channels that promote long run economic growth. STMKTCAP (Stock Market Capitalization / GDP) was robust in the two least restrictive models and one median model with positive coefficient. It was also positive and significant in the high income countries but failed the EBA test for robustness. This is consistent with previous studies. It is important to bear in mind that the market capitalization is a secondary market phenomenon and does not directly influences firms in initial funding; that is the function of the primary markets.

Liquidity of the market, however, does provide support to the firms insofar that it allows them to gauge the direction of their firm and an estimate of the probability of the firm to secure additional by the buyers marginal willingness to place for an equity share. STTURNOVER (Stock Market Turnover Ratio) was positive and significant in all the models and it was robust in the EBA. However, in the by income group analysis, it was insignificant and positive for the higher income countries and insignificant and negative in the lower income countries.

TABLE XXIX
ALL COUNTRIES EBA RESULTS, 1960-2009

Variable	Coefficient	Coeff.	Std. Err.	t statistic	p-values	Countries	Adj. R ²	Model	EBA	
bcbd	Lower Bound	-0.010	-0.002	0.004	0.450	0.633	149	-0.007	1	Fragile
	Base	0.000	0.000	0.003	0.000	0.830	117	0.424	4	
	Upper Bound	0.023	0.007	0.008	0.875	0.360	40	0.352	5	
bdgdp	Lower Bound	0.001	0.013	0.006	2.083	0.035	37	0.532	6	Robust
	Base	0.009	0.009	0.005	1.800	0.070	110	0.436	4	
	Upper Bound	0.034	0.024	0.005	4.720	0.000	110	0.232	2	
cbagdp	Lower Bound	-0.370	-0.310	0.030	10.333	0.321	39	0.488	5	Fragile
	Base	-0.016	-0.016	0.011	1.455	0.140	110	0.429	4	
	Upper Bound	0.075	-0.007	0.041	0.161	0.874	37	0.426	6	
concentration	Lower Bound	-0.039	-0.021	0.009	2.333	0.040	40	0.420	5	Fragile
	Base	-0.016	-0.016	0.005	3.200	0.000	110	0.451	4	
	Upper Bound	0.002	-0.012	0.007	1.714	0.070	110	0.063	2	
costinc	Lower Bound	-0.040	-0.024	0.008	3.000	0.003	110	0.111	2	Fragile
	Base	-0.008	-0.008	0.007	1.143	0.280	110	0.411	4	
	Upper Bound	0.048	0.020	0.014	1.393	0.180	38	0.345	6	
dbacba	Lower Bound	0.006	0.020	0.007	2.800	0.008	117	0.348	3	Robust
	Base	0.016	0.016	0.007	2.286	0.020	117	0.454	4	
	Upper Bound	0.076	0.044	0.016	2.750	0.011	40	0.462	5	
dbagdp	Lower Bound	0.001	0.011	0.005	2.200	0.022	37	0.549	6	Robust
	Base	0.010	0.010	0.005	2.000	0.040	110	0.442	4	
	Upper Bound	0.046	0.032	0.007	4.557	0.000	117	0.220	2	
fdgdp	Lower Bound	0.000	0.012	0.006	1.933	0.045	37	0.523	6	Robust
	Base	0.009	0.009	0.005	1.800	0.060	110	0.437	4	
	Upper Bound	0.034	0.024	0.005	4.780	0.000	110	0.237	2	
inslife	Lower Bound	-0.274	-0.070	0.102	0.686	0.498	38	0.304	6	Fragile
	Base	0.111	0.111	0.043	2.581	0.010	78	0.472	4	
	Upper Bound	0.300	0.192	0.054	3.546	0.001	85	0.135	1	
insnonlife	Lower Bound	-0.832	-0.368	0.232	1.586	0.128	38	0.360	6	Fragile
	Base	-0.048	-0.048	0.137	0.350	0.730	78	0.423	4	
	Upper Bound	0.500	0.176	0.162	1.086	0.282	78	0.043	2	
intldebt	Lower Bound	-0.045	-0.017	0.014	1.179	0.262	38	0.329	6	Fragile
	Base	0.004	0.004	0.007	0.571	0.590	77	0.433	4	
	Upper Bound	0.028	0.014	0.007	2.043	0.055	77	0.231	3	
intldebtnet	Lower Bound	-0.474	-0.080	0.197	0.405	0.689	38	0.295	6	Fragile
	Base	-0.035	-0.035	0.051	0.686	0.490	69	0.459	4	
	Upper Bound	0.143	0.041	0.051	0.806	0.422	77	0.064	1	
listco_pc	Lower Bound	-0.007	0.001	0.004	0.350	0.687	87	0.239	3	Fragile
	Base	0.002	0.002	0.003	0.667	0.560	87	0.394	4	
	Upper Bound	0.044	0.022	0.011	2.000	0.061	38	0.393	6	
llgdp	Lower Bound	-0.003	-0.001	0.001	0.700	0.293	108	0.284	3	Fragile
	Base	-0.001	-0.001	0.001	1.000	0.350	108	0.402	4	
	Upper Bound	0.022	0.012	0.005	2.340	0.036	37	0.531	6	

TABLE XXX

ALL COUNTRIES EBA RESULTS, 1960-2009 (continued)

Variable		Coefficient	Coeff.	Std. Err.	t statistic	p-values	Countries	Adj. R ²	Model	EBA
netintmargin	Lower Bound	-0.309	-0.231	0.039	5.910	0.000	126	0.210	1	Robust
	Base	-0.127	-0.127	0.034	3.735	0.000	109	0.480	4	
	Upper Bound	-0.080	-0.156	0.038	4.105	0.000	109	0.353	3	
nrbloan	Lower Bound	-0.013	-0.001	0.006	0.200	0.829	38	0.292	6	Fragile
	Base	-0.001	-0.001	0.000		0.010	118	0.446	4	
	Upper Bound	0.011	0.001	0.005	0.200	0.829	40	0.335	5	
ofagdp	Lower Bound	-0.054	-0.020	0.017	1.176	0.282	20	0.854	6	Fragile
	Base	0.012	0.012	0.009	1.333	0.190	39	0.423	4	
	Upper Bound	0.039	0.017	0.011	1.564	0.132	44	0.020	1	
offdep	Lower Bound	-0.035	-0.019	0.008	2.338	0.033	38	0.420	6	Fragile
	Base	0.000	0.000	0.000		0.010	116	0.462	4	
	Upper Bound	0.000	0.000	0.000		0.008	116	0.348	3	
overhead	Lower Bound	-0.429	-0.287	0.071	4.041	0.000	40	0.564	5	Robust
	Base	-0.148	-0.148	0.043	3.442	0.000	110	0.467	4	
	Upper Bound	-0.081	-0.177	0.048	3.683	0.000	110	0.326	3	
pcrdbgdp	Lower Bound	0.004	0.014	0.005	2.798	0.015	37	0.562	6	Robust
	Base	0.012	0.012	0.005	2.340	0.030	110	0.442	4	
	Upper Bound	0.040	0.030	0.005	5.940	0.000	135	0.204	1	
pcrdbofgdp	Lower Bound	0.000	0.012	0.006	1.950	0.058	37	0.514	6	Robust
	Base	0.010	0.010	0.005	2.040	0.050	110	0.439	4	
	Upper Bound	0.037	0.027	0.005	5.314	0.000	135	0.190	1	
prbond	Lower Bound	-0.021	-0.007	0.007	0.929	0.356	31	0.597	6	Fragile
	Base	0.005	0.005	0.005	1.000	0.280	38	0.631	4	
	Upper Bound	0.027	0.013	0.007	1.884	0.076	40	0.240	1	
pubond	Lower Bound	-0.019	-0.007	0.006	1.150	0.264	34	0.578	5	Fragile
	Base	-0.008	-0.008	0.006	1.333	0.180	41	0.637	4	
	Upper Bound	0.020	0.004	0.008	0.456	0.666	41	0.113	2	
remit	Lower Bound	-0.337	-0.053	0.142	0.371	0.714	36	0.114	6	Fragile
	Base	-0.024	-0.024	0.010	2.400	0.020	110	0.424	4	
	Upper Bound	0.015	0.003	0.006	0.447	0.628	141	-0.007	1	
roa	Lower Bound	-0.002	0.000	0.001	0.200	0.791	40	0.336	5	Fragile
	Base	0.000	0.000	0.001	0.000	0.830	110	0.405	4	
	Upper Bound	0.003	0.001	0.001	0.900	0.441	38	0.309	6	
roe	Lower Bound	-0.039	-0.027	0.006	4.433	0.000	38	0.607	6	Robust
	Base	-0.015	-0.015	0.006	2.500	0.020	110	0.439	4	
	Upper Bound	-0.006	-0.020	0.007	2.814	0.003	110	0.299	3	
stmktcap	Lower Bound	-0.006	0.004	0.005	0.760	0.448	38	0.308	6	Fragile
	Base	0.006	0.006	0.003	2.100	0.050	85	0.441	4	
	Upper Bound	0.018	0.010	0.004	2.475	0.009	85	0.094	2	
stturnover	Lower Bound	0.007	0.013	0.003	4.267	0.000	84	0.185	2	Robust
	Base	0.013	0.013	0.002	6.650	0.000	84	0.585	4	
	Upper Bound	0.025	0.015	0.005	3.000	0.005	38	0.497	6	
stvaltraded	Lower Bound	-0.004	0.006	0.005	1.160	0.209	38	0.338	6	Fragile
	Base	0.009	0.009	0.003	3.000	0.000	84	0.502	4	
	Upper Bound	0.016	0.010	0.003	3.400	0.002	92	0.101	1	
zscore	Lower Bound	0.000	0.000	0.000		0.777	38	0.293	6	Robust
	Base	0.000	0.000	0.000		0.950	109	0.423	4	
	Upper Bound	0.000	0.000	0.000		0.002	126	1.288	1	

TABLE XXXI
EBA RESULTS BY COUNTRY INCOME GROUPS FOR MODEL (3), 1960-2009

Sector	Variable _i	High Income	Upper Middle Income	Middle Income	Lower Middle Income	Low Income
		β^j	β^j	β^j	β^j	β^j
Aggregate	cbagdp	-.032**	-.012	-.028	-.0260	.025
Aggregate	fdgdp	.007**	-.024	-.002	.006	.052*
Aggregate	llgdp	.005**	-.024	-.001	.010	.029
Aggregate	remit	-.023	.006	.020	-.001	-.017
Banking	bcbd	.002	.006	-.001	-.005	-.001
Banking	bdgdp	.007***	-.023	-.001	.006	.054
Banking	concentration	-.010**	-.013	-.004	-.002	-.018
Banking	costinc	-.021**	.012	-.006	-.005	.003
Banking	dbacba	.032***	.017	.014	.0123	.003
Banking	dbagdp	.008**	-.016	.0025	.0105	.040*
Banking	netintmargin	-.209***	.023	.011	-.079	-.060
Banking	overhead	-.245***	.222	`	-.134	-.087
Banking	pcrdbgdp	.009**	-.013	.006	.0138	.043
Banking	roa	-.052	-.005	.000	-.000	-.094
Banking	roe	-.019	-.011	-.006	-.010	-.009
Banking	zscore	.000	-.0009***	-.000	.000	.001
Intermediaries	pcrdbofgdp	.01***	-.011	.001	.009	.040
Other Banklike	insnonlife	.156	-.299	-.221	-.672	N/A
Other Banklike	ofagdp	.006	-.029	-.013	.009	N/A
Other Banklike	offdep	-.003	.003	.001	.002	-.000
Other Banklike	inslife	.108***	-.070	-.009	.496	N/A
Debt Markets	intldebt	.006*	.009	.011	.016	-.036
Debt Markets	intldebtnet	.054	-.077	-.109	-.18	N/A
Debt Markets	nrbloan	.001	.005	.003	.0154	-.000
Debt Markets	prbond	-.000	.125	.058	N/A	N/A
Debt Markets	pubond	.002	-.127	-.019	-.163	N/A
Equity Markets	listco_pc	.004**	.005	.002	-.002	.476
Equity Markets	stmkcap	.006***	-.006	.000	.002	0.507
Equity Markets	stturnover	.004	.009	.007	-.005	-0.090
Equity Markets	stvaltraded	.003*	-.013	.003	-.005	-2.966

F. CONCLUSIONS

This paper investigates the empirical linkage between 30 financial structure indicators, as possible proxies of financial development, and economic growth in the classic cross-country framework. Averages were constructed for the periods 1980-2009 and 1960-2009 for 210 countries and regressions were performed on various models. Each indicator individually entered each regression, per the traditional cross-sectional methodology; this is also the reason for the difference in the number of observations for each regression as the data on the indicators is not available for some countries. As stated earlier savings and or investment rate⁹¹ were not one of the control variables as they may be highly theoretically correlated with the financial indicators but should be considered in future work. However, numerous human capital and country specific control variables were used that are most prevalent in the literature. The paper also utilizes the Levine and Renelt's method of sensitivity analysis using extreme bounds for robustness check and classified each indicator to have either a fragile or robust correlation coefficient with economic growth.

In a sample including 210 countries over the period of 1980-2009, nine indicators were robust- six of these robust indicators had positive coefficients while three of them had negative coefficients. The literature on financial development and economic growth has historically used the following six indicators, all expressed as a fraction of GDP, Deposit Bank Assets, Other Financial Assets, Central Bank Assets, Total Private Credit, Liquid Liabilities and Stock Market Value Traded as proxies for financial structures. Three of these prevalent six indicators- Other Financial Assets, Central Bank Assets and Stock Market Value Traded- failed the robustness check specified with the EBA. Liquid Liabilities was on the cusp corresponding to zero growth as a lower bound and a 0.02% increase in the 30 year real GDP per capita average growth rate for every 1%⁹² of change in the measure. A 1% change in Total Private Credit corresponded to a robust range of 0.003% and 0.03%. Bank Assets, similarly, corresponded to a robust range of 0.002% to 0.027%.

⁹¹ Savings Rate and Investments Rate as a ratio of GDP has often expressed as I/Y or S/Y in the cross-sectional literature. In this study the financial indicators were the variable of interest and were highly correlated with those particular control variables.

⁹² All results cited here have been adjusted where each correlation coefficient explains the annual average % change in the real GDP per capita growth rate over the model time period corresponding to a 1% average annual change in the variable of interest, *ceteris paribus*.

At the negative spectrum of robust and negative coefficients, the magnitude were alarmingly large with Net Interest Margin affecting as adverse as low as -0.348% and as high as -0.108%. Bank Overhead Costs corresponded to a robust negative range of -0.438% and -0.173%. In general, the magnitudes of the positive indicators were much smaller than the magnitude of the negatives indicators. This may suggest that the positive changes steadily contributed to economic growth in smaller increments. The larger negative changes may be explained by the banks not having good cost controls. The banks may be trying to recoup these higher overheads costs by extracting excessive rent from their borrowers. The higher borrowing costs would create distortions in the choices made by the bank's borrowers as the firms and consumers adjust their budget constraints. These distortions could cause the aggregate output to be adversely affected through multiple transmission mechanisms.

A Barriers-to-entry measure, No. of companies listed per 10k population, while fragile in robustness by the Levine and Renelt definition had a lower bound corresponding to a -0.256% change in the average real GDP per capita growth rate and an upper bound of 1.551%. That was by far the largest magnitude in this study which may suggest that a well-executed policy of removing barriers to entry for companies to go public may provide a 150% return on the initiative. The upper bound may be representing the best case scenario where not only just Barriers-to-entry but rather an overall policy environment that encourages investments and entrepreneurship raises the standard of living for all. In the most restrictive of these models, amongst the variables in the conditioning set, trade openness was consistently positive while the population growth rate and initial GDP were consistently negative in their statistical significance. Other positive robust indicators included Financial System and Bank Deposits while Bank Concentration was also a robust but negative indicator. These results are consistent with prior studies.

Expanding the period to 1960-2009 in all countries and repeating the above analysis, Bank Concentration was no longer had a robust correlation with economic growth. Return on Equity, a measure of return on equity investment, Stock Market Turnover, a liquidity ratio and Z-score, measure the stability in the banking sector were also determined to have robust coefficients; the former indicator having a negative coefficient while the latter two having positive coefficients. Magnitude, now measured as an average of 50 years, of the Z-score were near-zero in this sample. The magnitudes were fairly consistent

to the previous sample: Net Interest Margin had a lower bound of -0.309% and Overheads -0.429%. Bank Deposits, Financial System Deposits, Deposit Bank Assets and Total Private Credit corresponded to a change of 0.034%, 0.034%, 0.046% and 0.037% in the 50-year average real GDP per capita growth rate. The four indicators found in the literature, Other Financial Assets, Central Bank Assets, Liquid Liabilities and Stock Market Value Traded were again, like the previous sample, not found to have a robust correlation with the economic growth rates. The concentration of the banking system may have become relatively less relevant as the data sample expands from 1980-2009 to 1960-2009 due changes in the exchange rate regimes and the roles of central banks under the Bretton Woods System prior to the early 1970's.

To inspect how consistent the all country results were across countries in the various stages of development, a cross-sectional model was developed in which, like the prior analyses, each financial indicator entered at a time. This singular model contained several control variable and was evaluated over five sub-sets of the countries in our data-set. These analyses revealed that in the low income countries, Financial System Deposits and Bank Assets were statistically significant corresponding to a positive change in the average growth rate of 0.52% and 0.40% respectively over the period of 1960-2009.

In the lower middle income countries, none of the financial indicators proved to be statistically significant. However, Loans from Non-resident banks (foreign debt), Private Credit Extended by Banks and Bank Assets had large positive coefficients with reasonable precision corresponding to 0.015%, 0.014%, 0.012%. Financial indicators of Central Banks Assets and Overhead had large negative coefficients corresponding to -0.02% and -0.18% of the average growth rates. A plausible explanation may be the banks are more effective in this stage of development and central bank intervention or reliance on foreign lenders may impede the development of the domestic financial intermediaries and adversely impact the long run average growth rates.

The middle income countries exhibit Central Bank Assets and the introduction of the Private Bond markets to be statistically significant corresponding to a negative contribution from the Central Bank Assets of -0.028% and a positive contribution of 0.058% to changes in the average growth rates. Bank Assets as a ratio of Total Assets, Bank Return on Equity, Public Bond markets, Loans from Non-resident

banks, Stock Market Turnover (Liquidity) and Other Financial Assets had large coefficients with reasonable precision corresponding to 0.014%, -0.006%, -0.109%, -0.11%, 0.007% and -0.013% changes in growth rates suggesting that at this stage of development banks continue to play an important and develop. The positive changes by Liquidity also suggest that at this stage, it is crucial that there is confidence in the capital markets which may emanate from quick and easy equity market transactions.

In the upper middle income countries, the banking stability measure Z-score, was statistically significant, however with a near-zero coefficient. This may suggest that countries in this category have achieved banking sector stability and may develop other markets for access to finance. Financial System Deposits, Liquid Liabilities, Bank Deposits, Bank Assets and Other Financial Assets all had a sizeable coefficient with reasonable precision corresponding to a positive change of 0.024%, 0.024%, 0.023%, 0.016%, and 0.029% respectively. Bank Overheads, consistent to the previous results, had a coefficient corresponding to a -0.222% change in the long run growth rates.

In the high income countries, the Bank Overheads and Net Interest Margin had the largest statistically significant negative correlation coefficients corresponding the -0.245% and -0.209% change in the growth rates. Total Private Credit, Bank Assets, Bank Deposits, Financial System Deposits, Stock Market Capitalization, Liquid Liabilities, No. of Listed Companies and Stock Market Value Traded- all had corresponding positive changes in the range of 0.003% and 0.01% on the long run growth rates. Other Financial Assets, Public and Private Bond market capitalizations, Z-scores and various other financial indicators were neither statistically significant nor had large coefficients except for Non-life Insurance Premiums corresponding to a possibly 0.15% change on the growth rate averages.

There is not a single model that can perfectly represent the empirical linkage between financial development and economic growth as countries go through the various stages of economic development. It is best to reiterate that the income groups were determined at the end of the data period and not the beginning therefore it is a possibility that by choosing to emphasize on a particular aspect of the financial system, a country may be unknowingly self-selecting itself to be in an income group. As the high income and all country analyses have revealed, a country needs to develop several aspects of their financial system as multiple indicators have proven to have a statistically significant relationship with the long run average growth rates.

Despite the caveat, the study can still draw several important conclusions. The development of the banking sector is very important in the initial stages of economic development, once the banks have developed and stabilized, other markets within the financial system develop as the structure matures. Behavior within the banks as they seek to extract rent may hurt the long run growth as indicated by the negative coefficients of Bank Return on Equity and Net Interest Margins. Poor management at the banks leading to a higher Bank Overhead also impacts the economy negatively as cost control may become lax and be indicative of other poor practices at the institution. Excessive central bank intervention and policies that erect barriers for companies to go public hinder economic growth. Bank Assets, Bank Deposits, Financial System Deposits, Total Private Credit have consistently shown to have a positive correlation with economic growth.

The control variables representing the population growth rate and initial real GDP were consistently statistically significant and negative; initial income coefficient provides updated evidence on conditional convergence for the literature. Trade openness was consistently positive and statistically significant whereas the initial human capital measure was statistically significant only in the initial and less restrictive model; however that is not an endorsement of ignoring the measure in future studies. Government's share in per capita GDP and inflation rate were not found to be statistically significant.

VI. FINANCIAL INDICATORS AS RELIABLE PREDICTORS OF ECONOMIC GROWTH: A QUANTITATIVE ANALYSIS USING PARTIAL LEAST SQUARES

A. Introduction

The topic of economic growth in theory is accompanied by a laundry list of possible determinants that are considered to have exerted either a causal effect or simply have a statistically significant relationship with it. These determinants are a likely list of causal variables on which we have incomplete statistical distributional information at best. More often than not, these variables are not directly observed and forces one to rely on indicator variables that have some degree of association with the variable of interest; this was the message that Wold was trying to convey as he introduced his paper on the Theory and Application of Partial Least Squares (PLS).

In this paper we develop a path model with six blocks from the financial structural indicators (variables); we illustrate this model with an arrow and block schematic. We examine all country and all financial indicators, in the PLS framework, for the years 1980-2009. We then expand our analysis in three ways:

1. We extend our data range going as far back as 1960.
2. We compartmentalize our analyses, still within the time constraint of 1960-2009, by country income group.
3. We introduce other determinants of growth to the set of explanatory variables in addition to the indicators of financial structure.

We conclude that Private Credit, the most dominantly used proxy for financial indicator of structures is one of the indicators of the Financial Structure Database that is probably the best single indicator among the thirty possible indicators. However, the indicator captures a very small portion of the variation and is not consistent. Private Credit's parameters are estimated as a negative coefficient or near zero in all of the analyses. This is against the conventional estimates of private credit in cross-country and other empirical techniques when it is used as the sole proxy for the entire system. This also does not

support the theory of credit constraints enhancing development but supports if the easy credit is a result of crony capitalism.

Other indicators that must be considered all Bank Assets, Financial System Deposits, Liquid Liabilities, INSURANCE and DEBT composites and financial system deposits. Other important determinants of economic growth were growth rates in population, new capital, inflation rate, government and investment's share in real GDP per capita.

B. Theoretical Framework

This paper has used the Partial Least Squares technique to isolate the financial indicators that best explain the variation in the financial structures of a macro economy with respect to the economic growth rate. The thesis further investigates the empirical linkages in between the various indicators of financial structures and economic growth in a cross-sectional analytical framework.

Multiple linear regressions with several explanatory variables tend to result in over-fitting; where the model likely fits the data well but fails to predict new data reasonably. Similar to factoring and principal components analysis, PLS procedure works by extracting successive linear combinations of the predictors, called factors. These latent variables account for much of the variation in the data but within different parameters. Researchers⁹³ have expressed it best by calling PCA an unsupervised dimension reduction methodology whereas PLS being a supervised dimension reduction technology; exhaustive comparisons have also been performed of these two statistical techniques⁹⁴.

Partial Least Squares, a technique very popular in chemical engineering, tries to achieve a balance between capturing the variation in the raw predictive variables as well the relation between the predictive and target variables. Suppose that X, independent and highly correlated 'r' variables, matrix is an $n \times p$ matrix and the Y, dependent variable, matrix is an $n \times q$ matrix. The mathematical model is defined below:

$$\begin{aligned} X & [n \times p] \\ Y & [n \times q] \end{aligned}$$

$$\begin{aligned} X &= TP^T + E \\ Y &= UQ^T + F \end{aligned}$$

T $[n \times r]$ is a matrix of X-scores
U $[n \times r]$ is a matrix of Y-scores

P $[p \times r]$ is a matrix of X-loadings
Q $[q \times r]$ is a matrix of Y-loadings

E $[n \times p]$ is a matrix of X-residuals
F $[n \times q]$ is a matrix of Y-residuals

⁹³ Maitra and Yan (2008)

⁹⁴ Ibid

The PLS technique successively extracts factors from both the X and Y matrices such that covariance between the extracted factors and their scores is maximized.

Max Cov (T,U)

PLS also has the ability to perform the procedure for multiple independent variables. This paper only has one dependent variable, economic growth, but it can easily be expanded to incorporate additional dependent variables such a productivity growth or growth rate of new physical capital accumulation.

The method of analysis specifically used here is the Univariate Partial Least Squares method (PLS). Univariate because we only have one 'explained' or 'dependent' variable namely the growth rate in real GDP and a vector of X explanatory variables. These explanatory variables consist of the Financial Structure database indicators that explained the most variation from the Principal Components Analysis and the determinants of growth from Sala-I-Martin's analysis⁹⁵.

PLS technique extracts successive linear combinations of the predictors that are highly correlated. These linear combinations are considered factors or latent vectors of variables. The financial structure indicators along with the 'other' significant determinant of growth are the predictors of the model and the real per capita GDP growth rate is the dependent variable. The indicators are no longer entering the model individually in the traditional OLS models of the literature but are first being combined into indices where possible and then entering on the RHS of the model at the same time.

The response variable as defined in the PLS method terminology is the growth rate of real GDP per capita. The procedure seeks to optimize a balance between two objectives. The first objective is seeking to explain the variation of the response variable with linear combinations of the predictors. The second objective is to account for the variation in the predictors. It makes the assumption that when the predictors are highly correlated, the direction in the predictor space should provide good prediction of new observations provided a good sample size.

The PLS latent factor extracted is a vector of the different explanatory variables. The SIMPLS method is a variant of an iterative PLS Factor analysis and it computes the scores for each latent vector

⁹⁵ Sala-I-Martin (1997)

in terms of the original predictors, same as PLS, but satisfying different orthogonality conditions. Typically for a single response, the scores computed by both are similar where a score is defined as:

$$t_i = w_i^* X_i \quad \forall i;$$

C. Literature Review

The PLS methodology has never been employed to explore the link between financial development and economic growth. However, the introduction of this statistical technique was in a paper by Herman Wold which explored the various determinants of growth⁹⁶.

In his seminary paper, Wold⁹⁷ attempted to combine the Adelman's path model from the line of sociological literature used in the less knowledge intensive formulation of theory and partial least squares, a robust statistical procedure for drawing inference when one is ignorant about the relevant statistical distributions. Wold investigated 39 variables in 4 blocks or categories; his focus was however to introduce path modeling in a partial least square context when information is scarce about the variables and more importantly their interaction amongst themselves.

The Financial Development Report 2011 at the most recent World Economic Forum (WEF) had the following concluding remarks in its 'Structure of the Financial Development Index 2011' section:

"The importance of financial systems to economic growth has become even more pronounced in recent years; yet, there is still surprisingly little agreement about how to define and measure their development. To address this gap, the World Economic Forum has undertaken an ongoing initiative that aims to provide business leaders and policy-makers with a common framework for identifying and discussing the key factors in the development of global financial systems and markets⁹⁸."

The initiative in its current form refers to the Financial Development Report which for 2011 was a 427 page document. The report provides rank and scoring of the 60 top countries of the world. The report defines financial development as "financial development as the factors, policies, and institutions that lead to effective financial intermediation and markets, as well as deep and broad access to capital and

⁹⁶ Wold (1980)

⁹⁷ Adelman and Morriss (1973)

⁹⁸ <http://www.weforum.org/issues/financial-development/>

financial services". The above is precisely the primary goal of this paper that in addition to giving the policy-makers a quick and dirty way to observe the direction of progress of their own countries' financial structures.

The index developed to address this goal constructs seven pillars or main categories where each category contains several sub-categories; a brief summary is in the table below:

TABLE XXXII
PILLARS OF WORLD ECONOMIC FORUM'S FINANCIAL DEVELOPMENT INDEX

Pillars	Description
Institutional environment:	encompasses financial sector liberalization, corporate governance, legal and regulatory issues, and contract enforcement
Business environment:	considers human capital, taxes, infrastructure, and costs of doing business
Financial stability:	captures the risk of currency crises, systemic banking crises, and sovereign debt crises
Banking financial services:	measures size, efficiency, and financial disclosure
Non-banking financial services:	includes IPO and M&A activity, insurance, and securitization
Financial markets:	contains foreign exchange and derivative markets, and equity and bond market development
Financial access:	evaluates commercial and retail access

The WEF assigned each category a score. All categories and sub-categories have equal weights. The final score is the sum of all sub-scores and development is considered to be a positive change in the total score.

The primary method used in the compilation of this index is re-scaling the variables from 1 to 7. The higher the standardized value, the more developed that measure is considered. At the end of the standardization of all categories and sub-categories, the values are aggregated to estimate a unified measure from all pillars and the variables within.

The data of the scores comes partially from the same sources as the Financial Structures database and partially from various annual surveys such as the “Executive Opinion Survey” that represent the ‘level’ of ease of access to financing. It should be noted here that several of the academic advisors to this report are the same authors whose work has been referenced and cited in this thesis. They are intimately familiar with the subject and its intricacies.

A working paper presented⁹⁹ at the 8th International Conference on Islamic Economics and Finance in Dubai estimated a KOREAN index using principal components. The index appeared to be a sum of the principal components; the paper presents the descriptive statistics for the sum by countries limited to the countries in the Financial Development Report 2010. No other analyses were offered in this working paper and the author has not at the time of this writing responded to my questions pertaining to her methodologies.

Honohan¹⁰⁰ recommended have a financial development index which was a weighted sum of all aspects of a financial structure. The challenge remained on what aspects of financial structures to include and how to estimate those weights. He stated, “Each researcher had his or her own favorite explanatory variables, many of them mutually correlated, and each (if it advanced on its own) seeming to provide a considerable explanatory power. But the theories couldn’t all be alright.”

The recommendations were to measure structures x_i on which the financial system rests influenced by structural inputs z_i . The measured x_i along with other factors w_i will influence the output y_i . Examples of w_i ’s can be legal, regulatory or information aspects of the said country’s system. Examples of z_i ’s could be banking sector depth and stock market turnover; the output could be measured by GDP growth, stability

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¹⁰⁰ Honohan (2004)

of output, employment and poverty. Honohan stated that if such a function is linear than the x_i function can be independent of the non-financial factors w_i . He suggested a composite financial development indicator which could possibly be a weighted average of the various components. The PLS technique is most heavily used in Chemometrics. There are a few applications in asset returns in finance and even fewer in economics¹⁰¹. For that reason there is no other literature to review in this section. Maitra and Yan (2008) concluded that PLS a more efficient technique for dimension reduction due to the supervised nature of its algorithms.

¹⁰¹ Gelper and Croux (2010)

D. **Methodology**

1. **All Countries, 1980-2009**

A dataset was compiled which included the growth rates and the thirty one indicators of financial structures from the financial structure database. This dataset of over six thousand observations also included government's and investment's share in the real GDP per capita as well as sum of imports and exports as a fraction of GDO, inflation rate population growth rate and the growth rate of new capital. Furthermore, this sample set included all of the above variables, where available, for the years 1980-2009. This dataset is first standardized; the means are generated and inspected to verify the standardization.

A PLS model is then developed with the Y variable being the growth rate in real GDP per capita, year-to-year, and the dependent vector containing all of the thirty one indicators of financial structure from the indicators of financial structure database. This model looks like such:

$grgdp_l = f(\text{all indicators of the financial structure database});$

Analyzing the categorical break down of the financial system from Table 6, it can be seen that the model captures all aspects of a financial system. The model included an additional variable, the thirty first variable of the structure, by summing inbound remittances and foreign direct investments into a composite measure called inflows to reflect the funds that are flowing in to a domestic economy.

15 factors are then extracted out these observations; each factor will have a corresponding loading on the structural indicators. Coded regression coefficients are generated for all the fifteen factors as well parameters estimates for centered and scaled data and the conventional parameter estimates. These values are also used to generate the plots for the profile estimates, correlation loadings, predictor weight profiles, variable importance and the R-square analysis.

The paper also uses the PLS procedure to perform reduced rank regression also known as the (maximum) redundancy analysis. This technique extracts factors to explain as much response variation as possible. In our case of only one response variable it does not differ from multivariate linear regression.

There are two potential models that can be developed here to use PLS on:

1. All in all 38 total possibly predictors: 16 measures of financial structures and 22 determinants of growth from the literature are specified in the model. However, this would drastically reduce the number of observations in the empirical analysis as the majority of the significant results of the studies on determinants of growth are country characteristics such as rule of law and distance to the equator etc. and initial conditions from 1960 such as initial income per capita and primary (or secondary in some studies) schooling.
2. Developing a capital structure index and testing it along with other demand and supply variables that contributes to theoretical economic growth sacrificing a significant number of observations. In an attempt to develop a representation of the capital structure of an economy, I recall the original diagram of a financial system:

The other indicators that were qualitative in nature will be included as part of the explanatory vector as well:

TABLE XXXIII
THE QUALITATIVE INDICATORS FROM THE PCA

	Aggregate	Banking	Debt	Equity	Other
Qualitative		Stability		Liquidity	
		ROA			
		ROE			
		Intmargin		Barriers	
		Competition			

For the demand side indicators, the PLS will include share investments and government spending as a fraction of real GDP per capita as well total trade as a fraction of GDP in percentage. Observe all of the above (including the financial structure database indicators) have been expressed in percentage terms for intuitive interpretation.

For the supply side, we will include variables of human capital, namely either Percentage of Primary Schooling Attained in Population or Percentage of Secondary Schooling Attained in Pop.. These are measure once every 5 years so the inclusion of this aspect of the supply side will reduce the number of observations by 80%!

Other factors that are considered to for inclusion as supply side variables (and this is open for debate) would be growth rate on population and inflation rate as a percentage in either population or price levels will certainly erode the percentage change in Real GDP (with respect to the price levels) per capita (with respect to the population). These two variables do not affect the number of observations. Taxes were OECD countries as a percentage fraction of GDP were also obtained and incorporated in the control dataset. The model can be written as:

$$\text{Growthrate}_{i,t} = f(\text{Capital Structure}, \text{Capital Characteristics}, \text{Demand}, \text{Supply}) \quad \forall t[1960, 2009] \text{ and } i[1, 260]$$

Where the Growth rate is the % change in real GDP/capita for country 1 in year t. Capital Structure includes the Quantitative indicators (size measures) for the different aspect of a financial system. Several indicators have been collapsed here to make composites. Capital Characteristics includes the variables that capture the non-quantitative aspects of the financial system such as Stability and Liquidity. The Demand and Supply side variables are also previously discussed prior to the equation.

The PLS methodology will stay consistent with the themes employed in the EBA and the PCA by dividing the data into country income groups, standardizing the data and estimating factor and factor scores. The resulting factors will not be correlated and will accomplish the dual; purpose of the PLS technique of explaining the variance explained by the predictors given the response.

TABLE XXXIV
RESPONSE AND EXPLANATORY VARIABLES FROM THE PLS MODEL

Response Variable (%)	Explanatory Variables (%)			
Growth rate:Real GDP/Capita	Capital (Financial) Structure*	Structure Qualitative	Demand Side	Supply Side
	Aggregate:	Stability	Investments share: Real GDP/capita	Attained Primary Schooling
	Private Credit	ROA		Attained Secondary Schooling
	Inflows	ROE	Gov. Exp. share: Real GDP/capita	Population Growth Rate
	Central Bank:	Interest Margin	Totat Trade / GDP	Inflation Rate
	Liquid Liabilities (M3 orM2)	Competition		Taxes
	Assets (cba)	Barriers-to-entry		
	Intermediaries**:	Liquidity (Turnover)		
	Bank Assets (bank)			
	Other Assets (ofa)			
	Insurance Premiums			
	Capital Markets:			
	Debt			
	Equity			

* All Quantitative Capital Structure Variables are expressed as % of GDP

2. By Country Income Groups, 1960-2009¹⁰²

Taxes were dropped from the model due to insufficient observations. If they were kept in the model, all the observations would have been dropped drastically reducing the sample size. This highlights the simple fact that the low income or developing countries need to work on their macro revenue generation structures and implement policy that would promote revenue collection and develop capital debt markets. The model for the low income country income group is as such:

$grgdpl = f(lp, gp, gnewk, feds, banks, equity, debt, inflow, insurance, other, competition, liquidity, stability, barriers, intmargin, kg, ki, openk, credit, money, irate);$

Notice that most schools of macroeconomic determinants of growth are represented here along with financial structure indicators determined previously from the PCA chapter. The loading matrix, weights and parameter estimates are retained for further analysis in the empirical results section of this chapter. The individual schools of macroeconomics are represented here as specified below:

- a. Classical: lp (Human Capital), gp (Population growth rate) and gnewk (Capital formation per capita growth rate).
- b. Keynesian: kg (government expenditure), ki (investments), openk (trade openness) and credit (credit extended to the private non-financial real sector).
- c. Monetarist: money (M3 or M2 variable of money stock as a ratio of GDP) and irate (inflation rate).

The treatment of the Lower Middle Income countries is identical to the Low Income countries in this analysis. Taxes are dropped here as well from the model due to no observations. The rest of the methodology for this group is the same with naturally similar but different empirical findings.

For the Upper Middle and High Income Countries, the model slightly changed to incorporate taxes:

¹⁰² By default missing observations are dropped from the analysis. This data is complete standardized with means removed. The MISSING= option in the PROC PLS statement provides more sophisticated ways of modeling in the presence of missing values. With MISSING=AVG, the fit is computed by filling in missing values with the average of the non-missing values for the corresponding variable. With MISSING=EM, the procedure first computes the model with MISSING=AVG, then fills in missing values with their predicted values based on that model and computes the model again.

http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug_pls_sect016.htm

$grgdpl = f(lp, gpop, gnewk, taxes, feds, banks, equity, debt, inflow, insurance, other, competition, liquidity, stability, barriers, intmargin, kg, ki, openk, credit, money, irate);$

The loading matrix, weights and parameter estimates are retained for further analysis in the empirical results section of this chapter. The above process is repeated for High Income Country group. For the All Countries part of the analysis, the study also tried a model with and without imputing for the missing observations and uses the following model:

$grgdpl = f(gpop, taxes, gnewk, banks, equity, debt, inflow, insurance, other, kg, ki, openk, credit, money, irate);$

3. **Composites**

The study is now armed with the results of three investigative techniques: extreme bounds sensitivity, principal components and partial least squares analyses. This thesis thus moves forward, albeit somewhat cautiously, to bring it all together. As stated earlier, the representative indicators of the past cannot do justice if the question that one seeks the answer to asks for the macro financial development of an economy. The financial development, or the lack of it, represents all aspects of the financial structure.

The financial structures database was divided into aggregate, banking, equity and debt sectors along with an 'Other' category to represent the various aspects of macro financial structure. Each of these categories (data permitted) can be further divided into assets and liabilities.

There are also some spillover items in the data collection that cannot be ignored for example, IFS lines 22D.GZF and 22D.HZF (Claims on private sector) are counted in the calculations of both the Central Bank Assets indicator and the Private Credit by Deposit Money Bank indicator. Attention to detail at the line level was paid before making suggestions of the following indices:

1. Aggregate:

Liquid Liabilities and Financial System Deposits are highly correlated. This is expected from the theory and the money deposit expansion multiplies flows as such. The two are also liability side of the aggregate balance sheet items along with Total Private Credit extended. Generally throughout the various analysis Liquid Liabilities has dominated in magnitude for explaining much of the variation on the asset

side of the balance sheet. It is for those that in the measurement of the Financial Structure, this thesis will opt for Liquid Liabilities over Financial System Deposits and Private Credit as a ratio of GDP.

- a. The measures of Liquid Liabilities as a ratio of GDP (defined as money) and
- b. Private credit issued by the financial system as a ratio of GDP (defined as credit); we will exclude this variable from our structural measurements. However replacing Liquid Liabilities in a future empirical work may be of interest to students of credit particularly.
- c. Central Bank Assets as a ratio of GDP was also retained as an aggregate indicator (defined as Feds). These variable has not exhibited any correlation with the liabilities side of the aggregate balance sheet, it itself belongs to the asset side of the aggregate balance sheet. It will be included in the composite for structural measurement purposes.
- d. Remittance as a ratio of GDP (defined as remit) will also be retained as an aggregate measure; ideally it should be added with foreign direct investments (FDI) and / or with foreign portfolio investments (FPI). The study does execute the above in its latter stages. Another measure was developed labeled Inflows which calculated the sum of Remittance as a percentage of GDP and Foreign Direct Investments as a percentage of GDP. The data source of FDI was from the OECD tables. This measure will also allow us to include another determinant of growth not tested or found to be conclusive by Sala-I-Martin . This measure is expected to have a positive coefficient and play a significant role in especially low income countries.
- e. Assets measure was developed and equals the banking sector assets plus other financial assets as a ratio of GDP.
- f. Debt is an aggregate measure that is the sum of public and private bond markets as well the net value of funds borrowed from foreign entities expressed as a ratio of GDP.

2. Other:

Insurance was developed as the sum of both life and non-life insurance premiums as a ratio of GDP. Previous versions of the Financial Structures Database had the Assets of the Insurance companies which would have been additive element to the Asset measure providing there was no duplication of data between it and the Other Financial Asset measure.

3. Banking:

- a. "Intmargin"- Interest rate margin was retained because it expresses the revenue derived from the interest rate wedge that a bank inserts between the payout rate to the depositors and the lending rate to the borrowers as a fraction of the total revenue. This particular qualitative measure repeatedly occurs in the preceding analyses. This variable may be interpreted as an anti-competition variable whereas in perfect competition, the price of capital should equate its marginal cost, the higher this wedge is the more deviation the price will have from marginal cost. This variable tells another story, overhead was another variable that had been found along with return on equity to have a robust negative impact on "economic growth". Bank Credits as a ratio of Bank Assets explained some of the variation in the intermediaries in some income groups.
- b. Clearly the chase for profits by management impacts the intermediaries' behavior in some ways that may have economic implications. To logically account for banks behavior with respect to profit, this thesis after careful deliberation will scale the bank assets with the level of competition. Competition should capture the cost and profit functions of the firm.
- c. The variable concentration ratio was retained as expressing the market share as a percentage of the total for the top three banks in that country. The concentration will be transformed to a new variable called competition where:
- d. $\text{Competition} = (1/\text{concentration ratio}) * 100;$
- e. This will allow the competition to have a positive relationship with growth rather than the negative of the concentration ratio and will allow for other numerical transformation without biasing or making the interpretations ambiguous.
- f. ROA and ROE; return on assets and return on equity of the entire banking sector of that particular country.
- g. Stability was retained as the aggregate z-scores of the country's banking sector. Z-score in the cases where the EBA deemed it robust had coefficient magnitudes close to 0 up to three decimal places.

4. Stock Markets:

- a. Equity is the renamed Stock Market Capitalization as a ratio of GDP measure.

- b. Turnover is the measure which was Value of Traded Volume as a fraction of the Stock Market Capitalization times 'Equity'. This results in Traded Volume/GDP as the monotonic transformation of the product of the preceding two variables. The above (a) and (b) will give way to the computation of a new measure Liquidity which is defined as:

$$\text{Liquidity} = (\text{Stock Market Cap.}/\text{GDP}) * (\text{Traded Volume}/ \text{Stock Market Cap.});$$

This includes multiple indicators and can be further scaled with another qualitative measure representing barriers to entry that follows called "Barrier" was the measure defined as listed companies per 10,000 of the population. This may represent motivation of entrepreneurs or ease with which firms can access capital markets or may even represent the streamlining of private equity or investment banks that facilitate firms with growth prospects on the primary circuit.

TABLE XXXV
REDUCED DIMENSIONALITY OF THE FINANCIAL SYSTEM

	Aggregate	Banking	Debt	Equity	Other
Quantitative	Money (/GDP)		Debt/GDP	Stock Market Cap/GDP	Insurance Premiums/GDP (Insurance)
	Credit (/GDP)				
	Inflows				
	Assets (/GDP)				
	CBA (/GDP)				
Qualitative		Stability		Liquidity	
		ROA			
		ROE			
		Intmargin		Barriers	
		Competition			

To recap:

1. Aggregate includes: Liquid Liabilities, Central Bank Assets and Inflow.
2. Intermediaries includes: Bank Assets and Competition.
3. Debt includes: Private and public bond market capitalization and international loans.
4. Equity includes: Stock market capitalization, trade volume and a barriers to entry measure.
5. Others includes: Other Financial Assets and Insurance Premiums both as a ratio of GDP.

E. Empirical Results

1. All Countries, 1980-2009

From the analysis of 6,270¹⁰³ observations:

TABLE XXXVI
PLS VARIATIONS FOR ALL COUNTRIES, 1980-2009 WITH IMPUTATIONS

Extracted Factors	Number of Model Effects		Dependent Variables	
	Current	Total	Current	Total
1	5.612	5.612	1.013	1.013
2	18.221	23.833	0.120	1.133
3	9.348	33.180	0.140	1.273
4	3.328	36.508	0.095	1.368
5	3.541	40.049	0.032	1.400
6	2.758	42.807	0.028	1.428
7	2.986	45.793	0.028	1.455
8	3.612	49.405	0.016	1.471
9	2.625	52.030	0.009	1.480
10	2.692	54.722	0.003	1.483
11	2.463	57.184	0.001	1.484
12	3.886	61.070	0.000	1.484
13	2.545	63.615	0.000	1.485
14	1.595	65.210	0.001	1.485
15	2.127	67.337	0.000	1.486

¹⁰³ The missing assignments were imputed using SAS MISING =EM procedure where the procedure first computes the model with MISSING=AVG and then fills in missing values by their predicted values based on that model and computes the model again.

These results are not very encouraging; the maximum numbers of factors that PLC procedure extracts is restricted to 15. The 15 extracted factors explain only 67% of the variation in the 'dependent' variable and only about 1.5% of the variation explained within the financial structure indicators vector.

The same model without imputing for the missing values eliminate all but 70 observations in the dataset and produces the following result:

TABLE XXXVII
PLS VARIATIONS FOR ALL COUNTRIES, 1980-2009 WITHOUT IMPUTATIONS

Number of Extracted Factors	Model Effects		Dependent Variables	
	Current	Total	Current	Total
1	33.155	33.155	9.302	9.302
2	18.458	51.613	10.018	19.321
3	6.088	57.700	13.678	32.999
4	6.487	64.187	5.938	38.937
5	4.839	69.026	6.939	45.876
6	5.567	74.593	3.792	49.668
7	2.559	77.152	3.469	53.137
8	2.305	79.457	1.823	54.960
9	4.164	83.621	0.846	55.806
10	2.307	85.928	0.996	56.802
11	1.747	87.675	0.598	57.400
12	1.863	89.538	0.453	57.853
13	1.244	90.782	0.301	58.154
14	1.334	92.116	0.377	58.531
15	1.569	93.685	0.459	58.990

The model now explained approximately 94% of the variation in the dependent variables and 59% of the variation in the independent variable dataset. We will refer to the above two cases as imputed and non-imputed cases. Later in the paper, we explore the differences between the two in more thorough detail.

In the Imputed case, the resulting coefficients were a consistent mix of variables that were both positive and negative. Liquid Liabilities, Private Total Credit, Public Bond Markets and Stock Market Turnover had negative coefficients where Bank Assets and Financial System Deposits had the largest positive coefficients.

FIGURE 24
Profiles of Centered and Scaled Parameter Estimates, All Countries, 1980-2009

TABLE XXXVIII
 IMPUTED PLS ESTIMATES¹⁰⁴ FOR ALL COUNTRIES, 1980-2009 WITH IMPUTATIONS

Indicator	Estimates
PPCRDBOFGDP	-0.143
PPUBOND	-0.096
PPCRDBGDP	-0.091
PNETINTMARGIN	-0.049
PINTLDEBT	-0.048
PLLGDP	-0.048
PSTTURNOVER	-0.015
PCONCENTRATION	-0.014
PCBAGDP	-0.012
PSTMKTCAP	-0.010
PINSNONLIFE	-0.010
PCOSTINC	-0.005
PPRBOND	-0.001
PNRBLOAN	0.001
POVERHEAD	0.002
PROE	0.003
PROA	0.012
PREMIT	0.013
PSTVALTRADED	0.013
LISTCO_PC	0.020
ZSCORE	0.030
POFFDEP	0.031
PBDGDP	0.045
PINTLDEBTNET	0.046
PBCBD	0.048
PINSLIFE	0.059
PDBACBA	0.071
POFAGDP	0.071
PFDGDP	0.074
PDBAGDP	0.083

¹⁰⁴ Sample computations for the estimates can be found in the appendix.

Correlation Loading Plot

The plot displays SIMPLS Factor 1 (X Rsq = 5.6%, Y Rsq = 1.0%) on the x-axis and SIMPLS Factor 2 (X Rsq = 18.2%, Y Rsq = 0.1%) on the y-axis. Concentric dashed circles represent correlation levels at 25%, 50%, 75%, and 100%.

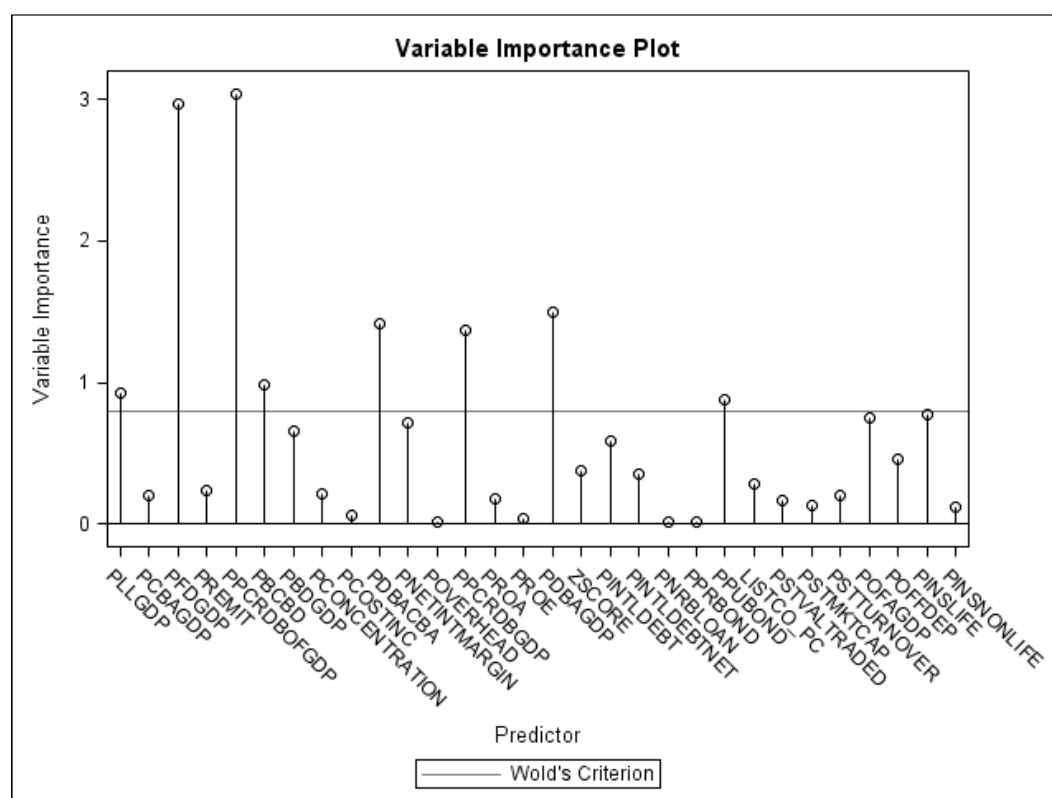
Key variables plotted include:

- PDBSEMIT (blue label)
- PDBNET (red label)
- PUBCAL (blue label)
- PINSKIDURE (blue label)
- PSTMIKTAP (blue label)
- PDBALBA (blue label)
- PUNGP (blue label)
- PBNGP (blue label)
- PBCBAGGP (blue label)
- PDBAGGP (blue label)

A green shaded area highlights a cluster of points near the center of the plot.

Last, the Variable Importance Plot (VIP) suggested by Wold¹⁰⁵ illustrates Liquid Liabilities, Financial Deposits, Total Private Credit, Bank Credit, Bank Assets and Public Bond Markets to meet the threshold of 0.8 where Other Financial Assets and life Insurance.

FIGURE 27
Variable Importance Plot of All Indicators, All Countries, 1980-2009



¹⁰⁵ Wold (1980)

Interesting observation here is despite these important variables do not explain much variation in the data set, they so to a certain degree explain variations in growth and amongst the indicators in the dataset explain it best. Considering both the magnitude of coefficients and the Variable Importance Plot for each of the indicators, Private Credit issued by banks and the system as a whole, Public Bond Market, Liquid Liabilities, Life Insurance Premiums, Bank Assets, Other Financial Assets and Financial System Deposits appear to be the predictors that cannot and should not be eliminated from any analysis; the former three predictors had a negative coefficient whereas the latter ones are positive.

2. By Country Income Groups, 1960-2009

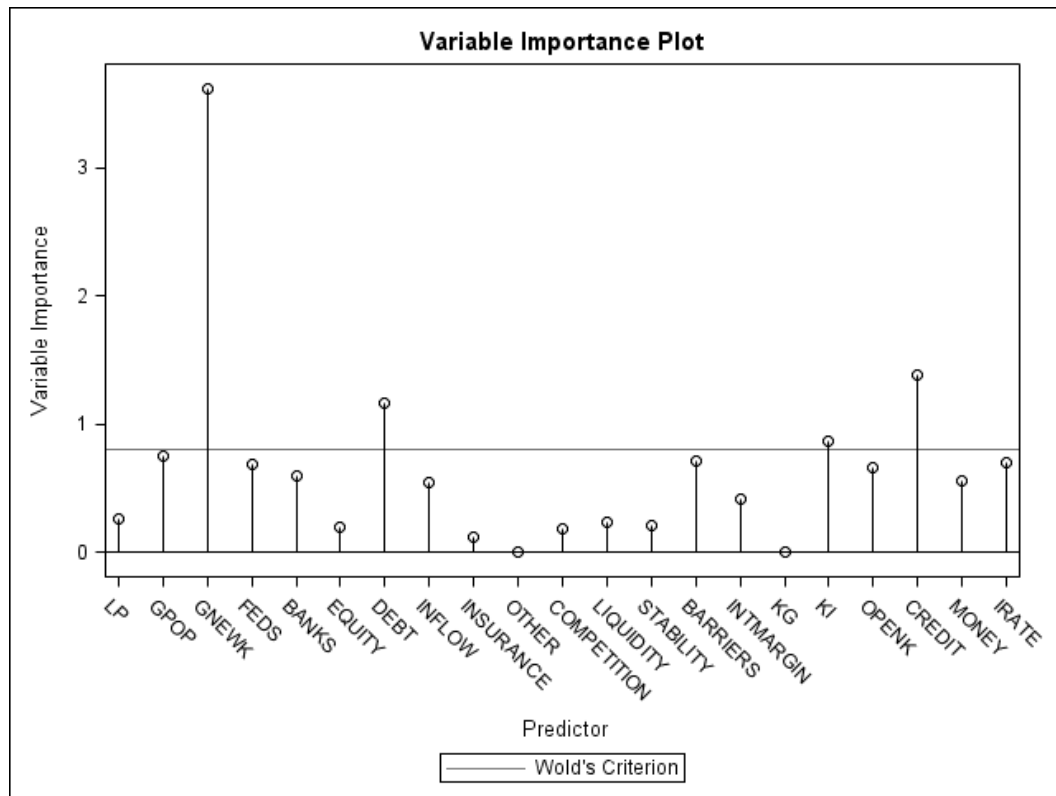
i. Low Income Countries

Growth rate of new capital accumulation, population growth rate, index Debt, investment's share in real GDP per capita and private credit as being the most dominant variables. The largest negative coefficient being barriers to entry to be listed on the public stock exchanges and the largest positive coefficient being the new capital accumulation rate and the runner up being the ability to access the debt markets.

TABLE XXXIX
PARAMETER ESTIMATES FOR LOW INCOME COUNTRIES, 1960-2009

Predictors	Estimates
LP	0.013
GPOP	-0.059
GNEWK	0.276
FEDS	-0.048
BANKS	0.014
EQUITY	-0.014
DEBT	0.089
INFLOW	0.040
INSURANCE	0.011
OTHER	0.000
COMPETITION	-0.013
LIQUIDITY	0.021
STABILITY	0.019
BARRIERS	-0.055
INTMARGIN	-0.033
KG	0.002
KI	0.069
OPENK	-0.051
CREDIT	-0.067
MONEY	0.035
IRATE	-0.050

FIGURE 28
Variable Importance Plot, Low Income Countries, 1960-2009



ii. Lower Middle Income Countries

The analysis of 2,650 observations reveals that the population and new capital accumulation growth rates are the dominant variables. For large positive coefficients of the analysis, Bank Assets and investment's share in real GDP per capita were very important as well. On the negative spectrum, population growth rate, government's share in real GDP per capita, total private credit extended and money supply or liquid liabilities had the largest negative coefficients.

TABLE XL
PLS VARIATIONS FOR LOWER MIDDLE INCOME COUNTRIES, 1960-2009 WITH IMPUTATIONS

Number of Extracted Factors	Model Effects		Dependent Variables	
	Current	Total	Current	Total

1	4.934	4.934	8.334	8.334
2	11.235	16.170	0.188	8.522
3	9.977	26.146	0.067	8.588
4	5.891	32.037	0.014	8.602
5	5.198	37.235	0.009	8.612
6	2.649	39.884	0.019	8.630
7	3.900	43.784	0.010	8.640
8	3.239	47.023	0.007	8.647
9	3.194	50.218	0.004	8.651
10	4.598	54.815	0.000	8.651
11	4.396	59.211	0.000	8.651
12	3.762	62.973	0.000	8.651
13	4.074	67.047	0.000	8.651
14	4.129	71.175	0.000	8.651
15	3.933	75.108	0.000	8.651

TABLE XLI
PLS IMPUTED ESTIMATES FOR LOWER MIDDLE INCOME COUNTRIES, 1960-2009

VARIABLES	COEF.
LP	-0.016
GPOP	-0.222
GNEWK	0.114
FEDS	-0.006
BANKS	0.065
EQUITY	0.004
DEBT	-0.023
INFLOW	0.012
INSURANCE	0.009
OTHER	-0.007
COMPETITION	-0.014
LIQUIDITY	0.012
STABILITY	0.021
BARRIERS	0.019
INTMARGIN	-0.031
KG	-0.072
KI	0.086
OPENK	-0.010
CREDIT	-0.116
MONEY	-0.017
IRATE	-0.109

FIGURE 29
Predictor Weight Profiles, Lower Middle Income Countries, 1960-2009

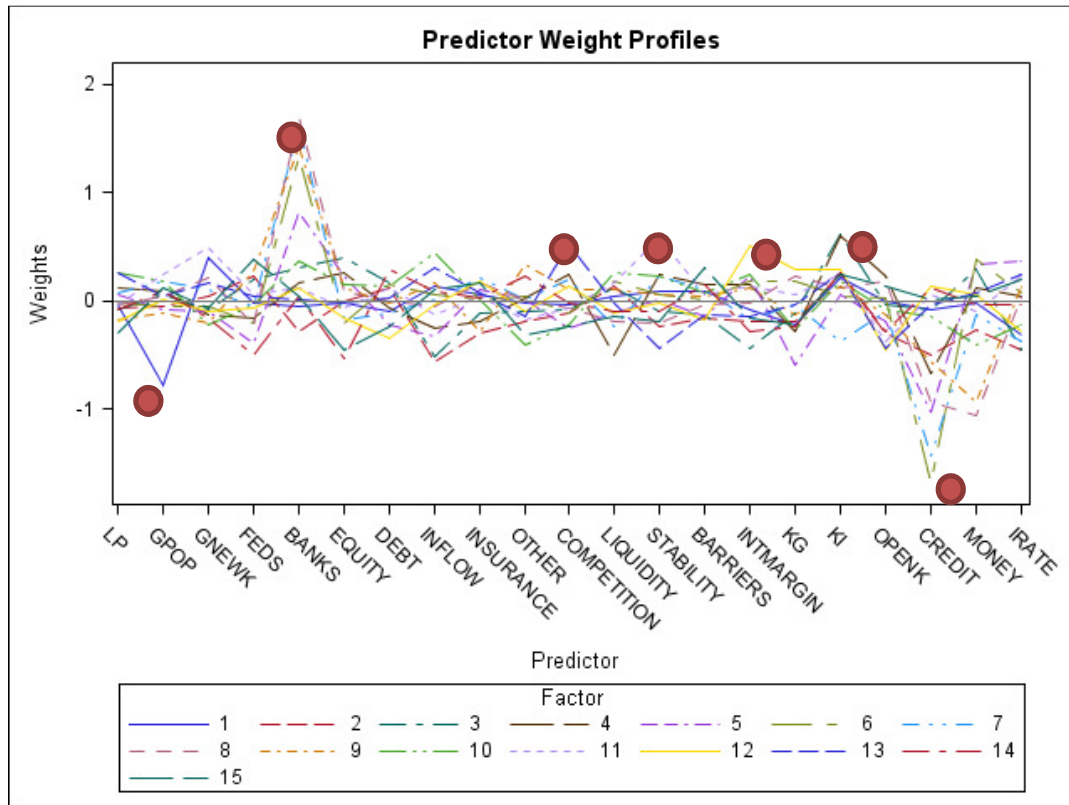


FIGURE 30

Predictor Profiles of Estimates, Lower Middle Income Countries, 1960-2009

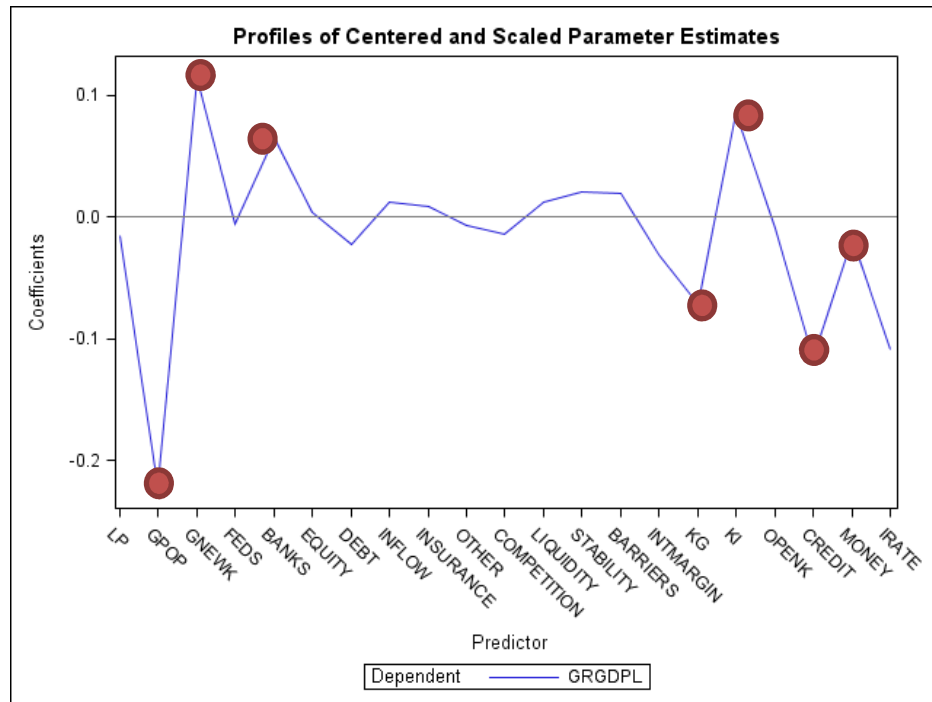
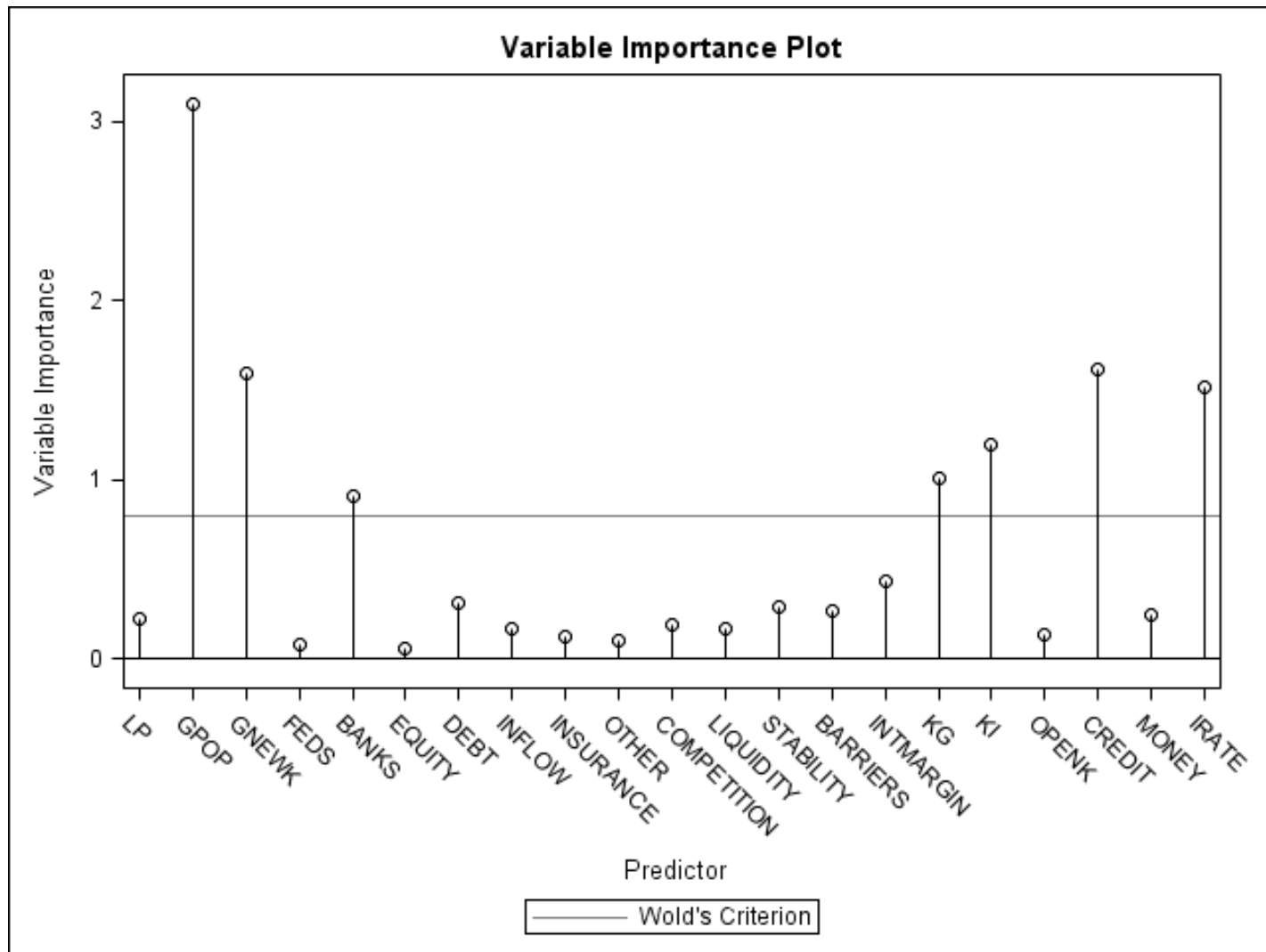


FIGURE 31
Very Important Predictor profile using RRR Methodology, Lower Middle Income Countries, 1960-2009



iii. Upper Middle Income Countries

The analysis of 2,400 observations reveal the population, new capital accumulation growth and inflation rates along with 'Other' to be the dominant variables. In this income group, government's share in real GDP per capita is important as well but it is estimated with a negative coefficient.

TABLE XLII
PLS VARIATIONS FOR UPPER MIDDLE INCOME COUNTRIES, 1960-2009 WITH IMPUTATIONS

Extracted	Model Effects		Dependent Variables	
Factors	Current	Total	Current	Total

1	5.561	5.561	25.556	25.556
2	7.487	13.047	1.362	26.918
3	12.743	25.791	0.175	27.092
4	5.848	31.639	0.067	27.159
5	5.055	36.693	0.020	27.179
6	3.505	40.198	0.008	27.187
7	3.725	43.923	0.004	27.191
8	4.070	47.993	0.002	27.193
9	3.181	51.173	0.001	27.194
10	2.049	53.222	0.001	27.195
11	3.501	56.723	0.000	27.196
12	3.281	60.005	0.000	27.196
13	3.442	63.447	0.000	27.196
14	4.038	67.485	0.000	27.196
15	4.145	71.630	0.000	27.196

FIGURE 32
Optimum Number of Factors for R^2 Analysis for Upper Middle Income Countries, 1960-2009

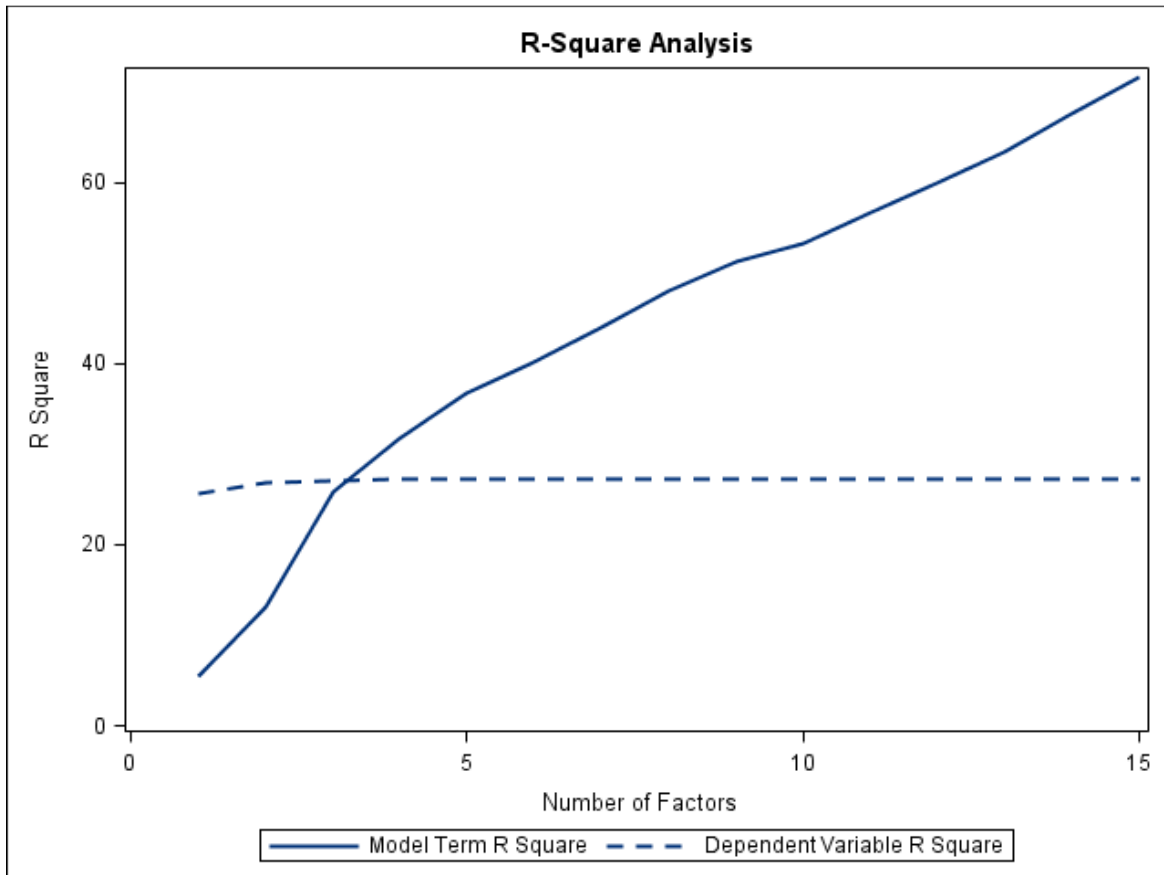
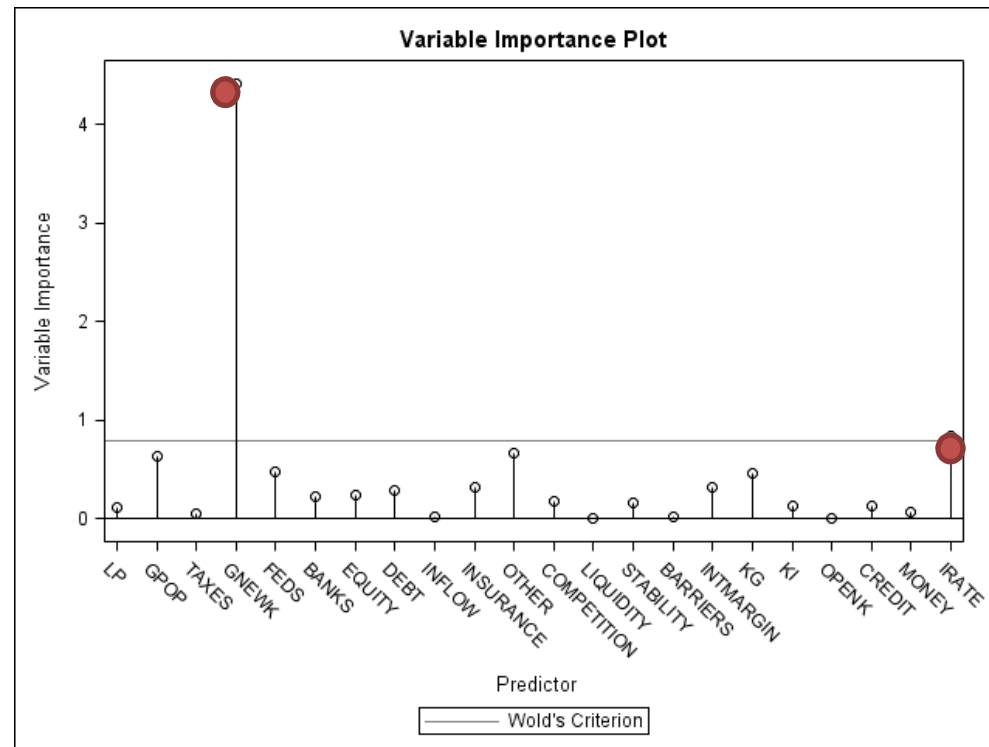


TABLE XLIII
PLS IMPUTED ESTIMATES FOR UPPER MIDDLE INCOME COUNTRIES, 1960-2009

Predictor	Estimates
Intercept	0.000
LP	0.014
GPOP	-0.070
TAXES	0.006
GNEWK	0.495
FEDS	-0.053
BANKS	-0.025
EQUITY	0.026
DEBT	-0.032
INFLOW	0.003
INSURANCE	0.035
OTHER	-0.075
COMPETITION	0.020
LIQUIDITY	-0.001
STABILITY	0.019
BARRIERS	0.002
INTMARGIN	-0.036
KG	-0.052
KI	0.015
OPENK	-0.001
CREDIT	0.014
MONEY	-0.007
IRATE	-0.095

FIGURE 33
Very Important Predictor profile using RRR Methodology, Upper Middle Income Countries, 1960-2009



iv. High Income Countries

The analysis of 3,350 observations reveal the new capital accumulation growth rate, private credit and investment's share in real GDP per capita were the dominant indicators in the analysis of the high income countries. The interesting result here was Inflow which had been introduced as the sum of Foreign Direct Investments and Remittances. It is suspected that the Foreign Direct Investments here are probably larger in magnitude relative to remittances and is probably a result of capital flight into the high income or developed countries. Money supply or liquid liabilities, government spending, capital markets, insurance, liquidity and several other variables did not have large coefficients associated with economic growth.

TABLE XLIV
PLS VARIATIONS FOR HIGH INCOME COUNTRIES, 1960-2009 WITH IMPUTATIONS

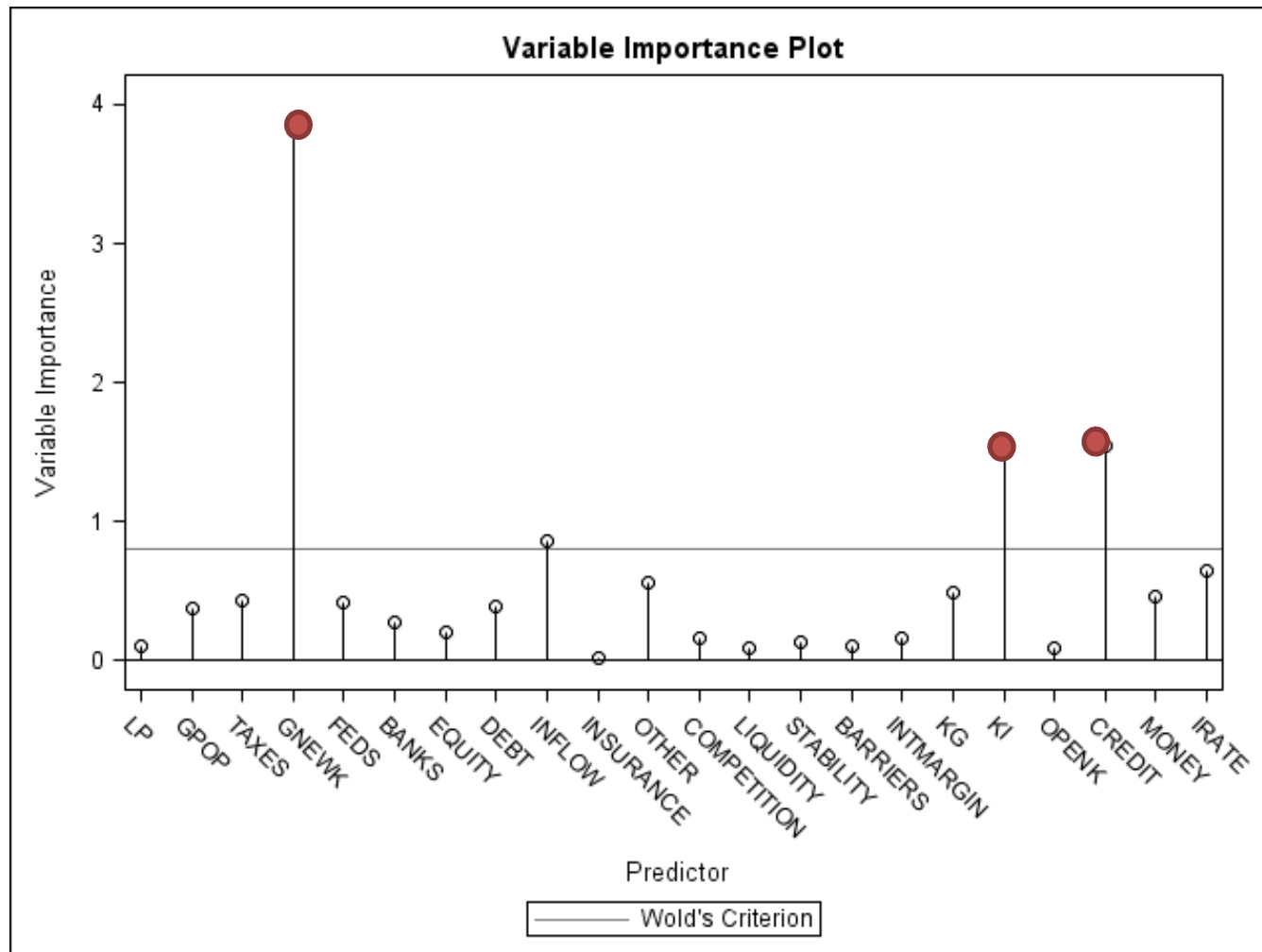
Extracted Factors	Model Effects		Dependent Variables	
	Current	Total	Current	Total

1	7.885	7.885	25.561	25.561
2	13.620	21.505	1.937	27.498
3	8.107	29.612	0.629	28.127
4	4.893	34.504	0.096	28.223
5	4.221	38.725	0.038	28.262
6	3.183	41.908	0.044	28.306
7	3.253	45.161	0.030	28.336
8	3.533	48.694	0.010	28.346
9	4.552	53.246	0.002	28.347
10	3.382	56.628	0.000	28.348
11	3.323	59.952	0.000	28.348
12	3.939	63.890	0.000	28.348
13	3.792	67.683	0.000	28.348
14	4.355	72.038	0.000	28.348
15	3.723	75.761	0.000	28.348

TABLE XLV
PLS IMPUTED ESTIMATES FOR HIGH INCOME COUNTRIES, 1960-2009

Predictor	Estimates
Intercept	0.000
LP	-0.011
GPOP	-0.040
TAXES	-0.047
GNEWK	0.407
FEDS	-0.045
BANKS	0.029
EQUITY	0.021
DEBT	-0.042
INFLOW	0.092
INSURANCE	-0.002
OTHER	0.059
COMPETITION	0.017
LIQUIDITY	-0.009
STABILITY	0.014
BARRIERS	0.011
INTMARGIN	-0.018
KG	-0.052
KI	0.164
OPENK	0.009
CREDIT	-0.165
MONEY	-0.049
IRATE	-0.069

FIGURE 34
Very Important Predictor profile using RRR Methodology, High Income Countries, 1960-2009



v. **All Countries, with and without Imputations**

An all countries analyzed was also conducted, first with observations without any imputations and then again with imputed observations. Growth rate in new capital accumulation and private credit were the only two variables that were important with and without imputations. Bank and Other Financial Assets were dropped as important variables after imputations and population growth and inflation rates picked up along with the investment's share in real GDP per capita.

TABLE XLVI
ALL COUNTRIES COMPARISON OF WITH AND WITHOUT PLS IMPUTATIONS EFFECTS

<u>No imputation (146 observations)</u>					<u>Imputation (10,400 observations)</u>				
Extracted	Model	Effects	Dependent	Variables	Extracted	Model	Effects	Dependent	Variables
Factors	Current	Total	Current	Total	Factors	Current	Total	Current	Total
1	24.886	24.886	49.724	49.724	1	7.6918	7.6918	12.1826	12.1826
2	17.721	42.607	23.891	73.615	2	14.583	22.2749	0.2717	12.4543
3	10.790	53.397	2.722	76.337	3	12.8236	35.0985	0.0539	12.5082
4	14.212	67.608	0.410	76.746	4	6.5632	41.6616	0.0062	12.5144
5	7.823	75.431	0.076	76.822	5	4.8229	46.4845	0.0042	12.5187
6	4.813	80.244	0.071	76.894	6	2.4523	48.9368	0.009	12.5276
7	4.388	84.632	0.029	76.923	7	4.8765	53.8134	0.0023	12.5299
8	6.028	90.660	0.021	76.944	8	5.1932	59.0066	0.0002	12.5301
9	1.472	92.132	0.071	77.014	9	5.5031	64.5097	0	12.5301
10	2.686	94.818	0.027	77.041	10	6.4266	70.9362	0	12.5301
11	2.016	96.834	0.029	77.069	11	4.7926	75.7289	0	12.5301
12	1.067	97.902	0.028	77.097	12	5.2456	80.9745	0	12.5301
13	1.042	98.944	0.006	77.104	13	6.0246	86.9991	0	12.5301
14	0.682	99.626	0.002	77.106	14	0	86.9991	0	12.5301
15	0.375	100.000	0.000	77.106	15	0	86.9991	0	12.5301

TABLE XLVII
EFFECTS OF IMPUTATIONS ON PLS COEFFICIENT ESTIMATES

Parameter Estimates for Centered and Scaled Data				
Predictors	No Imputation	Imputation	Sign Change	Magnitude Difference
Intercept	0.0000	0.0000	N	0%
GPOP	-0.1334	-0.0197	N	-85%
TAXES	-0.0234	-0.0810	N	246%
GNEWK	0.2776	0.7481	N	169%
BANKS	0.0154	-0.3012	Y	-2055%
EQUITY	0.0041	0.0050	N	21%
DEBT	0.0097	-0.0243	Y	-349%
INFLOW	0.0256	-0.0260	Y	-202%
INSURANCE	0.0047	0.1052	N	2128%
OTHER	0.0189	-0.2302	Y	-1321%
KG	-0.0588	0.0873	Y	-248%
KI	0.1009	0.1373	N	36%
OPENK	0.0123	0.1604	N	1205%
CREDIT	-0.0749	0.2135	Y	-385%
MONEY	-0.0040	0.0023	Y	-157%
IRATE	-0.0872	0.0478	Y	-155%

FIGURE 35
Very Important Predictor profile using RRR Methodology, No Imputations

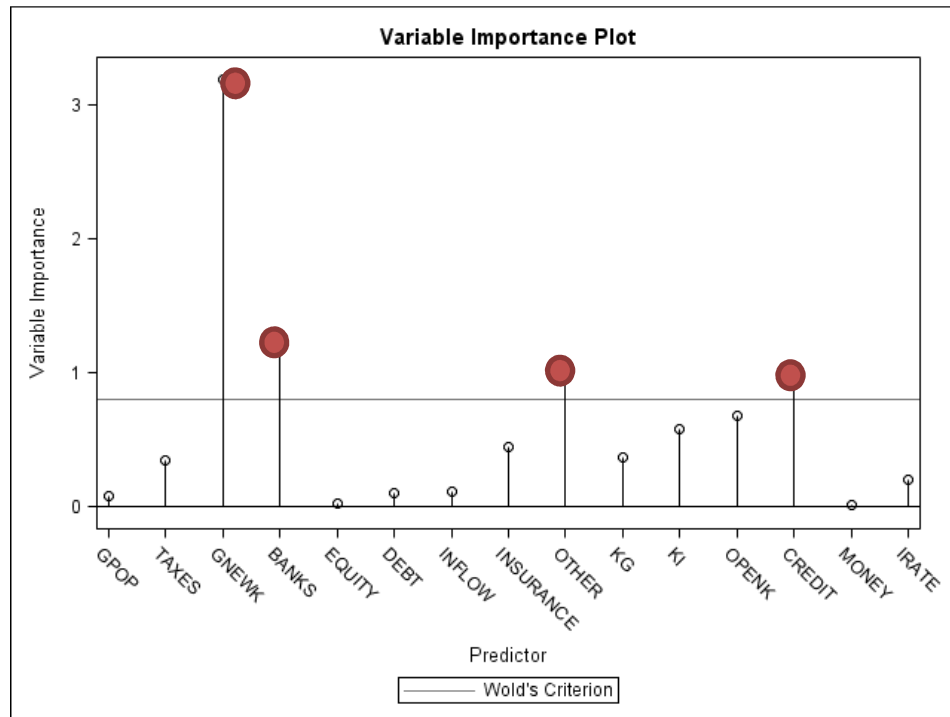
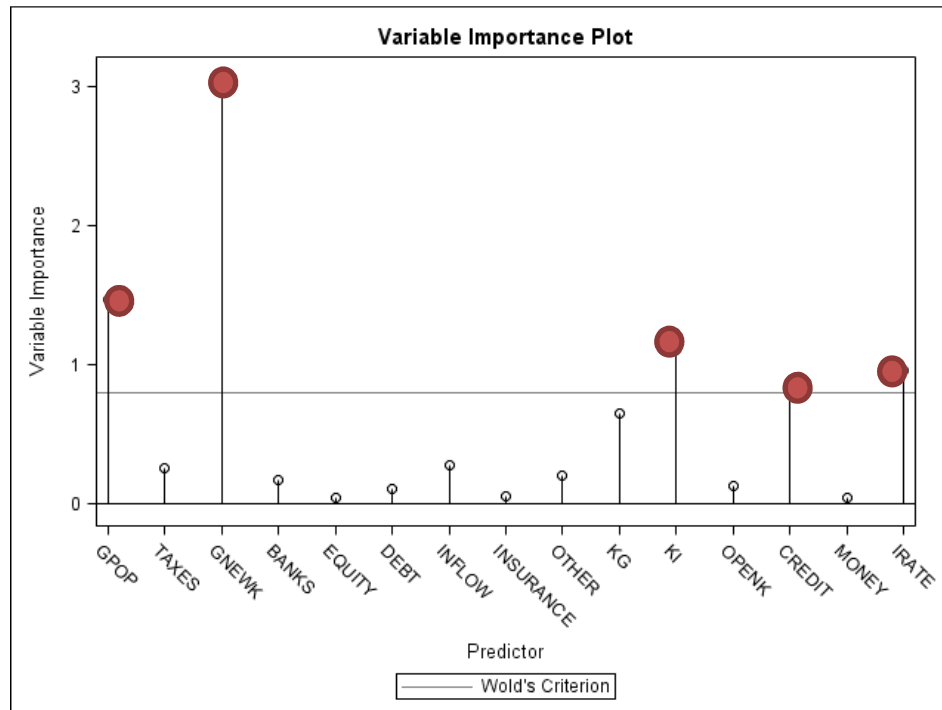


FIGURE 36
Very Important Predictor profile using RRR Methodology, Imputations



F. CONCLUSIONS

This paper investigated the empirical linkage between, all of the thirty financial structural indicators found in the Financial Development Database, and economic growth using the partial least squares methodology. Specifically, the study computed the centered and scaled estimates of the predictor (the financial structure indicators) coefficients of the final predictive model for the response variable (growth rate of real GDP per capita) - these estimates explained the maximum co-variation between the independent predictor vector and the corresponding dependent response; the study also took into account the Variable Importance for Projection (VIP) statistic¹⁰⁶. PLS overcomes the multicollinearity issues that plague traditional multivariate analysis. The final predictive model developed can be tested for on countries with existing data available and applied to make forecast for similar countries where data availability may be an issue. The technique has never been used before to explore the empirical relationship between financial development and economic growth.

In the all countries analysis for the period of 1980-2009, the largest positive parameter estimates for Bank Assets, Financial System Deposits and Other Financial Assets corresponding were 0.083, 0.074 and 0.071 change in the real GDP per capita growth rate. Other indicators seen in the literature such as Bank Deposits, Net International Debt, Z-score, Listed Companies per 10k population, Stock Market Value Traded and Remittances had parameter estimates of 0.045, 0.046, 0.03, 0.02, 0.013 and 0.013 respectively. Central Bank Assets, Concentration, Liquid Liabilities, Net Interest Margin and Public Bond market had negative parameter estimates of -0.012, -0.014, -0.048, -0.049 and -0.096 respectively. The largest negative parameter estimate, -0.143, was Total Private Credit; this is contrary to previous findings in the literature and warrants additional investigating including other predictors of economic growth in the predictor vector. From the above predictors, Liquid Liabilities, Financial System Deposits, Total Private Credit, Bank Assets, Public Bond markets, Other Financial Assets and Life Insurance Premiums were at or above the Wold's Criterion. Both the coefficients and the criterion are considered in these conclusions because the coefficients are part the final predictive model which does not necessarily convey the correlation between the predictors and the response. This is especially true when other determinants of

¹⁰⁶ Wold (1994)

economic growth are included in the predictor matrix; therefore the analyses focus more on the absolute value of the coefficients.

The study then divides the countries into sub-sets segregated by their income groups as determined by the World Bank; additional predictors of economic growth were also included in the predictor vector. A composite Debt was compiled that summed up the Private and Bond markets as well as Non-resident loans. The composite Inflow summed the predictors Remittances and Foreign Direct Investments. The composite Insurance combined Life and Non-life premiums.

The low income countries' potential predictors population growth rate, growth rate of new physical capital accumulation (GNEWK), Debt, Barriers (Number of Listing per 10K population), Investment's Share in Real GDP per capita and Credit (Total Private Credit), had relatively large coefficients in the final predictive model as well as were at or above the Wold's Criterion with values of -0.059, 0.276, 0.089, -0.055, 0.069 and -0.051 respectively. Feds (Central Bank Assets), Inflow (sum of FDI and Remittances), trade openness and inflation rate did not meet the criteria but had large coefficients of -0.048, 0.04, -0.067 and -0.050 respectively.

In the lower middle income countries, most notable predictors in the context of the magnitude and the criterion are population growth rate, GNEWK, Bank Assets, Government's and Investment's share in real GDP per capita, Credit and inflation rate with coefficients of -0.222, 0.114, 0.065, -0.072, 0.086, -0.116 and -0.109 respectively. Transitioning from low (Somalia) to lower income (Pakistan) the magnitude of population growth rate increased (negative), GNEWK maintained fairly constant, Bank Assets became more important than Central Bank Assets, Investments stayed important while government participation entered negatively. Credit extended and inflation rates also entered the predictive model negatively while trade openness and Inflow reduced their VIP standings.

The upper middle income countries clearly differentiated between the VIP of the predictors, population growth rates, GNEWK, Central Bank Assets, Other Financial Assets, Government's share in real GDP per capita and inflation rates entered the model with coefficients of -0.07, 0.495, -0.053, -0.075, -0.052 and -0.095 respectively. The results are consistent with previous analysis, the notable observation here may be that the development of the 'Other' financial sector may be premature in this stage of development. Net Interest Margin entered the model with a coefficient of -0.036; smaller in magnitude

than the other predictors but relatively sizeable nonetheless. This is the final stage of development before the countries enter the high income development phase.

The countries in the high income development phase continue to emphasize in accumulating new capital, Inflow (FDI may be the key here as international capital may flock to the stability of the developed countries), Investment's share in real GDP per capita, Credit, Money (Liquid Liabilities) and inflation rate with their respective coefficients of 0.407, 0.092, 0.164, -0.165, -0.049 and -0.069. Other Financial Assets did not meet the criterion but had a relatively large positive coefficient of 0.059- different sign than the upper middle income countries- suggests that at this stage all aspects of a financial system are critical in this final predictive model however some more than others as suggested by their respective weights.

VII. THESIS CONCLUSIONS

Economists and policy-makers have wondered whether it is even possible to measure financial development; particularly with a single composite. The convention in the has been to use a singular indicator, for examples Total Private Credit or Bank Assets, to serve proxy for the overall financial structure- thereby changes in the their levels to be financial development. Limited work has been done to 'combine' various indicators, multiplicatively, to become 'one composite indicator' without adequate explanation to either the process that led to the choice of the multiplied indicators or the mathematical operations. Some have suggested computing the weights of the various indicators and then developing a single composite; researchers for the World Economic Forum addressed by developing a 'consolidated' metric but assigned equal weights to the various sector within the financial system and the metric was indiscriminant between the various countries- United States and India's financial system were assumed to have identical distribution.

This thesis takes a step back from all of the above and asks first whether there is a single indicator that can best serve as a proxy for the entire financial structure; if so, how well does it explain the variations in the financial structure¹⁰⁷ and if these proxies behave consistently across the various countries in the income spectrum. This study used principal component analysis which maximizes the variation explained strictly and only in the independent variables. Four out of the six indicators that are used most often as proxies in the literature: Other Financial Assets, Total Private Credit, Stock Market Value Traded and Liquid Liabilities accounted for 16.18%¹⁰⁸, 15.5%, 14.9% and 13.9% respectively of the total variation in the data set for the period over 1980-2009 in a sample of 210 countries. The remaining two popular indicators, Bank Assets and Central Bank Assets explained 8.7% and near-zero percent respectively; the latter two indicators would not be strong proxy in financial development research. Non-life Insurance Premiums, Public and Private Bond Market Capitalizations and Bank Deposits are possibly other good alternative proxies explaining 16.8%, 15.6%, 15.2% and 14.4% respectively.

¹⁰⁷ As explained by the variations in the data of the Financial Structure Database also referred to as the Financial Development Database, developed and maintained by the World Bank, 2013.

¹⁰⁸ The percentages represent the weighted coefficient from the components. A percentage of 25 implies that the co-efficient of the variable in the component was 0.25.

As countries move through the various phases of their developmental cycle, the aggregate proxies that best represent them changed as well. Low income countries¹⁰⁹ financial development is best characterized by the level of remittances followed by liquid liabilities- an indicator that is highly correlated with financial system wide deposits. Liquid Liabilities, still highly correlated with Financial System Deposits continue to be the best proxy in the Lower Middle Income¹¹⁰ category- explaining 31% of the total variation in the Financial Structure data set. Total Private Credit also makes a strong appearance with 26.1% while Remittances play a secondary but strong role explaining 22.9% of the total variation. The best proxy in the Upper Middle Income countries¹¹¹ was a close three way tie between Liquid Liabilities, Central Bank Assets and Financial System Deposits- each explaining 31%, 30.4% and 29.5% of the variations. Total Private Credit indicator plays an important role here as well, explaining 27.6% of the total variation. Evolving through this category to the High Income group, Financial System Deposits and Liquid Liabilities, explain the variations the best with 32% and 31.5% while still being highly correlated with each other¹¹². Total Private Credit explained 27% of the variation and Remittances make a strong appearance explaining 28.3%.

The second question of research interest in this thesis was what, if any, is the empirical linkage between financial development, as defined by the changes in the potential proxy indicator, and economic growth as defined by the percentage change in real GDP per capita. This question was explored first using a traditional multivariate cross-section analysis and then using the technique of partial least squares. The latter maximized the covariance of response (dependent variable) and the predictors (independent variables) while the former was conducted using ordinary least squares with extreme bounds for robustness check.

In the cross-sectional analysis, a total of nine out of thirty indicators were found robust- six with positive coefficients and three with negative. Amongst the six prevalent indicators in the literature, Other Financial Assets, Central Bank Assets and Stock Market Value Traded- failed the robustness check. Amongst the robust prevalent indicators, Liquid Liabilities was on the cusp corresponding to zero growth

¹⁰⁹ such as Pakistan

¹¹⁰ such as India

¹¹¹ such as Brazil, Turkey

¹¹² The correlation co-efficient between Financial System Deposits and Liquid Liabilities in the High Income Country group was 0.983.

as a lower bound and a 0.02% increase in the growth rate¹¹³. A 1% change in Total Private Credit corresponded to a robust range of 0.003% and 0.03%. Bank Assets, similarly, corresponded to a robust range of 0.002% to 0.027%. At the negative spectrum of robust coefficients, the magnitude were alarmingly large with Net Interest Margin affecting as adverse as low as -0.348% and as high as -0.108%. Bank Overhead Costs corresponded to a robust negative range of -0.438% and -0.173%. The larger negative changes may be explained by the banks not having good cost controls and trying to recoup the costs by extracting excessive rent. The higher borrowing costs would create distortions and eventually affecting aggregate output adversely.

A notable observation in this study was the Barriers-to-Entry measure, No. of companies listed per 10k population, while fragile in robustness by the Levine and Renelt definition had a lower bound corresponding to a -0.256% and an upper bound of 1.551% and was by far the largest magnitude in this study. This may suggest that a well-executed policy of removing barriers to entry for companies to go public may provide a 150% return on the initiative.; the upper bound representing a best case scenario where an overall policy environment that encourages entrepreneurship raises the standard of living . The development of the banking sector is very important in the initial stages of economic development, once the banks have developed and stabilized, other markets within the financial system develop as the structure matures. Behavior within the banks as they seek to extract rent may hurt the long run growth as indicated by the negative coefficients of Bank Return on Equity and Net Interest Margins. Poor management at the banks leading to a higher Bank Overheard also impacts the economy negatively as cost control may become lax and be indicative of other poor practices at the institution. Excessive central bank intervention and policies that erect barriers for companies to go public hinder economic growth. Bank Assets, Bank Deposits, Financial System Deposits, Total Private Credit have consistently shown to have a positive correlation with economic growth.

The control variables representing the population growth rate and initial real GDP were consistently statistically significant and negative; initial income coefficient provides updated evidence on conditional convergence for the literature. Trade openness was consistently positive and statistically

¹¹³ All results cited here have been adjusted where each correlation coefficient explains the annual average % change in the real GDP per capita growth rate over the model time period corresponding to a 1% average annual change in the variable of interest, *ceteris paribus*.

significant. Government's share in per capita GDP and inflation rate were not found to be statistically significant whereas the initial human capital measure were only in the initial less restrictive models.

In the partial least squares analyses, the largest positive parameters' estimates in the final predictive models were for Bank Assets, Financial System Deposits and Other Financial Assets corresponding were 0.083, 0.074 and 0.071. Bank Deposits, Net International Debt, Z-score, Listed Companies per 10k population, Stock Market Value Traded and Remittances had parameter estimates of 0.045, 0.046, 0.03, 0.02, 0.013 and 0.013 respectively. Central Bank Assets, Concentration, Liquid Liabilities, Net Interest Margin and Public Bond market had negative parameter estimates of -0.012, -0.014, -0.048, -0.049 and -0.096 respectively. The largest negative parameter estimate, -0.143, was Total Private Credit; this is contrary to previous findings in the literature and warrants further investigation. From the above predictors, Liquid Liabilities, Financial System Deposits, Total Private Credit, Bank Assets, Public Bond markets, Other Financial Assets and Life Insurance Premiums were at or above the Wold's Variable Importance for Projection (VIP) statistic criterion¹¹⁴. The final predictive models were also estimated for countries in the various stages of development; those models also supported the notion that the importance of the individual sectors changes for a country as it evolves through the various stages of development.

This study concludes that while some indicators may be better representative¹¹⁵ of their relative aspect of the financial system, they are still insufficient to act as proxy for the entire system. A more comprehensive composite is the only way that an entire financial system can be measured. The functional form of that composite can be debated and it may even exist in forms of sub-composites, the changes in those composite or sub-composites will best represent the overall financial development of the country or groups of countries in question. Furthermore, these composites must be tailored to an individual country or a group of countries that share similar geo-political and socio-economic characteristics.

¹¹⁴ Wold (1994)

¹¹⁵ The specific numerical parameter estimates can be found in the corresponding tables for that particular country income group; please refer to the list of tables to locate the correct table for your needs.

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APPENDIX

TABLE XLVIII
INDICATORS OF FINANCIAL STRUCTURES DESCRIPTIVE STATISTICS, 1960-2009

Indicators of Financial Structures					
Descriptive Statistics					
210 Countries, 1960-2009					
Indicator	Observations	Mean	Std. Dev.	Min	Max
intldebtnet	718	0.018	0.052	0.000	1.136
prbond	815	0.281	0.370	0.000	3.831
pubond	955	0.337	0.262	0.000	3.247
ofagdp	1350	0.177	0.241	0.000	1.737
insnonlife	1686	0.020	0.012	0.001	0.089
intldebt	1795	0.180	0.300	0.000	3.444
zscore	1804	11.396	9.878	0.366	91.414
stmktcap	2088	0.468	0.621	0.000	7.425
stvaltraded	2132	0.293	0.662	0.000	6.731
stturnover	2156	0.445	0.766	0.000	16.781
listco_pc	2272	0.259	0.552	0.000	11.305
netintmargin	2431	0.051	0.037	0.002	0.420
nrbloan	2445	0.951	7.730	0.001	228.830
offdep	2460	1.610	16.833	0.003	335.583
inslife	2461	0.020	0.031	0.000	0.357
overhead	2465	0.043	0.030	0.002	0.270
costinc	2489	0.657	0.232	0.135	3.129
concentration	2510	0.719	0.208	0.119	1.000
roa	2514	-0.019	2.120	-103.596	22.528
roe	2514	0.137	0.331	-12.313	3.607
remit	4190	0.050	0.279	0.000	8.375
cbagdp	5023	0.078	0.116	0.000	2.650
llgdp	5193	0.613	4.414	0.002	153.462
pcrdbgdp	5399	0.358	0.335	0.001	2.698
pcrdbofgdp	5413	0.392	0.362	0.001	2.698
dbagdp	5430	0.442	0.381	0.001	2.716
bdgdp	5438	0.395	0.364	0.001	4.724
fdgdp	5441	0.404	0.367	0.001	4.651
dbacba	6297	0.792	0.217	0.017	1.609
bcbd	6886	0.974	0.693	0.011	27.139

TABLE XLIX
INDICATORS OF FINANCIAL STRUCTURE'S CORRELATION MATRIX

	bcbd	bdgdp	cbagdp	concentration	costinc	dbacba	dbagdp	fdgdp	inslife	insnonlife
bcbd	1.000	0.074	0.287	0.018	-0.024	-0.289	0.284	0.133	0.388	0.068
bdgdp	0.074	1.000	-0.255	0.218	-0.563	0.536	0.961	0.983	0.481	0.743
cbagdp	0.287	-0.255	1.000	-0.120	0.138	-0.906	-0.166	-0.307	-0.315	-0.371
concentrat~n	0.018	0.218	-0.120	1.000	-0.050	0.283	0.268	0.188	0.092	-0.058
costinc	-0.024	-0.563	0.138	-0.050	1.000	-0.328	-0.489	-0.586	-0.506	-0.526
dbacba	-0.289	0.536	-0.906	0.283	-0.328	1.000	0.421	0.544	0.413	0.527
dbagdp	0.284	0.961	-0.166	0.268	-0.489	0.421	1.000	0.959	0.500	0.685
fdgdp	0.133	0.983	-0.307	0.188	-0.586	0.544	0.959	1.000	0.536	0.767
inslife	0.388	0.481	-0.315	0.092	-0.506	0.413	0.500	0.536	1.000	0.593
insnonlife	0.068	0.743	-0.371	-0.058	-0.526	0.527	0.685	0.767	0.593	1.000
intldebt	-0.089	0.461	-0.337	0.357	-0.442	0.448	0.469	0.471	0.234	0.586
intldebtnet	-0.039	0.441	-0.295	0.324	-0.540	0.434	0.450	0.462	0.344	0.581
listco_pc	0.238	0.726	-0.104	0.289	-0.499	0.381	0.690	0.712	0.431	0.567
llgdp	-0.404	-0.279	-0.169	-0.140	-0.139	-0.012	-0.360	-0.205	-0.303	-0.038
netintmargin	-0.375	-0.592	0.286	-0.230	0.391	-0.489	-0.599	-0.589	-0.594	-0.506
nrbloan	0.158	0.650	-0.268	0.334	-0.492	0.448	0.693	0.699	0.445	0.630
ofagdp	-0.048	0.336	-0.179	0.052	-0.298	0.332	0.231	0.293	0.497	0.653
offdep	-0.375	-0.259	-0.239	-0.107	-0.108	0.066	-0.311	-0.184	-0.269	0.067
overhead	-0.214	-0.595	0.196	-0.168	0.755	-0.429	-0.549	-0.609	-0.631	-0.529
pcrdbgdp	0.356	0.943	-0.212	0.271	-0.521	0.461	0.980	0.961	0.564	0.703
pcrdbofgdp	0.257	0.865	-0.222	0.185	-0.519	0.474	0.831	0.866	0.636	0.837
prbond	0.082	0.643	-0.137	-0.231	-0.304	0.319	0.554	0.620	0.398	0.706
pubond	-0.247	0.441	-0.074	-0.025	-0.572	0.213	0.306	0.402	0.340	0.510
remit	-0.111	-0.207	-0.016	0.210	0.204	-0.050	-0.214	-0.205	-0.234	-0.428
roa	0.066	0.229	-0.109	-0.028	-0.571	0.129	0.187	0.240	0.148	0.316
roe	-0.636	-0.019	-0.034	0.109	-0.307	0.044	-0.158	-0.009	-0.235	0.022
stmrktcap	0.081	0.865	-0.173	0.348	-0.416	0.477	0.810	0.817	0.519	0.548
stturnover	0.313	0.528	-0.249	-0.099	-0.196	0.305	0.546	0.566	0.534	0.681
stvaltraded	0.165	0.865	-0.298	0.160	-0.288	0.507	0.834	0.867	0.450	0.809
Zscore	0.099	0.236	-0.214	0.171	-0.514	0.331	0.241	0.282	0.633	0.296

TABLE L
INDICATORS OF FINANCIAL STRUCTURE'S CORRELATION MATRIX (continued)

	pcrdbogdp	prbond	pubond	remit	roa	roe	stmkcap	stturnover	stvaltraded	zscore
bcbd	0.257	0.082	-0.247	-0.111	0.066	-0.636	0.081	0.313	0.165	0.099
bdgdp	0.865	0.643	0.441	-0.207	0.229	-0.019	0.865	0.528	0.865	0.236
cbagdp	-0.222	-0.137	-0.074	-0.016	-0.109	-0.034	-0.173	-0.249	-0.298	-0.214
concentrat~n	0.185	-0.231	-0.025	0.210	-0.028	0.109	0.348	-0.099	0.160	0.171
costinc	-0.519	-0.304	-0.572	0.204	-0.571	-0.307	-0.416	-0.196	-0.288	-0.514
dbacba	0.474	0.319	0.213	-0.050	0.129	0.044	0.477	0.305	0.507	0.331
dbagdp	0.831	0.554	0.306	-0.214	0.187	-0.158	0.810	0.546	0.834	0.241
fdgdp	0.866	0.620	0.402	-0.205	0.240	-0.009	0.817	0.566	0.867	0.282
inslife	0.636	0.398	0.340	-0.234	0.148	-0.235	0.519	0.534	0.450	0.633
insnonlife	0.837	0.706	0.510	-0.428	0.316	0.022	0.548	0.681	0.809	0.296
intldebt	0.376	0.162	0.261	-0.110	0.199	0.134	0.239	0.237	0.397	0.497
intldebtnet	0.352	0.082	0.170	-0.038	0.238	0.053	0.199	0.183	0.305	0.708
listco_pc	0.836	0.657	0.183	-0.347	0.198	-0.185	0.627	0.591	0.692	0.206
llgdp	-0.292	-0.300	0.160	-0.178	0.205	0.819	-0.323	-0.329	-0.250	-0.285
netintmargin	-0.688	-0.555	-0.093	-0.048	0.001	0.519	-0.516	-0.594	-0.585	-0.504
nrbloan	0.502	0.152	0.046	-0.105	0.138	-0.045	0.436	0.240	0.511	0.686
ofagdp	0.676	0.722	0.650	-0.286	0.180	0.018	0.356	0.657	0.532	0.072
offdep	-0.342	-0.407	0.018	-0.180	0.176	0.690	-0.334	-0.411	-0.244	-0.033
overhead	-0.712	-0.580	-0.387	0.030	-0.245	0.122	-0.471	-0.563	-0.494	-0.546
pcrdbgdp	0.862	0.562	0.266	-0.226	0.212	-0.163	0.818	0.561	0.853	0.277
pcrdbogdp	1.000	0.829	0.507	-0.316	0.258	-0.118	0.769	0.785	0.922	0.186
prbond	0.829	1.000	0.538	-0.302	0.122	-0.165	0.522	0.841	0.800	-0.037
pubond	0.507	0.538	1.000	-0.104	0.384	0.469	0.454	0.321	0.411	0.028
remit	-0.316	-0.302	-0.104	1.000	-0.124	-0.094	-0.176	-0.230	-0.226	0.073
roa	0.258	0.122	0.384	-0.124	1.000	0.204	0.177	0.057	0.179	0.039
roe	-0.118	-0.165	0.469	-0.094	0.204	1.000	0.017	-0.355	-0.099	-0.143
stmkcap	0.769	0.522	0.454	-0.176	0.177	0.017	1.000	0.312	0.771	0.164
stturnover	0.785	0.841	0.321	-0.230	0.057	-0.355	0.312	1.000	0.737	0.057
stvaltraded	0.922	0.800	0.411	-0.226	0.179	-0.099	0.771	0.737	1.000	0.027
zscore	0.186	-0.037	0.028	0.073	0.039	-0.143	0.164	0.057	0.027	1.000

TABLE LI
STANDARDIZED INDICATORS OF FINANCIAL STRUCTURES DESCRIPTIVE STATISTICS

Variable	Label	N	Mean	Std Dev	Minimum	Maximum
PINTLDEBTNET	pintldebtnet	718	0.000	1	-0.343	21.299
PPRBOND	pprbond	815	0.000	1	-0.759	9.582
PPUBOND	ppubond	955	0.000	1	-1.282	11.091
POFAGDP	pofagdp	1350	0.000	1	-0.733	6.467
PINSNONLIFE	pinsnonlife	1686	0.000	1	-1.581	5.724
PINTLDEBT	pintldebt	1795	0.000	1	-0.598	10.862
ZSCORE	zscore	1804	0.000	1	-1.117	8.100
PSTMKTCAP	pstmktcap	2088	0.000	1	-0.754	11.205
PSTVALTRADED	pstvaltraded	2132	0.000	1	-0.443	9.728
PSTTURNOVER	pstturnover	2156	0.000	1	-0.581	21.319
LISTCO_PC	listco_pc	2272	0.000	1	-0.469	20.016
PNETINTMARGIN	pnetintmargin	2431	0.000	1	-1.294	9.865
PNRBLOAN	pnrbloan	2445	0.000	1	-0.123	29.479
POFFDEP	poffdep	2460	0.000	1	-0.096	19.841
PINSLIFE	pinslife	2461	0.000	1	-0.639	10.800
POVERHEAD	poverhead	2465	0.000	1	-1.386	7.560
PCOSTINC	pcostinc	2489	0.000	1	-2.250	10.664
PCONCENTRATION	pconcentration	2510	0.000	1	-2.889	1.355
PROA	proa	2514	0.000	1	-48.862	10.636
PROE	proe	2514	0.000	1	-37.557	10.470
PREMIT	premit	4190	0.000	1	-0.178	29.880
PCBAGDP	pcbagdp	5023	0.000	1	-0.672	22.152
PLLGDP	pllgedp	5193	0.000	1	-0.139	34.630
PPCRDBGDP	ppcrdbgdp	5399	0.000	1	-1.068	6.988
PPCRDBOFGDP	ppcrdbofgdp	5413	0.000	1	-1.079	6.359
PDBAGDP	pdbagdp	5430	0.000	1	-1.157	5.968
PBDGDP	pbdgdp	5438	0.000	1	-1.085	11.906
PFDGDP	pfdgdp	5441	0.000	1	-1.099	11.566
PDBACBA	pdbacba	6297	0.000	1	-3.565	3.761
PBCBD	pbcabd	6886	0.000	1	-1.390	37.771

TABLE LII
REVIEW OF CROSS-COUNTRY MULTIPLE REGRESSIONS LITERATURE¹¹⁶¹¹⁷

Study	Years	# Countries	Proxy Indicator	Comparables	Bank	Stock	Bond	Other	Aggregate	Coefficient	Significance*	Causation	Issues
Goldsmith (1969)	1860-1963	35	Financial Intermediary Assets/GNP	DBAGDP + OFAGDP + CBAGDP	X			X	X	Positive: varied by country groups	YES	NO	Endogeneity, Simultaneity, No Control Variables; No Financial Market Variables
King and Levine (1993)	1960-1989	77	DEPTH=Liquid Liabilities/GDP	LLGDP					X	0.024	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	BANK=Dom. Bank Credit/(Deposit Money Bank + Central Bank Credit)	DBACBA	X	X				0.032	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	PRIVATE=Claims on non-financial private sector to total claims	PCRBDOFGDP/TOT. DOM. CREDIT	X			X	X	0.034	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	PRIVY=Gross Claims on the Pvt Sector/ GDP	DBAGDP + OFAGDP + CBAGDP	X			X	X	0.032	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	57	DEPTH1960=Initial Stock of Financial Development	LLGDP (for 1960)					X	0.020	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	DEPTH=Liquid Liabilities/GDP	LLGDP					X	0.022	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	BANK=Dom. Bank Credit/(Deposit Money Bank + Central Bank Credit)	DBACBA	X	X				0.022	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	PRIVATE=Claims on non-financial private sector to total claims	PCRBDOFGDP/TOT. DOM. CREDIT	X			X	X	0.020	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	PRIVY=Gross Claims on the Pvt Sector/ GDP	DBAGDP + OFAGDP + CBAGDP	X			X	X	0.025	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	DEPTH=Liquid Liabilities/GDP	LLGDP					X	0.018	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	BANK=Dom. Bank Credit/(Deposit Money Bank + Central Bank Credit)	DBACBA	X	X				0.026	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	PRIVATE=Claims on non-financial private sector to total claims	PCRBDOFGDP/TOT. DOM. CREDIT	X			X	X	0.027	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
King and Levine (1993)	1960-1989	77	PRIVY=Gross Claims on the Pvt Sector/ GDP	DBAGDP + OFAGDP + CBAGDP	X			X	X	0.025	YES	NO	Endogeneity, Simultaneity; No Financial Market Variables
Atje and Jovanovich (1993)	1980-85	40	S=Value Traded in Stock Market / GDP	STVALTRADED		X				0.360	YES	YES	Bond Market, Other, Lack of Explanatory variables, inconsistent time periods
Atje and Jovanovich (1993)	1975-80	94	B=Claims on the pvt sector by Banks and monetary authority /GDP	CBAGDP+DBAGDP	X				X	0.400	NO	NO	Bond Market, Other, Lack of Explanatory variables, inconsistent time periods

¹¹⁶ * Significance is @ 1%,5%,10%; see specific tables for the details

¹¹⁷ ** = Real GDP / Capita Growth - 0.3 Real Capital Stock apita Growth

TABLE LIII
FACTOR LOADINGS OF THE X-MATRIX FOR LOW INCOME COUNTRY GROUPS¹¹⁸

# of Factors	LP	GPOP	GNEWK	FEDS	BANKS	EQUITY
1	0.097	-0.074	0.761	-0.134	-0.019	-0.139
2	-0.025	-0.281	0.264	0.141	-0.154	0.178
3	-0.081	-0.042	0.011	-0.079	0.515	0.014
4	-0.226	0.087	-0.067	-0.166	-0.362	0.039

# of Factors	DEBT	INFLOW	INSURANCE	OTHER	COMPETITION	LIQUIDITY
1	0.284	0.338	0.003	-0.100	-0.100	0.002
2	-0.158	-0.426	0.069	-0.014	0.090	0.001
3	0.002	-0.054	-0.120	0.308	-0.152	0.024
4	0.207	-0.048	0.151	0.078	0.368	0.241

# of Factors	STABILITY	BARRIERS	INTMARGIN	KG	KI	OPENK
1	0.049	-0.124	-0.155	-0.056	0.265	0.076
2	-0.193	0.015	0.220	0.066	-0.315	-0.565
3	0.109	-0.025	-0.200	0.000	0.122	0.003
4	0.290	-0.048	0.042	0.190	0.155	0.112

# of Factors	CREDIT	MONEY	IRATE
1	-0.0515	-0.0175	-0.1724
2	-0.1887	-0.1010	-0.0459
3	0.4786	0.5344	0.0442
4	-0.5065	-0.2591	0.1549

¹¹⁸ 2,000 observations

TABLE LIV
FACTOR LOADINGS OF THE U-MATRIX FOR LOW INCOME COUNTRY GROUPS¹¹⁹

# of Factors	LP	GPOP	GNEWK	FEDS	BANKS	EQUITY
1	0.083	-0.134	0.838	-0.127	-0.011	-0.102
2	-0.078	-0.341	0.441	0.041	0.046	0.210
3	-0.207	-0.115	0.097	-0.238	0.617	0.154
4	-0.189	0.073	-0.110	-0.326	0.166	0.135

# of Factors	DEBT	INFLOW	INSURANCE	OTHER	COMPETITION	LIQUIDITY
1	0.273	0.253	0.015	-0.076	-0.085	0.016
2	-0.062	-0.489	0.065	0.137	0.088	0.080
3	0.149	-0.326	-0.018	0.502	0.040	0.232
4	0.315	-0.212	0.151	0.281	0.308	0.343

# of Factors	STABILITY	BARRIERS	INTMARGIN	KG	KI	OPENK
1	0.033	-0.137	-0.129	-0.037	0.229	-0.037
2	-0.093	-0.071	0.151	0.109	-0.207	-0.650
3	0.288	-0.192	-0.144	0.151	0.209	-0.241
4	0.395	-0.271	0.014	0.219	0.290	-0.060

# of Factors	CREDIT	MONEY	IRATE
1	-0.094	0.011	-0.179
2	-0.246	0.163	-0.038
3	-0.124	0.802	0.120
4	-0.984	0.404	0.166

¹¹⁹ 2,000 observations

FIGURE 37
Spatial distributions of the estimates, Lower Middle Income Countries, 1960-2009

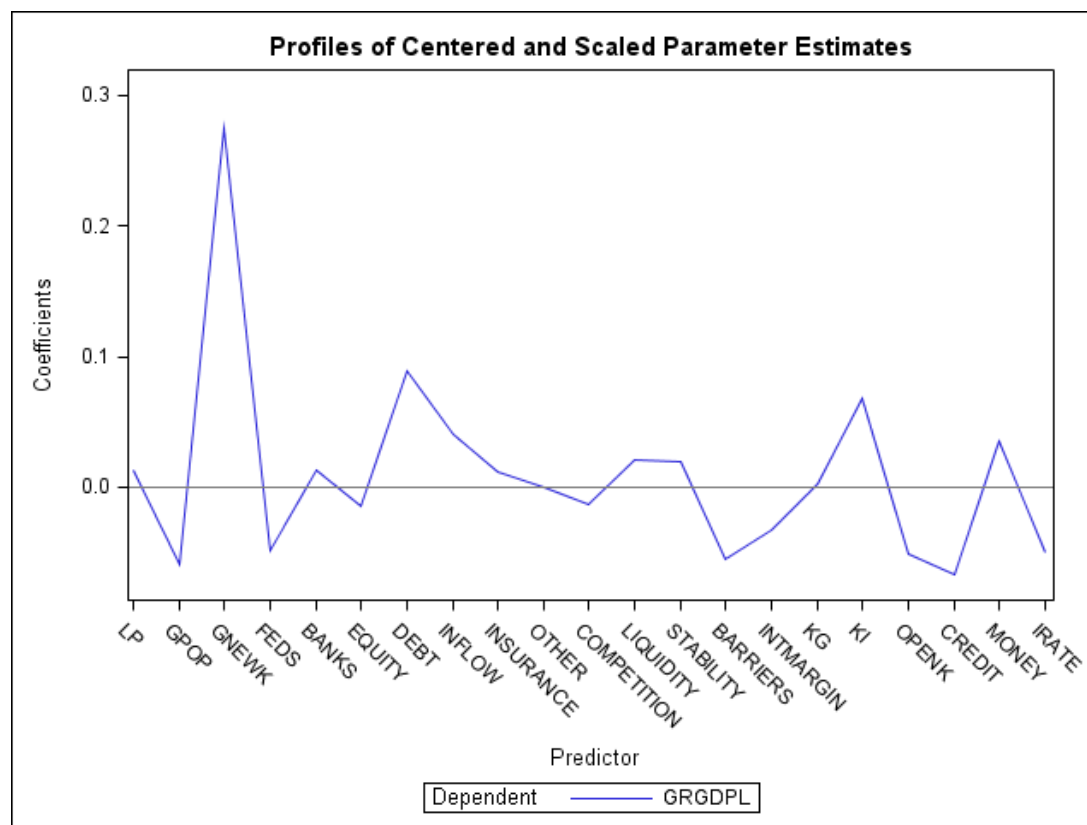


FIGURE 38
Correlation Loading Plot, Lower Middle Income Countries, 1960-2009

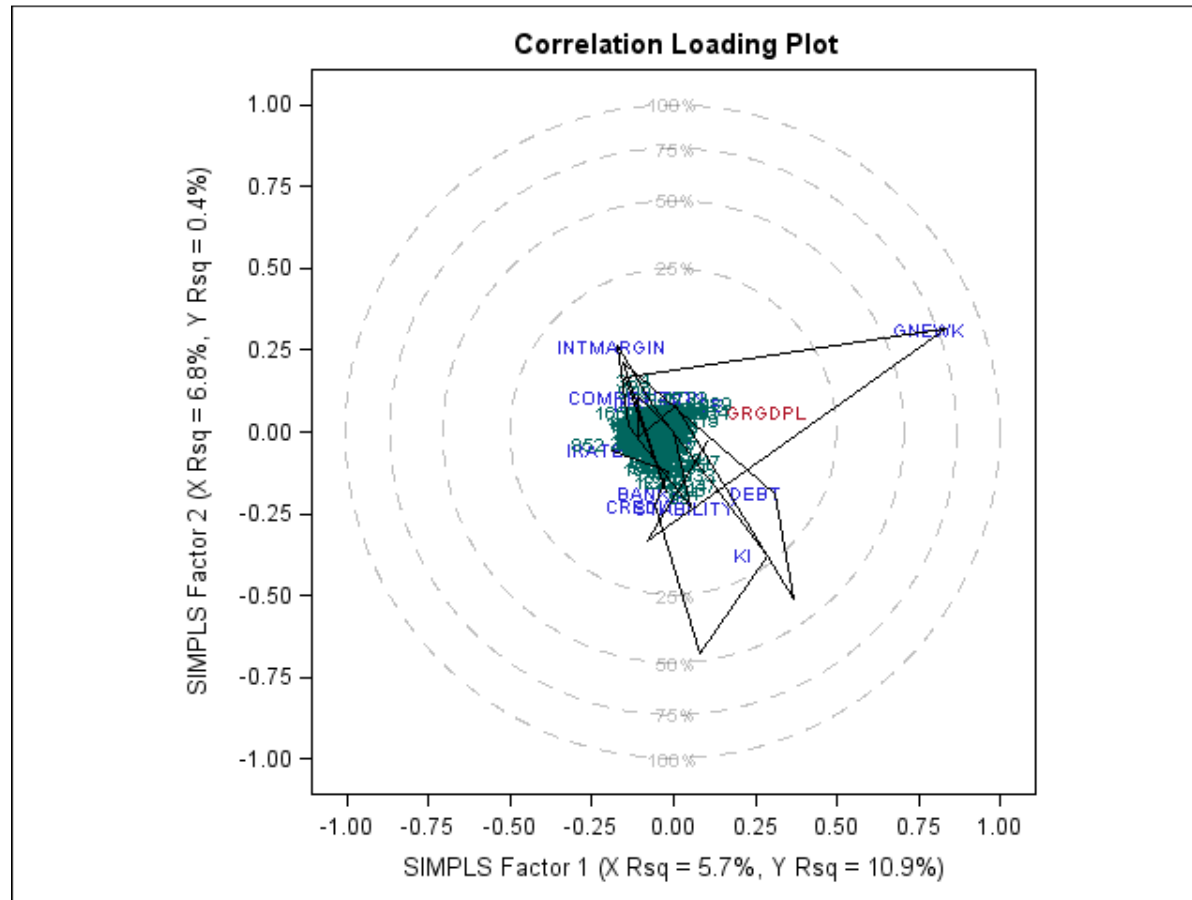
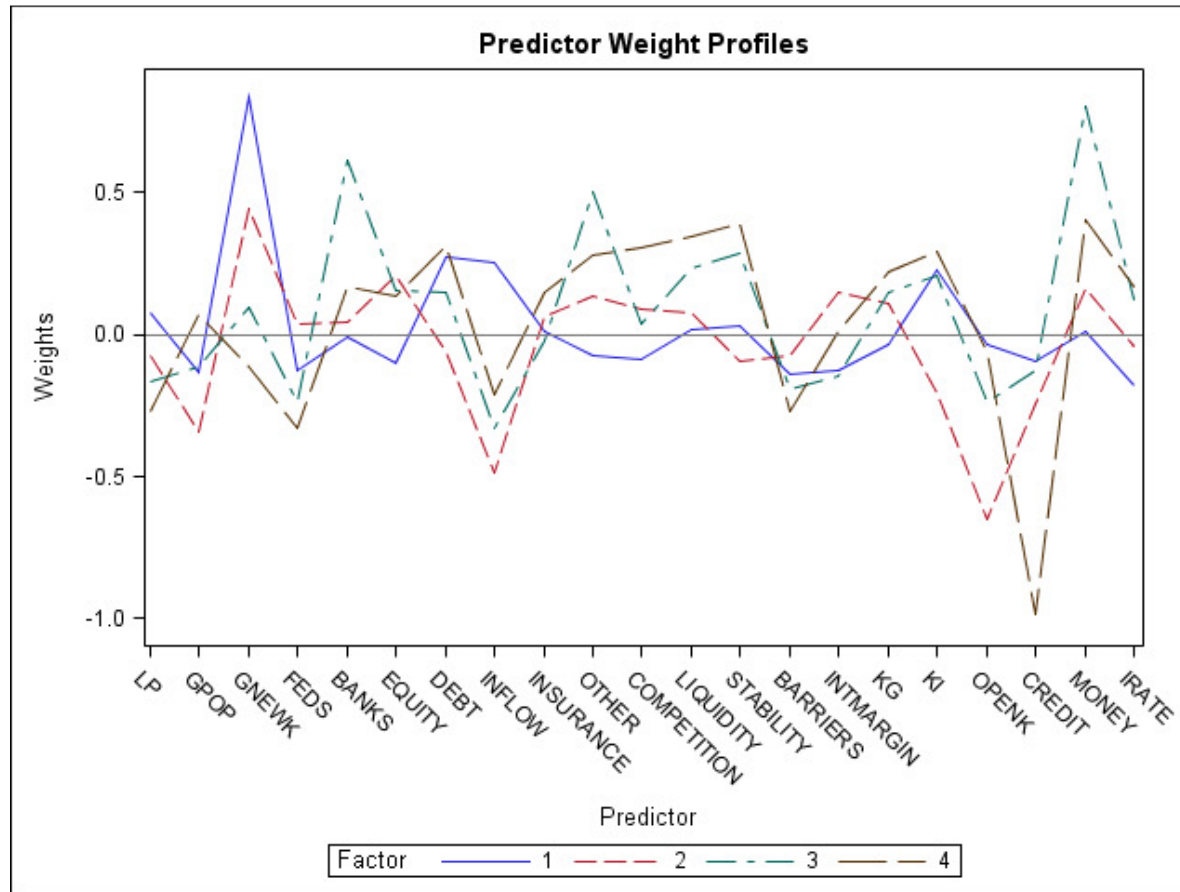


FIGURE 39
Predictor weight profiles the Lower Middle Income Countries, 1960-2009



Correlation Loading Plot

SIMPLS Factor 2 (X Rsq = 7.5%, Y Rsq = 1.4%)

SIMPLS Factor 1 (X Rsq = 5.6%, Y Rsq = 25.6%)

Variables plotted include: IRATE, FERR, LP, GRGDPL, 1788, 1507, 1504, 1503, 1502, 1501, 1500, 1499, 1498, 1497, 1496, 1495, 1494, 1493, 1492, 1491, 1490, 1489, 1488, 1487, 1486, 1485, 1484, 1483, 1482, 1481, 1480, 1479, 1478, 1477, 1476, 1475, 1474, 1473, 1472, 1471, 1470, 1469, 1468, 1467, 1466, 1465, 1464, 1463, 1462, 1461, 1460, 1459, 1458, 1457, 1456, 1455, 1454, 1453, 1452, 1451, 1450, 1449, 1448, 1447, 1446, 1445, 1444, 1443, 1442, 1441, 1440, 1439, 1438, 1437, 1436, 1435, 1434, 1433, 1432, 1431, 1430, 1429, 1428, 1427, 1426, 1425, 1424, 1423, 1422, 1421, 1420, 1419, 1418, 1417, 1416, 1415, 1414, 1413, 1412, 1411, 1410, 1409, 1408, 1407, 1406, 1405, 1404, 1403, 1402, 1401, 1400, 1399, 1398, 1397, 1396, 1395, 1394, 1393, 1392, 1391, 1390, 1389, 1388, 1387, 1386, 1385, 1384, 1383, 1382, 1381, 1380, 1379, 1378, 1377, 1376, 1375, 1374, 1373, 1372, 1371, 1370, 1369, 1368, 1367, 1366, 1365, 1364, 1363, 1362, 1361, 1360, 1359, 1358, 1357, 1356, 1355, 1354, 1353, 1352, 1351, 1350, 1349, 1348, 1347, 1346, 1345, 1344, 1343, 1342, 1341, 1340, 1339, 1338, 1337, 1336, 1335, 1334, 1333, 1332, 1331, 1330, 1329, 1328, 1327, 1326, 1325, 1324, 1323, 1322, 1321, 1320, 1319, 1318, 1317, 1316, 1315, 1314, 1313, 1312, 1311, 1310, 1309, 1308, 1307, 1306, 1305, 1304, 1303, 1302, 1301, 1300, 1299, 1298, 1297, 1296, 1295, 1294, 1293, 1292, 1291, 1290, 1289, 1288, 1287, 1286, 1285, 1284, 1283, 1282, 1281, 1280, 1279, 1278, 1277, 1276, 1275, 1274, 1273, 1272, 1271, 1270, 1269, 1268, 1267, 1266, 1265, 1264, 1263, 1262, 1261, 1260, 1259, 1258, 1257, 1256, 1255, 1254, 1253, 1252, 1251, 1250, 1249, 1248, 1247, 1246, 1245, 1244, 1243, 1242, 1241, 1240, 1239, 1238, 1237, 1236, 1235, 1234, 1233, 1232, 1231, 1230, 1229, 1228, 1227, 1226, 1225, 1224, 1223, 1222, 1221, 1220, 1219, 1218, 1217, 1216, 1215, 1214, 1213, 1212, 1211, 1210, 1209, 1208, 1207, 1206, 1205, 1204, 1203, 1202, 1201, 1200, 1199, 1198, 1197, 1196, 1195, 1194, 1193, 1192, 1191, 1190, 1189, 1188, 1187, 1186, 1185, 1184, 1183, 1182, 1181, 1180, 1179, 1178, 1177, 1176, 1175, 1174, 1173, 1172, 1171, 1170, 1169, 1168, 1167, 1166, 1165, 1164, 1163, 1162, 1161, 1160, 1159, 1158, 1157, 1156, 1155, 1154, 1153, 1152, 1151, 1150, 1149, 1148, 1147, 1146, 1145, 1144, 1143, 1142, 1141, 1140, 1139, 1138, 1137, 1136, 1135, 1134, 1133, 1132, 1131, 1130, 1129, 1128, 1127, 1126, 1125, 1124, 1123, 1122, 1121, 1120, 1119, 1118, 1117, 1116, 1115, 1114, 1113, 1112, 1111, 1110, 1109, 1108, 1107, 1106, 1105, 1104, 1103, 1102, 1101, 1100, 1099, 1098, 1097, 1096, 1095, 1094, 1093, 1092, 1091, 1090, 1089, 1088, 1087, 1086, 1085, 1084, 1083, 1082, 1081, 1080, 1079, 1078, 1077, 1076, 1075, 1074, 1073, 1072, 1071, 1070, 1069, 1068, 1067, 1066, 1065, 1064, 1063, 1062, 1061, 1060, 1059, 1058, 1057, 1056, 1055, 1054, 1053, 1052, 1051, 1050, 1049, 1048, 1047, 1046, 1045, 1044, 1043, 1042, 1041, 1040, 1039, 1038, 1037, 1036, 1035, 1034, 1033, 1032, 1031, 1030, 1029, 1028, 1027, 1026, 1025, 1024, 1023, 1022, 1021, 1020, 1019, 1018, 1017, 1016, 1015, 1014, 1013, 1012, 1011, 1010, 1009, 1008, 1007, 1006, 1005, 1004, 1003, 1002, 1001, 1000, 999, 998, 997, 996, 995, 994, 993, 992, 991, 990, 989, 988, 987, 986, 985, 984, 983, 982, 981, 980, 979, 978, 977, 976, 975, 974, 973, 972, 971, 970, 969, 968, 967, 966, 965, 964, 963, 962, 961, 960, 959, 958, 957, 956, 955, 954, 953, 952, 951, 950, 949, 948, 947, 946, 945, 944, 943, 942, 941, 940, 939, 938, 937, 936, 935, 934, 933, 932, 931, 930, 929, 928, 927, 926, 925, 924, 923, 922, 921, 920, 919, 918, 917, 916, 915, 914, 913, 912, 911, 910, 909, 908, 907, 906, 905, 904, 903, 902, 901, 900, 899, 898, 897, 896, 895, 894, 893, 892, 891, 890, 889, 888, 887, 886, 885, 884, 883, 882, 881, 880, 879, 878, 877, 876, 875, 874, 873, 872, 871, 870, 869, 868, 867, 866, 865, 864, 863, 862, 861, 860, 859, 858, 857, 856, 855, 854, 853, 852, 851, 850, 849, 848, 847, 846, 845, 844, 843, 842, 841, 840, 839, 838, 837, 836, 835, 834, 833, 832, 831, 830, 829, 828, 827, 826, 825, 824,

FIGURE 41
Very Important Predictor profile for the Upper Middle Income Countries, 1960-2009

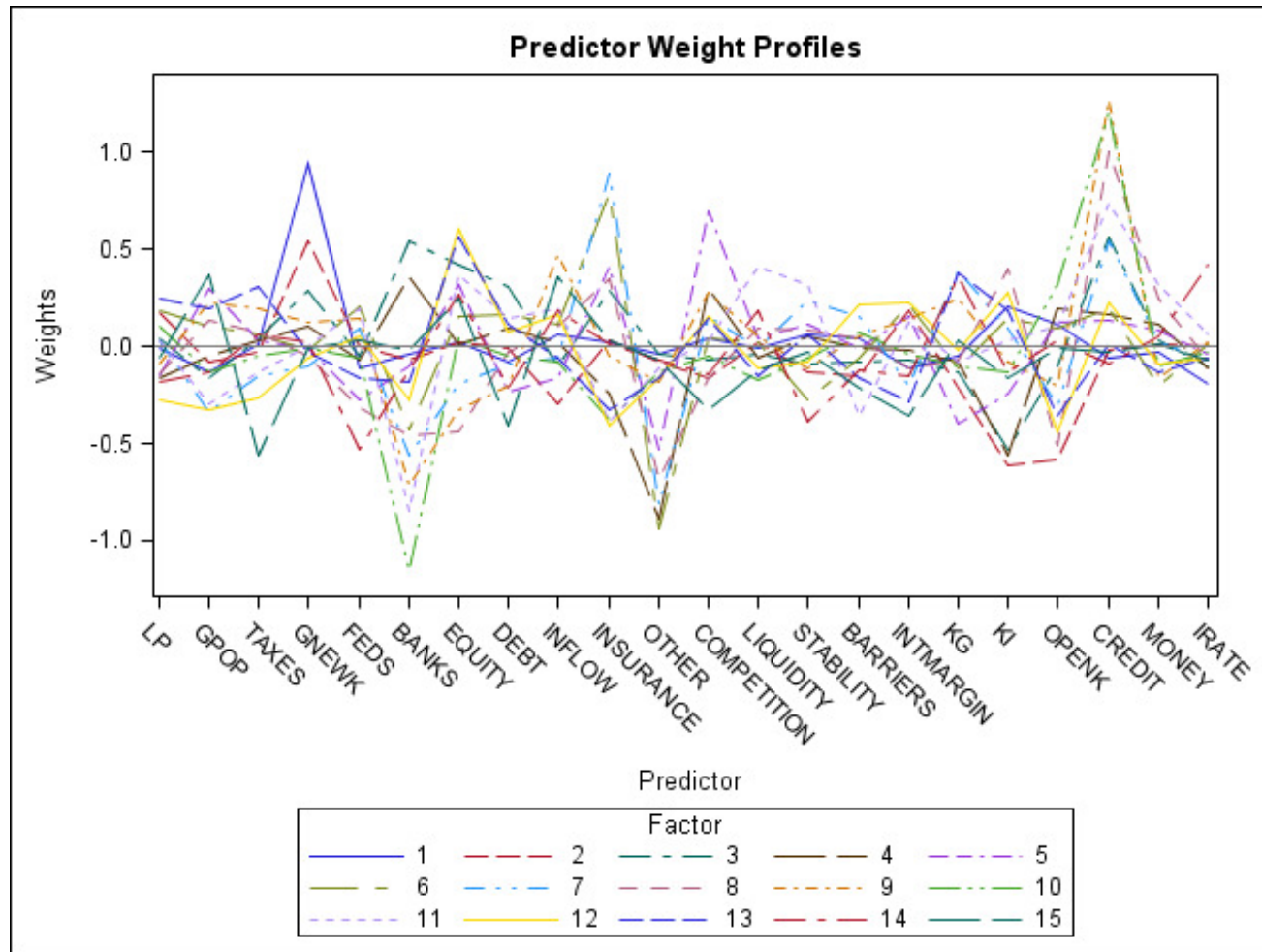


FIGURE 42
Spatial distributions of the estimates, Upper Middle Income Countries, 1960-2009

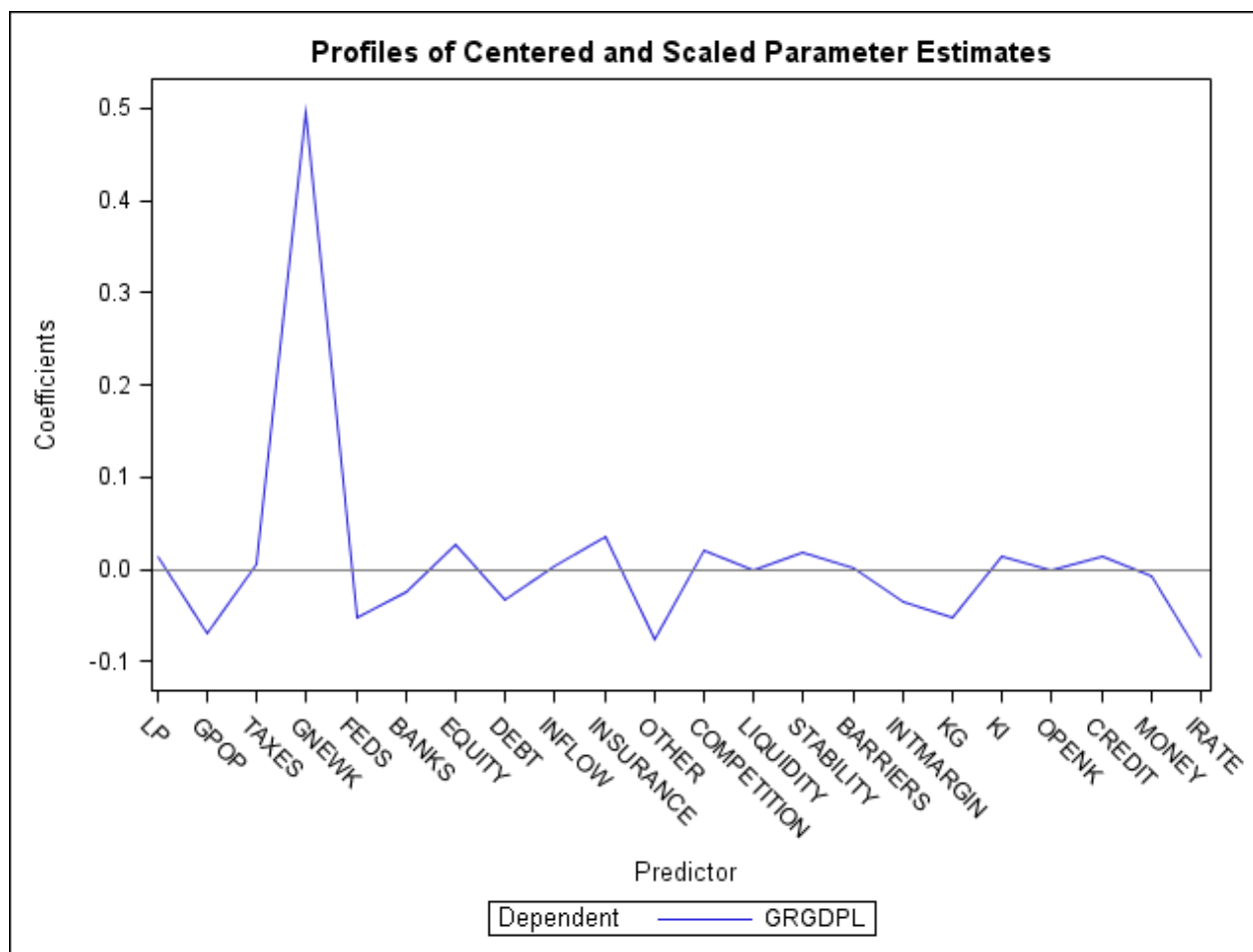


FIGURE 43
 R^2 Analysis for the Factors of High Income Countries, 1960-2009

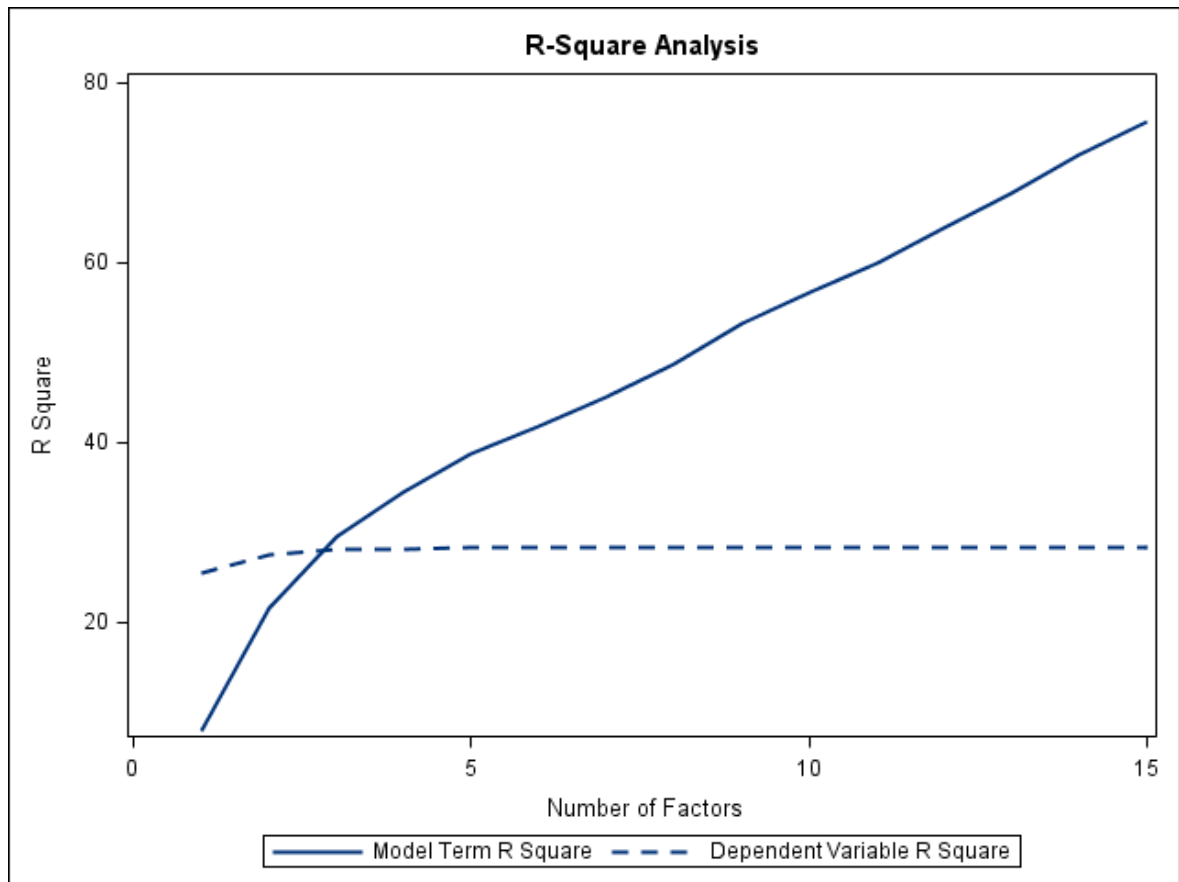


FIGURE 44
Very Important Predictor profile for the High Income Countries, 1960-2009

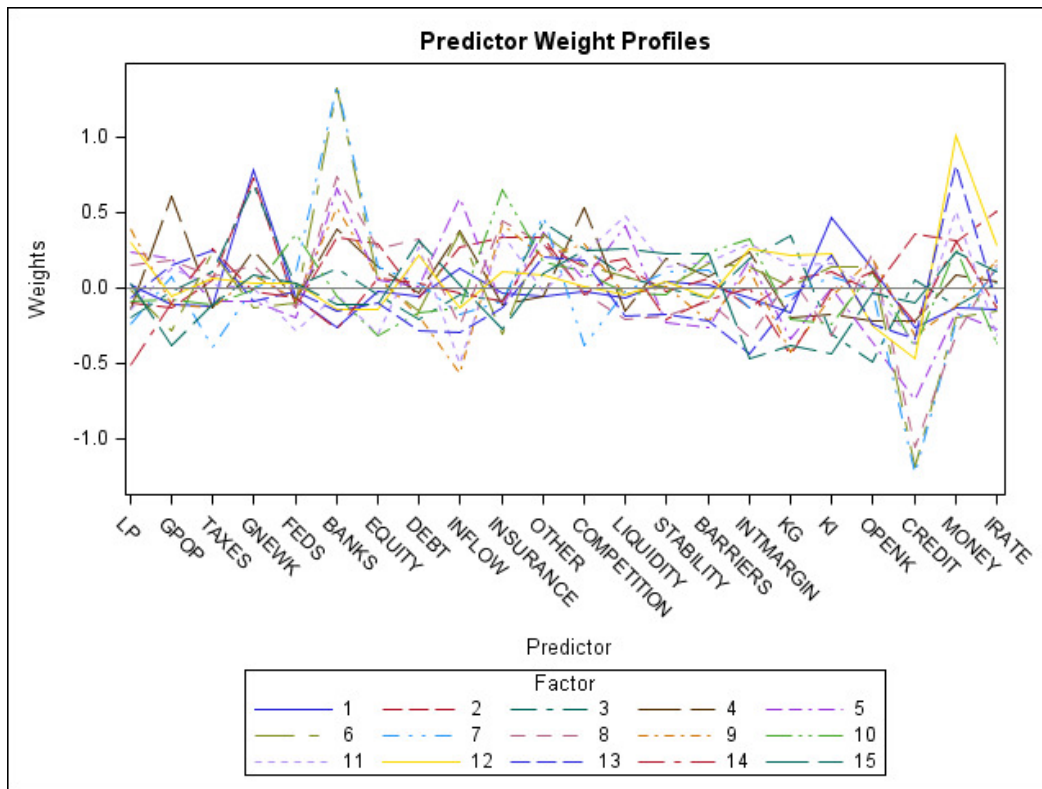
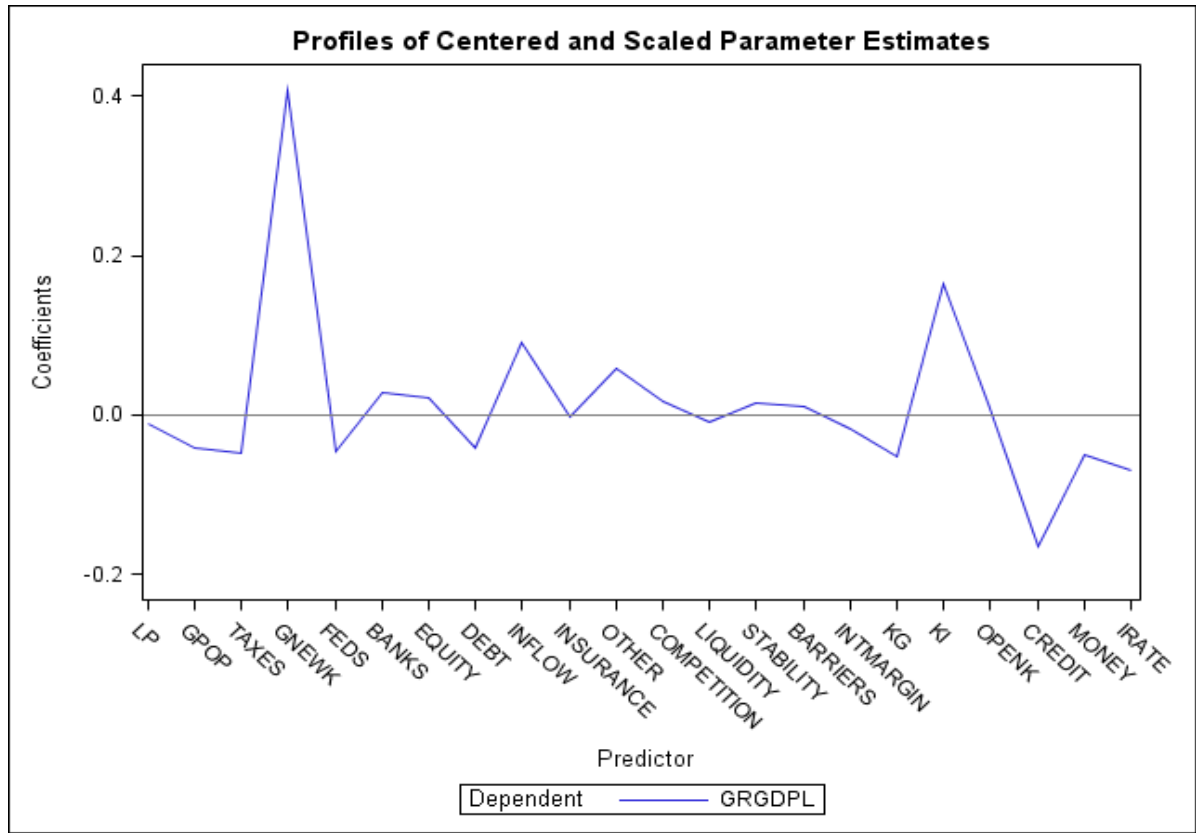


FIGURE 45
Spatial distributions of the estimates, High Income Countries, 1960-2009



VITA

GIBRAN REZAVI

EDUCATION

Ph.D. in Economics, University of Illinois at Chicago (UIC), anticipated 7/10-5/13

Dissertation: An Empirical Inquiry into the Developments of Financial Structures and Economic Growth

Committee: Gilbert Basset, Georgios Karras (Chair), Deirdre McCloskey, Joseph Persky, Paul Pieper, Houston Stokes

M.A. in Economics, UIC, 7/07-5/09

M.S. in Industrial Engineering, UIC, 1/97-12/98

B.S. (Honors) in Mechanical Engineering, UIC, 12/98

A.A.S. (High Honors) in Engineering Sciences, Wright College, 5/97

CERTIFICATIONS

Certificate in the Teaching of Economics, Center for Economic Education, 1/08-7/08

Graduate Certificate in Software Engineering, Illinois Institute of Technology, 1/99-5/00

HONORS AND AWARDS

2010 Oscar Miller Award for Teaching Excellence, 4/11

BOT Grant, 8/08-5/09, 8/10-present

Chancellor's Student Services Award, 5/98

Engineering Expo: 1st position (Transportation category), 4/98

ASHRAE Fellowship, 6/98-12/98

Who's Who in American Junior Colleges, 5/97.

Chicago Cubs Scholarship, 8/96

Harold Washington Academic Achievement Scholarship, 6/95-5/97

TEACHING EXPERIENCE

Adjunct Faculty, General Education, ITT Technical Institute, 12/09-present

Visiting Lecturer, Department of Economics, UIC, 7/08- 7/11

Adjunct Faculty, Department of Economics, Northeastern Illinois University, 1/10-7/11

Adjunct Faculty, College of Business, University of Phoenix, 6/10-7/11

Lecturer, Institute of Technology and Media, Robert Morris College, 12/98-3/99

COURSES TAUGHT

Principles of Microeconomics (traditional + online)

Principles of Macroeconomics (class size 118 students)

Intermediate Microeconomics (online)

Intermediate Macroeconomics

Money and Banking
Public Finance
International Economics (Trade)
International Monetary Policy and Theory
Econometrics
Environmental Economics
RESEARCH INTERESTS

Research Fields: Macro, Development, Monetary and Financial Economics.
Teaching Fields: International and Public Economics.

TECHNICAL SKILLS

Excel (intermediate), Access (intermediate), Stata (functional), SAS (functional), B34s (functional), RATS (functional), R (functional)

PRESENTATIONS

86th Annual IBEFA/WEAI Summer Meeting, 6/11
Graduate Economics Dissertation Workshop, UIC, 11/10

CONFERENCE PARTICIPATION

86th Annual IBEFA/WEAI Summer Meeting, 6/11 (presenter)
47th Annual FRB Chicago's Conference on Bank Structure and Competition, 5/11 (participant)

WORKING PAPERS

Financial Development and Economic Growth: Investigating the Indicators of Financial Structures
The Impact of Child Labor Mitigation on Economic Growth

PROFESSIONAL AFFILIATIONS

Member, American Economic Association (AEA), 8/08-present
Member, American Finance Association (AFA), 1/11-present
Member, International Banking, Economics and Finance Association (IBEFA), 1/11-present
Member, Western Economic Association International (WEAI), 1/11-present

RESEARCH EXPERIENCE

Research Assistant, Office of Sustainability, UIC, 1/10-present

- * Advised the Associate Vice Chancellor on campus affairs pertaining to sustainable development.
- * Maintained the GHG inventory for the entire campus.
- * Simplified the reporting formats by eliminating redundancies between reporting units and reduced associated time.

- * Worked with reporting units in generating numerical analyses.
- * Wrote executive summaries to support the above analyses.
- * Converted all archived paper data and files on personal computers into structured data directories on the network.
- * Imported the Excel-based data into an MS-Access database.
- * Automated monthly reports for the various units and the occasional ad-hoc queries.
- * Trained undergraduate students on various data collection best practices.
- * Supervised graduate students and web developers on the migration of all data, entries and reports into a web environment.
- * Provided reporting for Sustainability Tracking Assessment and Rating System (STARS) and the Sierra Club.

Research Assistant, Energy Systems Laboratories (UIC), 1/97-12/98

- * Assisted in Hydrogen production using Plasma conversion systems (funded by NASA and Air Liquide, Inc.).
- * Drafted experimental procedures and conducted Independent experiments.
- * Performed data analysis.
- * Assisted in writing grant proposals.

PROFESSIONAL EXPERIENCE

Industrial Engineering Planning Supervisor, United Parcel Service (UPS), 3/99-7/07

Industrial Engineering assignments:

- * Advised the operational management team both at all levels.
- * Created queries and reports using Access and Excel for strategic and operational support.
- * Improved the efficiency of the Supply Chain Logistics by undertaking several initiatives.
- * Managed Load-Planning to minimize the number of Loads On-Rail vs. On Road.
- * Redesigned internal package processing facility to increase productivity by reducing handling and knowledge units.
- * Updated time measurement studies to develop operational standards and the corresponding operating plans
- * Redesigned routes on the package (service provider delivery) side
- * Designed the largest seasonal premium service sort to handle Holiday season volume for the IL, WI, IN and MI.
- * Reduced approx. \$2.2 million for the Central Chicago (Jefferson Street) facility via training and auditing of the operational staff.
- * Utilized existing equipment and boosted productivity by 7% after a phased implementation
- * Followed up on adherence to plans by conducting audits and regularly briefing the executive group[s] on the findings.
- * Generated forecast of seasonal variation in package transmission volume along with staffing and production goals to meet demand.
- * Developed business and cost plans for fiscal years.
- * Trained new engineers and interns on UPS systems and analytical techniques for continued succession planning

Operations Management assignments:

- * Executed the IE developed business plans.
- * Managed day-to-day operational challenges involving employee turnover, production, service, and labor and safety concerns.
- * Supervised four full-time supervisors, eighteen part-time supervisors and over four hundred bargaining unit employees.
- * Enforced progressive discipline and conducted arbitration with multiple Teamster Local chapters (701,705,710).
- * Trained young supervisors and non-management personnel to enter jobs with greater management responsibility.
- * Ensured compliance to multiple governing bodies (FAA, DOT and OSHA).
- * Attained 8th overall operational ranking out of 480 possible plants in the last operational assignment.

Research Programmer, Microsystems (UIC), 6/98-3/99

- * Served in a dual capacity as a help desk supervisor and an Assistant LAN administrator.
- * Scheduled consultants to both on site and the phone banks.
- * Trained new consultants on troubleshooting methods in various environments: hardware and software.

LEADERSHIP

President, Graduate Students Council (GSC), 8/08-7/09, 8/10-present
Senator (Graduate Student Representative), UIC Faculty Senate, 8/08-7/09, 8/10-present
Senate Executive Committee
Budget, Planning and Priorities Committee
Supervisor Leadership School, UPS Leader Academy, 5/06
Leadership Academy, Dale Carnegie Institute, 3/03
President, American Society of Mechanical Engineers (ASME), UIC, 8/97-12/98
President, Phi Theta Kappa, Wilbur Wright College, 8/96-5/97

VOLUNTEER

Junior Achievement, 97-08
United Way, 04-07
Habitat for Humanity, 05

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