# Economic Development Levels and the Finance and Growth Nexus

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06 January 2017

This study investigates whether a country's level of economic development impacts its finance-growth relationship. The dynamic short run impact of financial system variables is tested against economic growth, focussed on levels of economic development, using a system GMM for 90 World Bank designated low, middle, and high income countries over 1980 – 2011. Our financial development measure includes domestic bond markets and insurance as well as the usual banking credit and stock market measures. The results confirm that levels of economic development matters in the financial development-economic growth nexus. We find that banking had a negative effect for all levels of development but more so for developed economies. Stock markets had a positive effect on growth for the middle income countries. Bond markets impacted growth positively for middle and high income countries. Insurance provides a positive relationship to growth for all three groups. In the pre-global crisis sample period, low income countries had the lowest impact on growth for banking, stock and bond markets. Also in the pre-crisis period sample tested, high income countries had the best banking result and positive effects from stock and bond markets on growth.

**JEL Classification:** O16; G20

**Keywords:** Financial development; Economic growth; Economic development

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The authors wish to thank the audience at Brown Bag at Monash University, the 2014 Paris Financial Management Conference, the 2015 Financial Management Association Conference for useful comments and feedback. The authors also wish to express gratefulness to Professor John Batten, Professor Barry Williams, Kathy Avram, Professor Robert Brooks, Professor Rodney Maddock, Dr. Duc Khuong Nguyen, Professor Alexandros Kontonikas, Dr. Florent Deisting for their valuable comments and suggestions.

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### 1. Introduction

A financial system is a complex interplay, of its many financial components where both financial intermediaries and financial markets matter in regards to economic growth (Levine, 2005). Although this is well accepted in the literature today, historically this view was not taken until the 1960s when the seminal works by Gurley and Shaw (1960), Goldsmith (1969), McKinnon (1973) and Shaw (1973), questioned which came first, financial development or economic growth.

How financial system components interact and impact on economic growth may differ based on each country's economic development. In low income countries, for instance, banks may play a greater role in promoting economic growth than other markets perhaps supporting the bank based financial system theory (Allen and Gale, 2000). As economies become more developed though, they also become more market based Demirguc-Kunt et al. (2011). Stock markets may take time to develop before they assist in growth, but a major benefit is that they allow investors to liquidate investments in long term projects rather than having to hold their investments until a distant maturity (Levine and Zervos, 1998), which thus supports the pooling of funds to facilitate long term economic growth. Bond markets too, may provide economic growth opportunities, but perhaps only in high income countries which may support the market based financial system theory (Allen and Gale, 2000). The risk mitigation properties of insurance may also assist in economic growth but it is uncertain if the level of economic development matters. The contribution of specific facets of a financial system to economic

growth, at different levels of economic development, may change over time, especially when considering crises with large shocks (Beck, 2012).

Despite an extensive financial development and economic growth literature, there is little consideration of how a country's level of income may impact on this relationship. Rioja and Valev (2004) reported a positive effect of banking and stock markets to economic growth on middle and high income countries, but negative results for lower income countries. In contrast Shen and Lee (2006) found banking had a weak negative relationship, which supports the negative banking leading to growth results in the recent finance-growth studies (Cecchetti and Kharroubi, 2012; Law and Singh, 2014). While theory would suggest financial development should be important (Beck, 2012), where financial development can be considered related to the ease with which a company can obtain finance for a productive project, where large risks can be spread across the economy and at a low cost (Rajan and Zingales, 2003), the empirical work can only offer proxies for what financial development might be. Levine, Loayza and Beck (2000), for example, used banking credit to GDP as their proxy, while Beck and Levine (2004) used stock market turnover as their proxy, but these components are only part of today's financial system. The more recent data availability for the bond markets and insurance industry allow for the construction of a more comprehensive proxy for financial development.

We therefore look to extend the Rioja and Valev (2004) study with a more comprehensive measure of financial development based on an expanded measure of financial system development using banking, stocks, bonds and insurance, as well as two sample periods to include or exclude the global financial crisis. Rioja and Valev (2004) highlighted a middle income positive effect in the finance-growth nexus, but with the the benefit of a longer sample,

we may be able to see a change for instance for low income countries where they may have had a catch-up effect in economic growth, and high income countries may have been impacted with the financial crisis.

Our measure of economic development is based on three categories of initial GDP per capita, and for robustness the sample is retested on two categories with the given World Bank classifications of Low/Middle Income versus High Income countries. Together with the mixed results for economic development leading to growth, motivates us to ask the following research questions: Does a country's level of economic development impact on the finance growth relationship? Has this relationship changed with the 2007/2008 financial crisis inclusion?

Our results for the banking sector showed a negative impact on economic growth but this impact was lowest for low income countries in the pre-crisis period, whereas in the full sample, high income countries had the lowest result. For stock markets a middle income positive effect was found in the full sample, but high income countries lost their positive effect once the global crisis was included. For domestic bond markets, a broad improvement in economic growth for all levels of economic development was found when contrasting the results of the full sample to the pre-crisis period. Finally, insurance promoted economic growth at all levels of development, however the effects were stronger with the inclusion of the crisis period. The rest of the paper is structured as follows: Section 2 examines the literature, Section 3 the methodology, with the results in Section 4, and conclusion in Section 5.

## 2. Literature

Although the causal link between finance and economic growth has long been debated, many studies link financial development and economic growth (e.g. King and Levine, 1993, Levine, Loayza and Beck, 2000). The pre-eminent paper that considered the level of economic development in the finance-growth relationship, Rioja and Valev (2004), found no significant evidence of finance leading to economic growth in less developed countries although they lacked stock market data for less developed countries. Meanwhile finance had no impact on growth for low income (developing) countries over 1960-1998 by Deidda and Fattouh (2002), but did hold for high income per capita countries.

The use of bank credit to the private sector has been a mainstay as a measure of financial development, and the initial results tended to support a positive result of banking leading to economic growth for middle income countries. For instance Odedokun (1996) used a sample from the 1960s to the 1980s and reported 85% of their less developed countries had a positive influence of banking to economic growth. Favara (2003) used a sample from 1960 to 1998, focussing only on the banking sector to measure financial development, and only found weak positive effects to growth for middle income countries. A middle income effect was also found by Demetriades and Law (2006) and Rioja and Valev (2004). Shen and Lee (2006) also supported the middle income effect but found that the banking sector size showed a negative influence to economic growth. But when they included conditional variables of financial liberalization, high income countries and good creditor protection, the results for banking become positive. Other literature based on more recent samples has consistently found banking to have a negative impact on economic growth. As a result, some have questioned if there is a frontier of finance beyond which banking no longer promotes economic growth (Beck and

Feyen, 2013; Law and Singh, 2014) or if banking credit in higher income countries is no longer a credible measure as banks move into other non-lending activities which also promote economic growth (Beck, Degryse and Kneer, 2014). We therefore expect that bank credit will lead to a positive middle income effect for economic growth, and the results for low and high income countries are expected to be negative.

When financial development is measured based on stock markets as used by Shen and Lee (2006), the results suggested that stock markets had a positive influence on economic growth. We therefore expect that the stock market measure will have a positive influence on economic growth at all levels of economic development.

Given private bond markets often develop and grow in line with a market based economy, a relationship may exist between a country's level of economic development and the role of its bond markets. Haiss and Fink (2006) argue that bond markets impact on growth even at low levels of development. The global financial crisis (GFC) of 2007-9 proved a serious challenge to the financial sectors and governments of many countries. Governments have sought to fund their resulting budget deficits through increased bond issues (Gruic and Shrimpf, 2014). Similarly, banks have sought longer term debt capital through the bond markets as have corporates seeking alternative debt finance. These measures could all cause the bond market to evolve new roles within the economy and so change its previous relation with economic growth.

Domestic bond markets normally have two main sub-markets: the public bond market (government-issued bonds) and private bond market (corporate-issued bonds)[1]. Government-issued bonds can help the price discovery process by serving as basis of pricing of the other borrowers who are subject to credit risk given their basis for establishing risk free yield curves (Herring and Chatusripitak, 2006). On the negative side, the bond market can result in excessive government borrowing which become a burden for the economy and reduce economic growth as well. The private bond market provides companies with a direct channel of funding instead of borrowing from banks. The deeper the bond market is and the better the market conditions in which it operates, the better the chance that corporate projects can be funded at lower rates, which encourages investments and fosters growth in the economy. Economies that are establishing their bond markets may mainly issue only government bonds, and the money raised from these issues may not be invested in growth projects as with perhaps middle and high income countries. We expect therefore that there may be a setup cost to establishing a productive domestic bond market, so it is expected that low income countries may not benefit from bond markets to the same extent as middle and high income countries. It would be expected that high income countries would benefit the most from bond markets given in these markets the bond markets will be more mainstreamed as a finance alternative.

Insurance may assist in risk mitigation and limiting exposure to onerous events. Webb, Grace and Skipper (2002) found that insurance together with banking had a significantly positive relationship with economic growth. Arena (2008) suggested that together with banking and stock market development, insurance activity also promotes economic growth by allowing for

[1] Offshore bond markets (international bond markets) are not included.

more efficient risk management. We therefore expect that insurance will have a positive effect in regards to economic growth.

## 3. Methodology

Following the finance-growth literature approach of maximizing the number of sample countries (e.g. Levine, Loayza, and Beck., 2000), we use a panel sample of 90 countries, with annual data from 1980 to 2011.[2] While five year average data used by prior studies (eg. Rioja and Valev, 2004) may smooth out business cycle and crisis effects, we use a crisis control variable (D_CRISIS) instead to capture the impact of financial crises on this finance-growth relationship.

Studies that begin with a 1960 or 1965 sample often report positive results for banking on the finance-growth relationship (e.g. Levine, Beck and Loayza, 2000; Rioja and Valev, 2004). More recent samples, such as used by Shen and Lee (2006) and Law and Singh (2014), often report a negative effect for banking, so the actual nature of banking leading to growth, may have changed over time. Our study begins in 1980, when financial deregulation and computer technology improvements occurred, and lasts until 2011.

In order to accommodate for the heterogeneity of the dataset and for robustness we also test the finance growth nexus using an economic development measure based on the World Bank classifications of income. First though, the whole sample is divided into three groups based on

[2] Due to data limitations, bond market data was available for 49 countries and insurance data for 79 countries.

their natural logarithm of initial (1980) GDP per capita (LGDPI) as used by Arena (2008) (refer to Appendix A). The first group contains countries with an initial LGDPI up to the 33.3 percentile of the sample ($D_L$), the second group has LGDPI inbetween the 33.3 percentile and the 66.6 percentile of the sample ($D_M$), and the third group with LGDPI at or above the 66.6 percentile of the sample ($D_H$). As a robustness test, we then redivide the sample into developing countries ($D_1$) based on 2011 World Bank classifications of low and middle income countries, and developed countries ($D_2$), based on high income countries. This multiple grouping approach follows the Levine (2005) suggestion that future finance-growth research should use diverse techniques and datasets.

*3.1 Measure of Financial Development*

Growth is measured as the real GDP per capita growth from the World Development Indicator (WDI). Following Levine. Loayza and Beck (2000), the banking sector variable BANK, is the amount of credit to the private sector by commercial banks as a share of GDP from the Financial Structure database (FSD). STOCK measures the stock market turnover based on total shares traded and average real market capitalization measured as:

$$T_t/P\_a_t/\{(0.5)*[M_t/P\_e_t + M_{t-1}/P\_e_{t-1}]\} \qquad (1)$$

where: T is total value traded, M is stock market capitalization, P_e is end of period CPI, P_a is average annual CPI (as used by Arena, 2008). Stock data is sourced from the Financial Structure Database calculated from raw data of Standard and Poor's Developing Market Database. T_BOND measures the total of public and private bonds for a particular country divided by GDP based on the Financial Structure Database. INS is insurance density measured

as the logarithm of the real total of life and non-life premiums per capita sourced from Sigma Swiss Re.

Our control variables follow Levine, Loayza and Beck (2000), Rioja and Valev (2004) and Arena (2008) and are sourced from the World Development Indicators, the World Bank, and IMF's IFS statistics. They include the following: logarithm of initial GDP per capita (LGDPI), government consumption (GOVT), inflation rate (INFLATION), trade openness (OPEN), and terms of trade (TOT). The initial GDP per capita (LGDPI) is added to address the convergence effect implied in the standard Solow-Swan growth theory (Levine, Loayza, and Beck, 2000). OPEN measures the ratio of exports and imports (in 2000 $US) to GDP. GOVT is the level of government consumption to GDP. INFLATION is the annual change in CPI. TOT is the logarithm differences of the net barter terms of trade index. A large government sector and a high inflation rate are presumed to affect growth negatively, whereas more openness and trade do so positively (Levine, Loayza, and Beck, 2000). To allow for the various crises, a dummy variable D_CRISIS is added using the banking crisis dates reported in Laeven and Valencia (2013).[3]

*3.2 Models*

Each of the main financial system component variables were tested for endogeneity using a Hausman test. BANK, STOCK, T_BOND and INS, all show endogeneity (p-value = 0.000 or close to it rejecting the null hypothesis) supporting the use of the generalized method of

[3] These include the crises for most countries in our sample, and specifically the technology crash in the U.S. (1997-2000), the Latin American crisis, the Asian financial crisis (1997-98) and the global financial crisis (2007-2011).

moments (GMM) estimation method. The GMM method, using two equations or a "system" estimator, as developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). It addresses the problem of endogeneity for the independent variables which is common in growth regressions (Beck, 2009). This is caused by the correlation of the right-hand side variables with the disturbance terms and can be a function of omission of relevant variables, measurement error, sample selectivity, unobserved country-specific effects (Baltagi, Demetriades, and Law, 2007). GMM can also handle disturbance heteroskedasticity and disturbance autocorrelation among the variables. The GMM estimator relaxes the normal distribution assumption on disturbance term, which is a required assumption for ordinary least square (OLS) estimation[4]. The Arellano-Bond and Arellano-Bover estimation is similarly suitable for panels with a large number of cross-section but small number of observations across time dimension and was used by Levine, Loayza and Beck (2000) and Beck and Levine (2004).

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta' FS_{i,t} + \gamma C_{i,t} + \eta_i + \varepsilon_{i,t} \quad (2)$$

where *i* denotes for country and *t* denotes for time period, $y$ is the logarithm of real per capita Gross Domestic Product (GDP), FS is a set of explanatory variables representing the financial system. This set will include four components: BANK, STOCK, T_BOND, INS (Insurance). C is a set of control variables, $\eta$ = an unobserved country-specific effect and $\varepsilon$ is the error term.

It is noted that the lagged dependent variable, which enters as an independent explanatory variable, should be correlated with the country-specific component of the error term $(\eta)$. To

[4] OLS is actually a special case of GMM estimator.

resolve this problem, Arellano and Bond (1991) proposed to take first difference of Equation (2):

$$\left(y_{i,t} - y_{i,t-1}\right) - \left(y_{i,t-1} - y_{i,t-2}\right) = \alpha\left(y_{i,t-1} - y_{i,t-2}\right) + \beta'\left(FS_{i,t} - FS_{i,t-1}\right) + \gamma\left(C_{i,t} - C_{i,t-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right) \quad (3)$$

While differencing eliminates the country-specific effect, it introduces a new bias; by construction, the new error term, $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$ is correlated with the lagged dependent variable, $\left(y_{i,t-1} - y_{i,t-2}\right)$. To remove this, Arellano and Bond (1991) proposed using the following moment conditions:

$$E\left[y_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})\right] = 0 \text{ for } s \geq 2,\ t = 3, \ldots, T. \quad (4)$$

$$E\left[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})\right] = 0 \text{ for } s \geq 2,\ t = 3, \ldots, T. \quad (5)$$

(X stands for explanatory variables: both $FS$ and $C$)

Noted that Equations (4) and (5) are under the assumption that: (a) the error term, ε, is not serially correlated, and (b) the explanatory variables, (both $FS$ and $C$, or X), are weakly exogenous (i.e. the explanatory variables are assumed to be uncorrelated with future realizations of the error term).

Using these moment conditions, Arellano and Bond (1991) propose a two-step GMM estimator. In the first step the error terms are assumed to be independent and homoskedastic across countries and over time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance–covariance matrix. This relaxes the

assumptions of independence and homoskedasticity. The two-step estimator is thus asymptotically more efficient relative to the first-step estimator. GMM estimator using Equation (3) is known as the "difference" estimator and Equation (2) is the "level" estimator.

The difference estimator, however, excludes any country-specific effect, which may be of interest. Therefore, Arellano and Bover (1995) and Blundell and Bond (1998) developed a "system" GMM estimator, which put the equation at "level" and "difference" together in a system (Equations (2) and (3)). This combination should help reduce the potential biases and imprecision associated with the difference estimator (Blundell and Bond, 1998).

The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumptions. Although there may be correlation between the levels of the right-hand side variables and the country-specific effect in Equation (2), there is no correlation between the differences of these variables and the country-specific effect. This assumption yields the following stationarity properties:

$$E\,[y_{i,t-p}\eta_i] = E[y_{i,t+q}\,\eta_i] \text{ and } E\,[X_{i,t-p}\eta_i] = E[X_{i,t+q}\,\eta_i] \text{ for all } p \text{ and } q. \qquad (6)$$

Therefore, additional moment conditions for the second part of the system (the regression in levels) are:

$$E[(y_{i,t-s} - y_{i,t-s-1})(\,\eta_i + \varepsilon_{i,t}\,)] = 0 \text{ for } s = 1 \qquad (7)$$

$$E[(X_{i,t-s} - X_{i,t-s-1})(\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s = 1 \quad (8)$$

The GMM system estimator is the combination of the equation at level and difference; therefore, the GMM system estimator is obtained using the moment conditions in Equations (4), (5), (7), and (8).

The consistency of the GMM estimator depends on the validity of the assumptions that the error terms do not exhibit serial correlation and on the validity of the instruments. Two standard specification tests are suggested by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The first is a Sargan test of over-identifying restrictions, which tests the validity of the instruments with the null hypothesis (Ho) that instruments used are not correlated with the residuals from the respective regression. The second test examines the hypothesis that error term of the first-difference regression is not serially correlated. The null hypothesis of this test confirms that errors in the first-difference regression exhibit no second-order serial correlation. As both tests failed to reject the null hypothesis, they support our use of the GMM model.

*3.3 Model Specifications for Economic Samples*

The main model in this study uses 3 groups of ranked initial (1980) logarithm of GDP per capita ($D_L$, $D_M$, $D_H$) against the four financial components based on Equation 9:

$$y_{i,t} - y_{i,t-1} = \alpha + \beta'_L D_L * FS_{i,t} + \beta'_M D_M * FS_{i,t} + \beta'_H D_H * FS_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t} \quad (9)$$

where *i* denotes for country and *t* denotes for time period, $y$ is the logarithm of real per capita gross domestic product (GDP), FS is a set of explanatory variables representing the financial system. This set includes the four financial system components: BANK, STOCK, T_BOND, INS (Insurance). The dummies for the economic development based on GDP are given as: $D_L$ = dummy for first group (LGDPI<33.3 percentile), $D_M$ = dummy for second group (33.3 percentile<LGDPI<66.6 percentile) and $D_H$ = dummy for third group (LGDPI>66.6 percentile). C is a set of control variables as given above.

The GMM system model used for robustness test use the other grouping of countries based on the World Bank developed and developing classification, for example where $D_1 = 1$ as a dummy if the country is a developing country, and $D_2 = 1$ as a dummy if the country is a developed country.

$$y_{i,t} - y_{i,t-1} = \alpha + \beta'_1 D_1 * FS_{i,t} + \beta'_2 D_2 * FS_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t} \qquad (10)$$

where *i* denotes for country and *t* denotes time period, $y$ = logarithm of real per capita gross domestic product (GDP), FS = a set of explanatory variables representing the financial system. It is comprised of four components: BANK, STOCK, T_BOND, INS (Insurance). C = a set of control variables, $D_1$ = dummy for developing country, $D_2$ = dummy for developed country and $\varepsilon$ = error term.

Hypothesis 2 is tested with Equations (9) and (10) based on a shorter sample period (1980 to 2006) to see if the Global Financial Crisis of 2007-2008 changes the relationships. To test the consistency of the GMM estimator, a Sargan test is performed to test the validity of the

instruments and second order correlation test for serial correlation. Variance Inflation Factor (VIF) tests are performed for multicollinearity in the regressions.

### *3.4 Descriptive statistics*

Descriptive statistics based on the low/middle/high income sample are provided in Table 1. Not surprisingly, the middle income group has the highest median real GDP per capita growth rate (median of 2.78%) and the high income group has the lowest figure (1.98%). Low income ($D_L$) and middle income countries ($D_M$) have similar absolute levels of banks, stock, bond and insurance markets and much lower for high income group ($D_H$). This is not surprising given their lower level of financial development. The low income countries ($D_L$) median private credit by banks to GDP (23.97%) is slightly less than the middle income countries ($D_M$) (29.02%), and less than one third of the high income countries (83.37%). The differential in stock markets is even more pronounced with the low income countries median of 12.48% around one fifth of the high income countries (57.99%). Low income countries bond market capitalisation is similar to the middle income countries but significantly less than the high income countries.

Median of insurance (INS) in low income countries ($D_L$) is approximately 60% of the middle income group ($D_L$) and 40% of the high income group ($D_H$). Government consumption (GOVT) is highest in high income countries with a median of 19.42%, followed by middle income countries (14.87%) and low income countries (13.28%). In constrast, the median inflation rate (INFLATION) is highest for low income countries (8.46%), slightly less for middle income countries (7.86%) but quite low for high income countries (2.85%). The degree of openness (OPEN) is highest in middle income countries (78.73%), followed by high income countires

(70.54%) and low income countries (67.41%). The terms of trade (TOT) is similar for low income and middle income group (-0.39% and -0.36%), but high income countries have a less negative figure.

*<Insert Table 1 about here>*

The correlation matrix (Table 2) suggests that the logarithm of initial value of total GDP (LGDPI) divided by population is correlated at the 95% level with INS. This is not surprising given that people with a higher income level would be more able to purchase insurance. Other variable correlations exist because they revolve around economic growth and relationships with each other. This highlights the endogeneity issue of growth regressions, and therefore justifies the use of the GMM estimation method as explained previously.

A number of Panel Unit Root tests are performed to ensure that the variables do not have a unit root attached to the series (Table 3). The Levin, Lin and Chu (2002) test is used for the common unit root test. For individual unit root tests, the Im, Pesaran and Shin (2003) tests and Fisher-type tests (Choi, 2001), which allow for an unbalanced panel dataset, are used. The result is a rejection of a common unit root or individual unit root, which suggests no unit root issues.

*<Insert Table 2 about here>*

*<Insert Table 3 about here>*

## 4. Results

Table 4 outlines the low, middle and high income country results for the finance growth relationship. Equation (1) in Table 4 and 5 include all four financial system components (banks, stocks, bonds and insurance). The test for multicollinearity (VIF) suggests that

multicollinearity is an issue, meaning that these equations should be interpreted with some caution. Hence, to interpret the effect of each financial component we rely therefore more on equations (2) to (5) where each financial system component is considered alone and has an acceptable VIF score.

*<Insert Table 4 about here>*

*<Insert Table 5 about here>*

Overall the banking measure of private credit provided by banks to GDP, for the full sample period, appears to have a negative relationship with GDP growth (Equation 2, Table 4). Higher income countries experience lower results (-0.03862***) and low income countries a higher but still negative (-0.02797***) result. The middle income result (-0.3489***) does not produce an inverted U-shape as others in the literature using banking have suggested as the high income coutries have an even lower result for banking (-0.03862***). The stock market results show a positive middle income effect (0.00953***) but no significance for low or higher income countries. The total domestic bond results (Equation 4, Table 4) suggest that low income countries experience a weak negative effect on growth (-0.00579*), whilst both middle and high income countries benefitted from bond markets with positive results. Insurance was positive for all three levels of income but strongest for middle income countries. This positive linkage of insurance markets to economic growth supports Arena (2008). The Wald Test results for each financial variable confirm a difference between the three country groups for all four financial system components.

Our shorter sample period of 1980 to 2006 to avoid the effects of the global financial crisis (Table 5, Equation 9) shows a number of changes. Banking (Equation 2, Table 5) remains

negative for all levels of income, but the results on level of development is reversed from Table 4 with high income countries now having the smallest negative impact in this pre-crisis sample and the low income countries with the largest negative impact. The effects from including the financial crisis in the sample highlight the impacts of the global financial crisis on the ability of banking markets in middle and high income countries to foster economic growth.

The stock market results (Equation 3, Table 5) for the pre-global financial crisis sample showed changed results. For low income countries the stock market has a negative effect suggesting perhaps a setup cost given the strong positive result for middle (0.00829***) and high (0.00728***) income countries. In contrast to the Table 4 results which include the crisis period, only middle income countries seemingly benefitted. The change for high income countries again suggests that their markets, this time stock markets, were seriously impacted by the global financial crisis.

Equation 4, of Table 5 suggests that the domestic bonds for low and middle income countries had negative effects on growth in the pre-crisis period and only weakly positive for high income countries. The Table 4 results, where the sample extends to 2011, shows a great improvement for all levels of income, with only low income countries still experiencing a negative effect from bond markets to growth.

Insurance coverage shows strong results for all levels of development in Model 5, Table 4. Contrasting these results to the pre-crisis sample however shows weaker but still positive results for all levels of development, but a middle income effect. These results highlight the

importance of the insurance sector in promoting economic growth during the turbulent times of the financial crisis, but also when catastrophic weather events occurred.

Robustness tests are then run by using the 2011 World Bank Classifications, as shown in Equation 10, of D1 (lower income) and D2 (higher income) countries. For banking results in Equation 2 of Tables 6 and 7 confirms the negative impact of banking on growth. In both samples the lower level of income countries have lower levels of banking contributing to growth (0-.03429*** for D1 with the full sample and -0.03847*** for the pre-crisis sample (Equation 2, Table 7). The smaller result for higher income countries holds for the alternate measure of income. A reason for the difference in results here could be attributed to the size of the D1 category based on both low and middle income countries as classified by the World Bank.

The robustness results for stock markets shows positive effects and the higher income countries have stronger results. The prior positive middle income effect as reported from Equation 3, Table 4 may help improve the low income countries' results in this particular test given only two groupings of countries. This suggests the initial three sample split may be more beneficial in understanding the impact of income levels on the finance-growth relationship.

For the bond market robustness tests (Equation 4, Tables 6 and 7) again support the notion of a negative result for low income countries in the pre-crisis sample but improved results for the whole sample result to 2011 (Table 6). The high income country results also improve with the full sample again supporting the notion that funds raised from the domestic bond markets

during the financial crisis period may have been invested in more economic income producing projects.

Robustness results for insurance also supported the initial results, suggesting the supporting nature of insurance during the crisis period, and higher positive effects for high income countries, which is not the same as the middle income effect with the prior delineation but with only two classifications in this case.

The control variables for Table 4 – 7 are similar and also behave consistently for both delineations and for two periods: 1980-2011 and 1980-2006. Initial GDP per capita (LGDPI) has a significant negative sign with economic growth for all equations. The negative sign of LGDPI means if the economic development of the country is low (low initial GDP per capita), then the economic growth rate will be lower, which is consistent with the literature (Barro, 1998). Openness (OPEN), as suggested by Levine, Loayza, and Beck (2000), brings more growth, so will have a positive, significant coefficient. This is true for all equations except equation (4) Table 5. This may be due to the lower number of observations and countries with equations having total bond data. Government consumption (GOVT) should have a similar sign with initial GDP per capita because larger government expenditures hinder the growth rate. This is observed for all equations in Table 4-7, where GOVT has a negative sign and is significant at 1%.

Inflation (INFLATION), like government spending, should hold a negative sign as higher inflation countries suffer lower economic growth. The coefficient of inflation is negative and

significant at 1% for all equations except equation (4) of Table 5. This again may be due to lower observations and countries with total bond data. Contrary to inflation, improving the terms of trade (TOT), should lead to an expansion of economic output, and hence, more growth. This is confirmed for all equation with TOT is positive and significant at 1% level.

The D_CRISIS, a dummy capturing the year of a banking crisis, takes a value of 1 for years with a crisis and 0 for years without one, has a significant (at the 1% level) and negative coefficient for all equations, which confirms the expectation that a country's growth rate would be affected negatively by having a banking crisis in that year.

All the Sargan test results of all the regressions reject the null hypothesis of an over-identifying model. Correspondingly, second order correlation test results reject the null hypothesis of serial correlation. Hence, for all the equations, the models are correctly identified and not suffered from serial correlation problems.

## 5. Conclusion

This study investigated whether the relationship between financial development and economic growth was impacted by a country's economic development. We used a system GMM estimator examining the finance-growth relationship on a sample of 90 countries with banking, stock market, domestic bond markets and insurance as our proxy measure of financial development. The countries were divided into three groups based on their initial per capita GDP level (low, medium and high income) and tested for the period 1980 to 2011. As robustness tests, this analysis was also performed using a two group (high income versus low

and medium income) approach and again for just the pre-global financial crisis period of 1980 to 2006.

We found that banking had a negative impact on economic growth, for all low, medium and high income countries, but the order reversed with the different sample periods. In the full sample period, high income countries had the lowest result, but in the pre-crisis sample period result, high income countries had the best result. This differs with earlier large scale studies using earlier sample periods that suggest positive effects of banking leading to growth (for example Beck et al., 2012 used 1994-2005). Nevertheless we confirm more recent data samples which find a negative relationship between banking and economic growth (e.g. Cecchetti and Kharroubi, 2012; Shen and Lee, 2006), although we find no evidence of an inverted U-shape. Using banking as the only measure of financial development, Law and Singh (2014) suggested that finance has a positive effect on growth up to a certain point after which this turns negative (an inverted U shaped relationship). Our full sample results for banking show that the higher developed countries had a more negative result for banking. This supports the Beck et al., (2012) argument that as households gain access to bank credit, this will lead less to GDP growth because household spending from bank borrowings may not lead to economic growth. Whereas if business receives funding for productive purposes further GDP growth should result. Business tended to deleverage when the financial crisis occurred so these effects may have spilled over on the ability of the banking sector to promote growth.

Our stock market result for the full sample, suggests a positive middle income effect, but an insignificant relationship for low income and high income countries. In the pre-crisis sample however, this positive effect covers both high income and middle income countries but the lower income group becomes negative. This again highlights the impact the inclusion of the

financial crisis period on the ability of stock markets to promote economic growth for particularly high income countries. The results also suggest that stock markets may need to achieve a certain threshold before having a positive impact on growth, given the results for low income countries, confirming the findings of Rioja and Valev (2004)..

The total domestic bond to economic growth shows mixed results. For high income countries, the results were positive for both sample periods and economic delineations. For both low income and middle income group domestic bond markets negatively impacted on growth prior to the financial crisis (pre-Global Financial Crisis). However, for the whole period from 1980 to 2011, domestic bonds had a positive impact on both middle as well as high income group. This suggests that the bond markets, especially for government bonds, were perhaps used to support growth more effectively after the global financial crisis. For the low income group, bond markets hold a negative relationship with economic growth. So poor countries, did not benefit from bond market development. This may be because large government bond issues of low income countries were not used to foster growth projects.

Our insurance results show a strong positive influence on economic growth in nearly all results regardless of the level of economic development with the strongest effect at middle level. The positive linkage of insurance markets to economic growth supports Arena (2008).

The results highlight the negative impact of the financial crisis on the banking and stock markets to promote growth, for high income countries. For low income countries, the inclusion of the financial crisis period led to an improvement in stock market and bond market results. Insurance improved for all levels of development when the financial crisis period was included,

which supports the risk mitigation aspects of this market in a financial system. The importance of specific areas of financial development therefore differ for the various levels of economic development. For low to middle income countries, insurance is most important followed by stock market and then bond markets. While both stock and bond markets provide a positive influence on growth for middle income countries, low income countries may question their development. For higher income countries, insurance, the bond markets and the stock markets are all important for economic growth.

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## Appendix A: Sample Delineation Based on Initial Per Capita Level of Income

| Lower Income | Middle Income | High Income |
|---|---|---|
| Nepal | Ecuador | Czech Republic |
| China | Ukraine | Portugal |
| Bangladesh | Peru | Hong Kong SAR, China |
| India | Georgia | Cyprus |
| Ghana | Fiji | Israel |
| Pakistan | Macedonia, FYR | Slovenia |
| Kenya | Kazakhstan | Spain |
| Sri Lanka | Costa Rica | Greece |
| Indonesia | Panama | Ireland |
| Kyrgyz Republic | Turkey | New Zealand |
| Zimbabwe | Romania | Italy |
| Egypt, Arab Rep. | Brazil | Australia |
| Mongolia | Uruguay | Japan |
| Nigeria | Korea, Rep. | United Kingdom |
| Zambia | Argentina | Finland |
| Thailand | Latvia | Saudi Arabia |
| Bolivia | Poland | Germany |
| Philippines | Estonia | Austria |
| Morocco | South Africa | Canada |
| Paraguay | Russian Federation | France |
| Cote d'Ivoire | Croatia | Belgium |
| Botswana | Mexico | Netherlands |
| Tunisia | Lithuania | United States |
| Mauritius | Hungary | Sweden |
| Jordan | Malta | Denmark |
| Iran, Islamic Rep. | Jamaica | Kuwait |
| El Salvador | Slovak Republic | Luxembourg |
| Bulgaria | Barbados | Iceland |
| Malaysia | Trinidad and Tobago | Norway |
| Colombia | Singapore | Switzerland |

## Appendix B: Variable Definitions and Sources

| Variable | Code | Definition and construction | Source |
|---|---|---|---|
| *Group 1: Economic Growth* | | | |
| **Real GDP per capita** | y | Ratio of GDP to total population. GDP is in constant 2005 US$ | World Development Indicator (WDI) |
| **Real GDP per capita growth** | GROWTH | Logarithm difference of real GDP per capita | Calculated, using WDI |
| *Group 2: Financial System variables* | | | |
| **Bank Credits** | BANK | Private credit by deposit money banks/GDP (total amount of credit to the private sector by commercial banks as a share of GDP)<br>Construction: $\{(0.5)*[F_t/P\_e_t + F_{t-1}/P\_e_{t-1}]\}/[GDP_t/P\_a_t]$ where: F is credit to the private sector by deposit money banks, P_e is end of period CPI, and P_a is average annual CPI. | Financial Structure Database, calculated from raw data of IFS |
| **Stock Market Turnover** | STOCK | Ratio of value of total shares traded and average real market capitalisation, denominator is deflated<br>Construction: $T_t/P\_a_t/\{(0.5)*[M_t/P\_e_t + M_{t-1}/P\_e_{t-1}]\}$ where: T is total value traded, M is stock market capitalization, P_e is end of period CPD, P_a is average annual CPI. | Financial Structure Database, calculated from raw data of Standard and Poor's Emerging Market Database (and Emerging Stock Markets Factbook). |
| **Total Bond** | T_BOND | Private and public bond market capitalisation/GDP (market value of private and public domestic debt securities issued by financial institutions and corporations as a share of GDP). | Financial Structure Database, calculated from raw data of Bank of International Settlements. |
| **Insurance** | INS | Logarithm of Real Total insurance premium per capita (in USD)<br>Insurance premium in USD converted to real figure by the formula: Nominal/(1+Inflation Rate) | Total Premium in USD from Sigma, Inflation figure from WDI |
| *Group 3: Control Variables* | | | |
| **Initial GDP per capita** | LGDPI | Logarithm of initial value of ratio of total GDP to total population | Calculated, using WDI |
| **Lag of GDP per capita** | LGDP | Lag of logarithm of GDP per capital | Calculated, using WDI |
| **Government Consumption** | GOVT | Ratio of government consumption to GDP | WDI, The World Bank |
| **Inflation Rate** | INFLATION | Annual change in CPI | IFS, line 64/ WDI |
| **Degree of openness** | OPEN | Ratio of exports and imports (in 2000US$) to GDP (in 2000 US$) | WDI, The World Bank |
| **Term of Trade** | TOT | Logarithm differences of the net batter terms of trade index | Calculated, using WDI, The World Bank |
| **Crisis Dummy** | D_CRISIS | Equals 1 for the year that the country has a banking crisis and equals 0 otherwise | Author adopted from Laeven and Valencia (2013) |

## Table 1: Descriptive Statistics Based on Low/Middle/High Income

**Panel A: Lowest Income group ($D_L$)**

| Variables | Mean | Median | Max. | Min. | Std. Dev. | Skewness | Kurtosis | N |
|---|---|---|---|---|---|---|---|---|
| ***Group 1: Economic Growth*** | | | | | | | | |
| GROWTH | 2.20 | 2.70 | 11.78 | -14.27 | 4.34 | -0.99 | 5.27 | 948 |
| ***Group 2: Financial system variables*** | | | | | | | | |
| BANK | 32.87 | 23.97 | 165.80 | 3.74 | 27.70 | 1.74 | 6.13 | 853 |
| STOCK | 34.03 | 12.48 | 307.82 | 0.35 | 55.32 | 3.05 | 13.37 | 590 |
| T_BOND | 32.00 | 27.69 | 112.11 | 2.17 | 22.51 | 1.49 | 5.47 | 169 |
| INS | 2.93 | 2.94 | 6.22 | 0.34 | 1.33 | 0.05 | 2.42 | 613 |
| ***Group 3: Control Variables*** | | | | | | | | |
| LGDP | 7.01 | 6.95 | 8.75 | 5.57 | 0.79 | 0.11 | 2.14 | 922 |
| GOVT | 13.91 | 13.28 | 29.91 | 4.83 | 5.10 | 0.64 | 3.19 | 923 |
| INFLATION | 17.83 | 8.46 | 500.00 | -0.85 | 48.07 | 7.78 | 70.47 | 897 |
| OPEN | 71.84 | 67.41 | 220.41 | 15.24 | 35.88 | 0.97 | 4.30 | 921 |
| TOT | -0.19 | -0.39 | 27.80 | -33.11 | 10.15 | -0.18 | 4.93 | 826 |

**Panel B: Middle Income group ($D_M$)**

| Variables | Mean | Median | Max. | Min. | Std. Dev. | Skewness | Kurtosis | N |
|---|---|---|---|---|---|---|---|---|
| ***Group 1: Economic Growth*** | | | | | | | | |
| GROWTH | 1.88 | 2.78 | 11.78 | -14.27 | 5.25 | -0.87 | 3.87 | 848 |
| ***Group 2: Financial system variables*** | | | | | | | | |
| BANK | 36.30 | 29.02 | 128.85 | 3.74 | 25.09 | 1.23 | 4.02 | 783 |
| STOCK | 37.76 | 13.43 | 307.82 | 0.35 | 56.41 | 2.52 | 9.94 | 546 |
| T_BOND | 31.49 | 27.10 | 113.81 | 2.17 | 23.23 | 1.00 | 3.83 | 274 |
| INS | 4.67 | 4.74 | 8.04 | 0.34 | 1.47 | -0.26 | 3.04 | 640 |
| ***Group 3: Control Variables*** | | | | | | | | |
| LGDP | 8.56 | 8.51 | 10.42 | 6.52 | 0.63 | 0.03 | 3.31 | 821 |
| GOVT | 15.36 | 14.87 | 29.91 | 4.83 | 4.61 | 0.21 | 2.23 | 846 |
| INFLATION | 36.26[5] | 7.86 | 500.00 | -0.85 | 90.91 | 4.15 | 20.28 | 821 |
| OPEN | 91.54 | 78.73 | 344.83 | 15.24 | 64.01 | 2.10 | 8.68 | 833 |
| TOT | -0.22 | -0.36 | 27.80 | -33.11 | 8.27 | -0.22 | 5.99 | 587 |

**Panel C: High Income group ($D_H$)**

| Variables | Mean | Median | Max. | Min. | Std. Dev. | Skewness | Kurtosis | N |
|---|---|---|---|---|---|---|---|---|
| ***Group 1: Economic Growth*** | | | | | | | | |
| GROWTH | 1.67 | 1.98 | 11.78 | -14.27 | 3.08 | -1.27 | 8.35 | 931 |
| ***Group 2: Financial system variables*** | | | | | | | | |
| BANK | 83.87 | 75.05 | 193.53 | 5.83 | 44.96 | 0.71 | 2.78 | 868 |
| STOCK | 68.90 | 57.99 | 307.82 | 0.35 | 49.89 | 1.33 | 5.45 | 649 |
| T_BOND | 75.61 | 67.85 | 204.33 | 2.17 | 45.34 | 0.88 | 3.46 | 559 |
| INS | 6.88 | 7.05 | 8.62 | 3.38 | 1.14 | -0.72 | 3.10 | 867 |
| ***Group 3: Control Variables*** | | | | | | | | |
| LGDP | 10.19 | 10.23 | 10.98 | 9.06 | 0.43 | -0.34 | 2.56 | 894 |
| GOVT | 19.77 | 19.42 | 29.91 | 5.62 | 4.73 | -0.15 | 3.29 | 938 |
| INFLATION | 6.00 | 2.85 | 373.82 | -0.85 | 18.83 | 14.00 | 238.77 | 910 |
| OPEN | 85.73 | 70.54 | 344.83 | 15.92 | 56.48 | 2.26 | 9.22 | 938 |
| TOT | 0.36 | -0.16 | 27.80 | -33.11 | 6.04 | 0.33 | 11.27 | 370 |

*Note: All variables in Group 1, 2 and 3 have been winsorized at 1% (both ends).*

[5] Levine and Renelt (1992) had an average inflation score of 31.13.

**Table 2: Correlation Matrix**

| Variables | GROWTH | BANK | STOCK | T_BOND | INS | LGDPI | GOVT | INFL | OPEN | TOT |
|---|---|---|---|---|---|---|---|---|---|---|
| GROWTH | 1.00 | | | | | | | | | |
| BANK | **-0.39** | 1.00 | | | | | | | | |
| STOCK | -0.08 | **0.25** | 1.00 | | | | | | | |
| T_BOND | **-0.33** | **0.49** | **0.38** | 1.00 | | | | | | |
| INS | **-0.48** | **0.69** | **0.39** | **0.57** | 1.00 | | | | | |
| LGDP | **-0.52** | **0.65** | **0.33** | **0.56** | **0.95** | 1.00 | | | | |
| GOVT | **-0.45** | **0.51** | **0.17** | **0.46** | **0.70** | **0.71** | 1.00 | | | |
| INFLATION | **0.26** | **-0.39** | **-0.18** | **-0.30** | **-0.54** | -0.49 | -0.31 | 1.00 | | |
| OPEN | -0.05 | **0.26** | **-0.28** | -0.01 | **0.17** | 0.15 | 0.14 | -0.13 | 1.00 | |
| TOT | 0.00 | -0.11 | -0.07 | **-0.17** | -0.13 | -0.14 | -0.08 | 0.00 | -0.15 | 1.00 |

This table shows Pearson pairwise correlation coefficients of the variables and control variables. Bold texts indicate statistically significant at 5% level or higher. Variables have been winsorized at 1%.

**Table 3: Panel Unit Root Test**

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin and Chu t* | -4.17078 | 0.0000 | 21 | 3087 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -2.49648 | 0.0000 | 21 | 3087 |
| ADF - Fisher Chi-square | 99.4392 | 0.0000 | 21 | 3087 |
| PP - Fisher Chi-square | 438.660 | 0.0000 | 21 | 5901 |

**Table 4: GMM System Results for Finance-Growth Relationship: Low, Middle and High Income per Capita Groupings (1980 - 2011)**

This table presents the results of the system GMM estimator estimate of Equation (9):

$$y_{i,t} - y_{i,t-1} = \alpha + \beta'_L D_L * FS_{i,t} + \beta'_M D_M * FS_{i,t} + \beta'_H D_H * FS_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t} \quad (9)$$

Sample of 90 countries, 1980-2011 (annual observations). Subscript *i* denotes countries, *t* denotes the time period. $y_{i,t}$ is logarithm of real per capita GDP, Dependent variable is GROWTH (Real GDP per capita growth), GROWTH(-1) is lag of growth, FS is a set of explanatory variables including: BANK is the banking industry variable (total amount of credit to the private sector by commercial banks as a share of GDP); STOCK is stock market turnover (ratio of value of total shares traded and average real market capitalization), T_BOND is bond market component measure (private and public bond capitalization/GDP), and INS (logarithm of real total insurance premium per capita) measures the insurance component. Control variables are: LGDP (lag of logarithm of GDP per capita), OPEN (ratio of imports and exports to GDP), GOVT (ratio of government consumption to GDP), INFLATION (annual change in CPI), TOT (logarithm differences of the net barter terms of trade index). YEAR is a year dummy. D_CRISIS is the dummy for year-crisis in countries. $D_L$ and $D_M$ and $D_L$ are dummies for a country's stage of economic development, dividing based on initial GDP per capita ($D_L$ = 1 for first group: LGDPI<33.3 percentile, $D_M$ = 1 for second group: 33.3 percentile < LGDPI < 66.6 percentile, $D_H$ = 1 for third group: LGDPI > 66.6 percentile). z -statistic in parentheses. *, **, *** indicates statistical significance at the 10%, 5% and 1% level.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| GROWTH(-1) | -0.19839*** | -0.15274*** | -0.16044*** | -0.15114*** | -0.16008*** |
| | (-9.682) | (-37.400) | (-27.236) | (-9.501) | (-22.938) |
| $D_L$BANK | -0.06303*** | -0.02797*** | | | |
| | (-7.838) | (-18.911) | | | |
| $D_M$BANK | -0.09643*** | -0.03489*** | | | |
| | (-13.558) | (-20.710) | | | |
| $D_H$BANK | -0.04903*** | -0.03862*** | | | |
| | (-3.918) | (-23.410) | | | |
| $D_L$STOCK | 0.01473*** | | 0.00030 | | |
| | (5.473) | | (0.702) | | |
| $D_M$STOCK | 0.01360*** | | 0.00953*** | | |
| | (4.520) | | (17.049) | | |
| $D_H$STOCK | 0.00839*** | | 0.00003 | | |
| | (3.330) | | (0.024) | | |
| $D_L$T_BOND | -0.02128*** | | | -0.00579* | |
| | (-5.195) | | | (-1.927) | |
| $D_M$T_BOND | -0.01420*** | | | 0.01209*** | |
| | (-3.340) | | | (3.985) | |
| $D_H$T_BOND | 0.01298*** | | | 0.01327*** | |
| | (2.765) | | | (3.822) | |
| $D_L$INS | 0.05817*** | | | | 0.02109*** |
| | (6.129) | | | | (7.171) |
| $D_M$INS | 0.08278*** | | | | 0.02884*** |

| | | | | | |
|---|---|---|---|---|---|
| | (9.611) | | | | (10.748) |
| $D_H$INS | 0.04459*** | | | | 0.02270*** |
| | (6.520) | | | | (9.606) |
| LGDP | -0.09129*** | -0.01157*** | -0.02754*** | -0.02941*** | -0.05380*** |
| | (-6.350) | (-9.878) | (-23.177) | (-3.968) | (-19.552) |
| OPEN | 0.05768*** | 0.06521*** | 0.07355*** | 0.02137** | 0.07038*** |
| | (7.604) | (33.666) | (31.667) | (2.058) | (30.585) |
| GOVT | 0.01625 | -0.06128*** | -0.05882*** | -0.03850*** | -0.06785*** |
| | (1.240) | (-74.261) | (-27.825) | (-11.841) | (-38.521) |
| INFLATION | 0.00422** | -0.01216*** | -0.00169*** | 0.00436*** | -0.00067 |
| | (2.490) | (-25.839) | (-3.425) | (2.820) | (-1.576) |
| TOT | 0.07186*** | 0.02530*** | 0.04080*** | 0.10331*** | 0.04378*** |
| | (5.664) | (12.589) | (8.110) | (9.873) | (8.689) |
| YEAR | -0.00258*** | 0.00157*** | 0.00053*** | -0.00008 | -0.00161*** |
| | (-4.643) | (15.392) | (4.662) | (-0.302) | (-6.941) |
| D_CRISIS | -0.04255*** | -0.04681*** | -0.06314*** | -0.05594*** | -0.05410*** |
| | (-20.098) | (-55.712) | (-62.607) | (-25.306) | (-51.062) |
| Constant | 5.64786*** | -2.96722*** | -0.93503*** | 0.44445 | 3.49717*** |
| | (4.880) | (-15.140) | (-4.200) | (0.879) | (7.456) |
| Observations | 666 | 1,554 | 1,317 | 695 | 1,329 |
| Number of countries | 49 | 90 | 90 | 49 | 79 |
| Sargan test p-value | 1.0000 | 1.0000 | 0.9995 | 1.0000 | 1.0000 |
| 2nd order correlation test p-value | 0.4596 | 0.2687 | 0.2652 | 0.2961 | 0.2036 |
| Wald-test p-value of: | | | | | |
| $D_L$BANK=$D_M$BANK=$D_H$BANK | 0.0000 | 0.0000 | | | |
| $D_L$STOCK=$D_M$STOCK=$D_H$STOCK | 0.2219 | | 0.0000 | | |
| $D_L$T_BOND=$D_M$T_BOND=$D_H$T_BOND | 0.0000 | | | 0.0000 | |
| $D_L$INS=$D_M$INS=$D_H$INS | 0.0000 | | | | 0.0000 |
| Mean VIF test | 24.08 | 5.00 | 2.19 | 4.01 | 6.68 |

## Table 5: GMM System Result for Finance-Growth Relationship: Low, Middle and High Income per Capita Groupings (1980 - 2006)

This table presents the results of the system GMM estimator estimate of Equation (9):

$$y_{i,t} - y_{i,t-1} = \alpha + \beta'_L D_L * FS_{i,t} + \beta'_M D_M * FS_{i,t} + \beta'_H D_H * FS_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t} \quad (9)$$

Sample of 90 countries, 1980-2006 (annual observations). Subscript *i* denotes countries, *t* denotes the time period. $y_{i,t}$ is logarithm of real per capita GDP, Dependent variable is GROWTH (Real GDP per capita growth), GROWTH(-1) is lag of growth, FS is a set of explanatory variables including: BANK is the banking industry variable (total amount of credit to the private sector by commercial banks as a share of GDP); STOCK is stock market turnover (ratio of value of total shares traded and average real market capitalization), T_BOND is bond market component measure (private and public bond capitalization/GDP), and INS (logarithm of real total insurance premium per capita) measures the insurance component. Control variables are: LGDP (lag of logarithm of GDP per capita), OPEN (ratio of imports and exports to GDP), GOVT (ratio of government consumption to GDP), INFLATION (annual change in CPI), TOT (logarithm differences of the net barter terms of trade index). YEAR is a year dummy. D_CRISIS is the dummy for year-crisis in countries. $D_L$ and $D_M$ and $D_H$ are dummies for a country's stage of economic development, dividing based on initial GDP per capita ($D_L$ = 1 for first group: LGDPI<33.3 percentile, $D_M$ = 1 for second group: 33.3 percentile < LGDPI < 66.6 percentile, $D_H$ for third group: LGDPI > 66.6 percentile). z -statistic in parentheses. *, **, *** indicates statistical significance at the 10%, 5% and 1% level.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| GROWTH(-1) | -0.15139*** | -0.12298*** | -0.16262*** | -0.16030*** | -0.14157*** |
| | (-3.921) | (-18.434) | (-38.161) | (-14.479) | (-48.166) |
| $D_L$BANK | -0.05830*** | -0.02714*** | | | |
| | (-9.636) | (-20.923) | | | |
| $D_M$BANK | -0.06799*** | -0.02631*** | | | |
| | (-11.164) | (-17.736) | | | |
| $D_H$BANK | 0.00195 | -0.01989*** | | | |
| | (0.198) | (-14.417) | | | |
| $D_L$STOCK | 0.01350*** | | -0.00114*** | | |
| | (4.239) | | (-3.061) | | |
| $D_M$STOCK | 0.02564*** | | 0.00829*** | | |
| | (11.992) | | (14.797) | | |
| $D_H$STOCK | 0.00713*** | | 0.00728*** | | |
| | (2.653) | | (8.929) | | |
| $D_L$T_BOND | -0.02154*** | | | -0.01982*** | |
| | (-7.587) | | | (-12.421) | |
| $D_M$T_BOND | -0.02293*** | | | -0.00510*** | |
| | (-6.086) | | | (-6.343) | |
| $D_H$T_BOND | -0.01665** | | | 0.00263* | |
| | (-2.240) | | | (1.879) | |
| $D_L$INS | 0.05864*** | | | | 0.00511*** |
| | (7.794) | | | | (6.033) |
| $D_M$INS | 0.06368*** | | | | 0.01502*** |
| | (12.440) | | | | (15.820) |
| $D_H$INS | 0.03719*** | | | | 0.01337*** |
| | (5.021) | | | | (14.271) |

| | | | | | |
|---|---|---|---|---|---|
| LGDP | -0.10628*** | -0.02235*** | -0.02280*** | -0.02322*** | -0.03368*** |
| | (-14.729) | (-20.285) | (-24.919) | (-10.358) | (-37.209) |
| OPEN | 0.03475*** | 0.02954*** | 0.01103*** | -0.00906*** | 0.01421*** |
| | (4.331) | (22.532) | (5.797) | (-4.444) | (17.844) |
| GOVT | 0.00611 | -0.05826*** | -0.06217*** | -0.05788*** | -0.06928*** |
| | (0.884) | (-91.778) | (-42.948) | (-21.668) | (-61.952) |
| INFLATION | -0.00701*** | -0.02077*** | -0.01305*** | -0.00635*** | -0.01034*** |
| | (-6.140) | (-81.505) | (-27.481) | (-8.830) | (-51.833) |
| TOT | 0.09971*** | 0.03606*** | 0.05127*** | 0.13321*** | 0.05544*** |
| | (7.281) | (18.494) | (20.582) | (18.585) | (32.329) |
| YEAR | -0.00103** | 0.00117*** | 0.00088*** | 0.00131*** | 0.00006 |
| | (-2.036) | (28.339) | (10.912) | (7.277) | (1.207) |
| D_CRISIS | -0.03974*** | -0.04085*** | -0.05006*** | -0.06140*** | -0.04195*** |
| | (-15.439) | (-63.447) | (-35.481) | (-31.061) | (-81.652) |
| Constant | 2.78069*** | -1.96489*** | -1.40443*** | -2.14183*** | 0.30022*** |
| | (2.741) | (-23.646) | (-8.839) | (-6.102) | (3.172) |
| Observations | 456 | 1,172 | 912 | 462 | 969 |
| Number of countries | 49 | 90 | 90 | 49 | 78 |
| Sargan test p-value | 1.0000 | 0.9999 | 0.9740 | 1.0000 | 1.0000 |
| 2nd order correlation test p-value | 0.9012 | 0.3311 | 0.4648 | 0.4958 | 0.4083 |

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

## Table 6: GMM System Results for Finance-Growth Relationship: Developing and Developed Country (1980-2011)

This table presents the results of the system GMM estimator estimate of Equation (10):

$$y_{i,t} - y_{i,t-1} = \alpha + \beta'_1 D_1 * FS_{i,t} + \beta'_2 D_2 * FS_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t} \qquad (10)$$

Sample of 90 countries, 1980-2011 (annual observations). Subscript *i* denotes countries, *t* denotes the time period. $y_{i,t}$ is logarithm of real per capita GDP, Dependent variable is GROWTH (Real GDP per capita growth), GROWTH(-1) is lag of growth, FS is a set of explanatory variables including: BANK is the banking industry variable (total amount of credit to the private sector by commercial banks as a share of GDP); STOCK is stock market turnover (ratio of value of total shares traded and average real market capitalization), T_BOND is bond market component measure (private and public bond capitalization/GDP), and INS (logarithm of real total insurance premium per capita) measures the insurance component. Control variables are: LGDPI (logarithm of initial value of ratio of total GDP to total population), OPEN (ratio of imports and exports to GDP), GOVT (ratio of government consumption to GDP), INFLATION (annual change in CPI), TOT (logarithm differences of the net barter terms of trade index). YEAR is a year dummy. D_CRISIS is the dummy for year-crisis in countries. D1 and D2 are dummies of a country's stage of economic development (D1 = 1 for a developing country and D2 =1 for developed countries). z -statistic in parentheses. *, **, *** indicates statistical significance at the 10%, 5% and 1% level.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| GROWTH(-1) | -0.19661*** | -0.13662*** | -0.06321*** | -0.07970*** | -0.06904*** |
| | (-8.132) | (-49.106) | (-13.731) | (-10.614) | (-14.929) |
| D1BANK | -0.08208*** | -0.03429*** | | | |
| | (-18.503) | (-24.702) | | | |
| D2BANK | -0.03988*** | -0.01029*** | | | |
| | (-3.682) | (-9.779) | | | |
| D1STOCK | 0.01884*** | | 0.00298*** | | |
| | (9.836) | | (14.737) | | |
| D2STOCK | 0.00750*** | | 0.00655*** | | |
| | (2.613) | | (7.016) | | |
| D1T_BOND | -0.01785*** | | | -0.00219 | |
| | (-7.261) | | | (-1.304) | |
| D2T_BOND | 0.00969* | | | 0.02763*** | |
| | (1.944) | | | (10.172) | |
| D1INS | 0.07522*** | | | | 0.01677*** |
| | (12.143) | | | | (17.222) |
| D2INS | 0.04936*** | | | | 0.01999*** |
| | (10.474) | | | | (23.923) |
| LGDPI | -0.09750*** | -0.04014*** | -0.02756*** | -0.03218*** | -0.04275*** |
| | (-8.928) | (-45.742) | (-19.776) | (-7.807) | (-27.748) |
| OPEN | 0.04490*** | 0.04617*** | 0.07027*** | 0.01595*** | 0.06150*** |
| | (4.224) | (29.140) | (30.137) | (2.667) | (30.019) |
| GOVT | -0.00691 | -0.05489*** | -0.06433*** | -0.09536*** | -0.07042*** |
| | (-1.214) | (-48.324) | (-31.069) | (-17.870) | (-71.808) |

| | | | | | |
|---|---|---|---|---|---|
| INFLATION | 0.00002 | -0.00994*** | -0.00496*** | 0.00120 | -0.00547*** |
| | (0.014) | (-27.476) | (-17.199) | (0.946) | (-13.506) |
| TOT | 0.07469*** | 0.03024*** | 0.04714*** | 0.13117*** | 0.04329*** |
| | (6.330) | (24.095) | (14.203) | (11.126) | (13.739) |
| YEAR | -0.00283*** | 0.00169*** | 0.00101*** | 0.00138*** | -0.00111*** |
| | (-5.156) | (29.235) | (9.063) | (8.128) | (-5.808) |
| D_CRISIS | -0.04137*** | -0.04269*** | -0.04976*** | -0.04995*** | -0.04386*** |
| | (-18.400) | (-46.274) | (-48.723) | (-31.080) | (-42.288) |
| Constant | 6.28047*** | -2.95137*** | -1.89896*** | -2.31307*** | 2.46241*** |
| | (5.919) | (-26.399) | (-8.904) | (-7.307) | (6.585) |
| | | | | | |
| Observations | 644 | 1,557 | 1,290 | 672 | 1,343 |
| Number of countries | 49 | 90 | 90 | 49 | 79 |
| Sargan test p-value | 1.0000 | 1.0000 | 0.9996 | 1.0000 | 1.0000 |
| 2nd order correlation test p-value | 0.4525 | 0.1000 | 0.5351 | 0.7507 | 0.1820 |
| Wald test p-value for: | | | | | |
| D1BANK=D2BANK | 0.0000 | 0.0000 | | | |
| D1STOCK=D2STOCK | 0.0007 | | 0.0002 | | |
| D1T_BOND=D2T_BOND | 0.0000 | | | 0.0000 | |
| D1INS=D2INS | 0.0001 | | | | 0.0004 |
| Mean VIF test | 18.96 | 3.58 | 1.77 | 2.87 | 5.98 |

z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

**Table 7: GMM System Results for Finance-Growth Relationship Pre-GFC: Developed and Developing Country (1980 – 2006)**

This table presents the results of the system GMM estimator estimate of Equation (10):

$y_{i,t} - y_{i,t-1} = \alpha + \beta'_1 D_1 * FS_{i,t} + \beta'_2 D_2 * FS_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t}$ (10)

Sample of 90 countries, 1980-2006 (annual observations). Subscript *i* denotes countries, *t* denotes the time period. $y_{i,t}$ is logarithm of GROWTH (real per capita GDP), Dependent variable is Real GDP per capita growth, GROWTH(-1) is lag of growth, FS is a set of explanatory variables including: BANK is the banking industry variable (total amount of credit to the private sector by commercial banks as a share of GDP); STOCK is stock market turnover (ratio of value of total shares traded and average real market capitalization), T_BOND is bond market component measure (private and public bond capitalization/GDP), and INS (logarithm of real total insurance premium per capita) measures the insurance component. Control variables are: LGDP (lag of logarithm of GDP per capita), OPEN (ratio of imports and exports to GDP), GOVT (ratio of government consumption to GDP), INFLATION (annual change in CPI), TOT (logarithm differences of the net barter terms of trade index). YEAR is a year dummy. D_CRISIS is the dummy for year-crisis in countries. D1 and D2 are dummies of a country's stage of economic development (D1 = 1 for a developing country and D2 = 1 for developed countries). z -statistic in parentheses. *, **, *** indicates statistical significance at the 10%, 5% and 1% level.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| GROWTH(-1) | -0.15344*** | -0.08042*** | -0.08252*** | -0.05361*** | -0.04780*** |
| | (-11.914) | (-40.948) | (-35.192) | (-10.319) | (-25.888) |
| D1BANK | -0.09621*** | -0.03847*** | | | |
| | (-26.841) | (-60.692) | | | |
| D2BANK | -0.00407 | -0.00305*** | | | |
| | (-0.692) | (-4.231) | | | |
| D1STOCK | 0.02133*** | | 0.00133*** | | |
| | (11.626) | | (5.492) | | |
| D2STOCK | 0.01269*** | | 0.00860*** | | |
| | (7.920) | | (14.506) | | |
| D1T_BOND | -0.02904*** | | | -0.01353*** | |
| | (-14.654) | | | (-10.321) | |
| D2T_BOND | -0.01889*** | | | 0.00577*** | |
| | (-3.337) | | | (4.244) | |
| D1INS | 0.06395*** | | | | 0.00667*** |
| | (20.414) | | | | (11.460) |
| D2INS | 0.03044*** | | | | 0.00914*** |
| | (7.402) | | | | (18.100) |
| LGDPI | -0.11340*** | -0.04239*** | -0.01898*** | -0.01561*** | -0.02110*** |
| | (-16.870) | (-138.221) | (-26.969) | (-11.213) | (-48.236) |
| OPEN | 0.05199*** | 0.01823*** | 0.00729*** | -0.00816** | 0.01882*** |

| | | | | | |
|---|---|---|---|---|---|
| | (13.441) | (24.053) | (5.901) | (-2.374) | (33.442) |
| GOVT | -0.03152*** | -0.06027*** | -0.06456*** | -0.08897*** | -0.07060*** |
| | (-7.798) | (-138.773) | (-137.856) | (-36.821) | (-125.321) |
| INFLATION | -0.00876*** | -0.01527*** | -0.01101*** | -0.00757*** | -0.00915*** |
| | (-14.800) | (-72.443) | (-41.531) | (-14.556) | (-55.742) |
| TOT | 0.09033*** | 0.01940*** | 0.04796*** | 0.14912*** | 0.04344*** |
| | (14.167) | (17.096) | (44.768) | (21.145) | (43.327) |
| YEAR | -0.00036 | 0.00128*** | 0.00110*** | 0.00202*** | -0.00001 |
| | (-0.783) | (32.243) | (15.642) | (8.193) | (-0.379) |
| D_CRISIS | -0.02662*** | -0.03474*** | -0.04142*** | -0.05213*** | -0.03487*** |
| | (-13.367) | (-63.118) | (-105.823) | (-70.832) | (-116.240) |
| Constant | 1.61894* | -1.97170*** | -1.85560*** | -3.57318*** | 0.32503*** |
| | (1.853) | (-25.269) | (-13.810) | (-7.499) | (4.439) |
| Observations | 445 | 1,218 | 899 | 451 | 996 |
| Number of countries | 49 | 90 | 90 | 49 | 78 |
| Sargan test p-value | 1.0000 | 1.0000 | 0.9292 | 1.0000 | 1.0000 |
| 2nd order correlation test p-value | 0.1158 | 0.2912 | 0.9421 | 0.9629 | 0.3881 |

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1