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Abstract

We revisit the relationship between financial development and economic growth in a panel of 52 middle income countries over the 1980-2008 period, using pooled mean group estimator in a dynamic heterogeneous panel setting. We show that financial development does not have a linear positive long-run impact on economic growth in this sample. When we consider a non-linear relationship between financial development and growth, we find an inverted U-shaped relationship between finance and growth in the long run. In the short-run, the relationship is insignificant. This finding suggests that middle income countries face a threshold point after which financial development no longer contributes to economic growth.

JEL-Code: C230, O110, O160, O470.

Keywords: financial development, economic growth, heterogeneous panels, pooled mean group estimation, non-monotonicity.

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I. Introduction

Over the last several decades, economists seemed to have reached a general consensus that the link between financial development and economic growth is positive. Recent empirical studies, however, offer contradictory evidence (see Kaminsky and Reinhart, 1999; Deidda and Fattouh, 2002; Wachtel, 2003; Favara, 2003; Rousseau and Wachtel, 2011and Arcand et al., 2011 and Demetriades and Rousseau, 2011). Consequently, the current verdict on the financial development-growth relationship has remained inconclusive. In this paper, we re-examine this relationship in the context of middle-income countries. When doing so, we apply recently developed econometric techniques that allow the relationship to vary between the short and long run, and the short-run relationship to vary across countries.

The original view (see Schumpeter, 1934); Gurley and Shaw, 1955; and Goldsmith, 1969) holds that a well-developed financial system stimulates growth by channelling savings to the most productive investment projects. Conversely, financial repression results in a poorly functioning financial system that in turn depresses growth: this can happen as a result of excessive government interference in the financial system with measures such as interest rate ceilings, higher bank reserve requirements, and direct credit programs to preferential sectors. The recent endogenous growth literature highlights the positive role of the financial sector in driving economic growth, particularly through its role in mobilizing savings, allocating resources to the most productive investments, reducing information, transaction and monitoring costs, diversifying risks and facilitating the exchange of goods and services. This results in a more efficient allocation of resources, a more rapid accumulation of physical and human capital, and faster technological progress (see Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; Roubini and Sala-i-Martin, 1992; King and Levine, 1993a; Greenwood and Smith, 1997; Levine, 1997; Levine, 2005).

Empirically, there have been various approaches to explore the relationship between finance and growth. Past research was based on cross-sectional data using standard OLS estimation methods, which confirmed the positive correlation between financial development and economic growth (for instance, Goldsmith, 1969; King and Levine, 1993a, 1993b; and Levine and Zervos, 1998). While their findings suggest that finance helps to predict long-term growth, a number of authors (Chuah and Thai, 2004; Khan and Senhadji, 2003; and Barro, 1991) argue that conclusions based on cross-sectional analysis are unreliable and have several econometric problems. First, these results are sensitive to the sample of countries chosen. In other words, it is inappropriate to draw policy implications from findings obtained from cross-country studies that treat different economies as homogeneous entities. Second, cross-sectional studies do not take advantage of time-series variation in the data. Finally, the issue of causality cannot be handled formally in cross-sectional studies (Khan and Senhadji, 2003). Moreover, Ahmed (1998) and Ericsson et al. (2001) point out that using instrumental variables does not solve this problem when the data are averaged over long periods. Furthermore, using time-series data does not resolve these problems either: Christopoulos and Tsionas (2004) and Beck (2008) argue that high-frequency data is required to gain econometric power from the time series approach, which limits the analysis to just a few countries for which such data are available.

In order to reduce the shortcomings of both cross-sectional and time series analysis, researchers increasingly turn to panel data that enable them to combine time series and cross-sectional features and offer a variety of estimation approaches (for example Calderon and Liu, 2003; Christopoulos and Tsionas, 2004; Dawson, 2010). However, these studies apply either the traditional fixed or random effect methods, or the panel cointegration technique. The former averages the data per country to isolate trend effects which hides the dynamic relationship between the variables of interests. The latter has the disadvantages that the evidence of long-term relationships can be obtained only when variables are integrated at the same level (Pesaran and Smith, 1995; Pesaran, 1997; and Pesaran and Shin, 1999)[5].

Recently, Loayza and Ranciere (2006) attempt to reconcile the remaining issues in the finance-growth nexus. They employ annual data with 75 countries over the period 1960-2000, use a panel error correction model and estimate this model by pooled mean group estimator (PMG). The novelty of this approach is that it allows for heterogeneity in parameters in growth regressions. Furthermore, this methodology distinguishes between the short and long-run effect of finance on growth. They find a significant and positive long-run relationship between financial development and economic growth, while the short- run impact is significant and negative. They suggest that the negative short–run effect may be a result of cross-country heterogeneity in general, and higher volatility of business cycles in particular. They, nevertheless, do not allow for the non-monotonic effect of financial deepening.

Other contributions to the recent empirical work highlight the non-monotonic relationship between financial development and growth. For example, Deidda and Fattouh (2002) apply a threshold regression model and suggest that the relationship between finance and growth is non-linear and possibly non-monotonic. They argue that financial depth does not affect economic growth in the same

[5]This issue will be discussed more extensively in the methodology section.

way in countries at different income levels. Their finding suggests that in low–income countries the relationship between financial development and economic growth is statistically insignificant. However in high–income countries, there is a positive link between financial development and economic growth.

Similar results were found by Rioja and Valev (2004), Rousseau and Wachtel (2002) and Favara (2003). More recently, Arcand et al. (2012) utilize different types of datasets at the country level and industry level. They find that the finance and growth relationship is positive only up to a certain point, and after that it turns negative. This negative relationship occurs once financial development, measured as the ratio of private credit by banks to GDP, exceeds a threshold of about 110% of GDP for high-income countries. This result was consistent across different types of estimators, including simple cross-section OLS regression, semi-parametric estimations and system- GMM.

In the light of the on-going debate on the role of financial development in economic growth, we seek to contribute to the debate on the effects of financial development from an empirical perspective in the following ways. First, we adopt the recently developed dynamic panel heterogeneity analysis based on the technique introduced by Pesaran et al. (1999). Specifically, we use the autoregressive distributed lag (ARDL) model, where the estimations are carried out by three different estimators: the pooled mean group (PMG), mean group (MG), and the dynamic fixed effect (DFE) estimators in order to examine both the long- and short-term effects of financial intermediation on growth. The use of these techniques allows us to take into account the country-specific heterogeneity issue. Second, we consider 52 middle income countries.[6] Although there is a large body of literature that investigates the linkage between financial development and economic growth in advanced countries, far less is known about this relationship in developing countries. The focus on advanced countries is particularly prevalent because of the nature of their financial markets. Financial systems in advanced countries can efficiently facilitate the mobilization of capital between surplus and deficit agents, which eventually leads to economic growth. Developing countries, on the other hand, used to have less developed and less efficient financial systems with lower levels of banking intermediation. However, from in 1980s onwards, developing countries have improved the efficiency of their financial markets. Nonetheless, previous studies argue that the relationship between financial development and economic growth in developing countries is inconclusive (Kar et al, 2011). Therefore, this paper considers a panel of middle-income countries. Third, given that financial development can be captured by several possible indicators, we use principal component analysis (PCA) to build an indicator of financial development that is as broad as possible and captures various dimensions of the financial sector. Finally, in contrast

[6]The World Bank classification in 2010 is considered here.

to Loyaza and Ranciere (2006), we allow for the existence of a non-linear relationship between financial development and economic growth in order to investigate the possibility of the economy being adversely affected due to "too much" finance. To achieve this, we include a quadratic term in the models used in our analysis. In addition, we follow the recent study by Lind and Mehlum (2010) to test for an inverted U shaped relationship. By applying this test, both necessary and sufficient conditions for the test of a U shape can be obtained[7].

Our findings show no evidence of financial development having a significant linear impact on economic growth in the long or short-run. However, the test for the existence of a non-linearity confirms that the relationship between financial development and economic growth is different from the predominant view. Financial deepening might have a negative effect beyond a certain threshold.

The remainder of this paper is organized as follows: Section II outlines the data and describes the construction of the financial development indicator. Section III explains the econometric methodology used to analyze the long- and the short-run impact of financial development on economic growth. The empirical results of the paper are discussed in section IV. Finally, Section V concludes the paper.

II. Data Description

This study adopts a panel-data approach covering 23 upper- and 29 lower-middle income countries, as classified by the World Bank (WB) in 2010, over the period 1980-2008,[8] to examine the dynamic relationship between financial development and economic growth.[9]

The dependent variable and the control variables

The dependent variable is economic growth, measured by the real GDP growth rate, denoted by gdpg. As far as the economic variables are concerned, we consider the typical variables that are used in the literature.[10] These variables include the population growth rate, used as proxy for growth of the labour force, and is denoted by pop, and openness to trade (the ratio of exports plus imports to GDP), denoted

[7] An inverted U-shaped test by Lind and Mehlum, 2010, will be discussed in detail in the results and discussion section.
[8] We have checked if there were any changes in the 2013 WB classification and we have found that Fiji moved to the lower income category. Ecuador, Jordan and Peru become upper middle income countries. However, it is noteworthy that when we re-estimated all the models in with these changes, the results in terms of sign and significance level remain as same as in the main estimation in this paper. Therefore, we did not report these changes in our current version.
[9] A number of middle income countries were excluded from our sample due to lack of sufficient data. Appendix 1 presents the sample of countries used in the analysis.
[10] Some important controls are not available for the whole sample of 52 countries, such as secondary school enrolment as an indicator of human capital.

as trd, as a proxy for the importance of international factors in influencing economic activity. Finally, government consumption expenditure as a percentage of GDP, denoted by gov, is also included. Government consumption expenditure is vital in assessing the importance of fiscal policy in providing the public goods for both individuals and business, especially in education, health care and infrastructure. However, this variable also captures whether government expenditure creates distortions, which in turn lower growth. Finally, we include gross fixed capital formation as a percentage of GDP, denoted by lnca, to capture the investment physical capital. We include also a dummy for upper middle income countries, denoted by dincome.[11]

Measures of financial development

The construction of the variables to capture financial development is a difficult task due to a number of reasons. Financial services are provided by a wide range of financial institutions and agents. Among them, banks and stock markets both play a major role. In order to capture a complete picture, we need to consider different aspects of financial development, for instance, whether the financial sectors of the studied countries are dominated by banks or the stock market or both. However, our prime objective is to investigate the long-run relationships. Therefore, we use bank-based financial proxies due to the unavailability of long-span time series data for the stock market for many of the countries.[12]

Most of the empirical literature on this topic uses monetary aggregates such as M2 and M3 as a ratio of nominal GDP to capture the overall size and depth of the financial sector. However, some researchers such as Khan and Senhadji (2003) argue that M2/GDP might be a poor proxy for financial development in the case of countries with underdeveloped financial systems for two reasons. First, high level of monetization might be linked to financial underdevelopment and vice versa. Second, M2 mostly captures the ability of the financial system to provide transaction services rather than its ability to link up surplus and deficit agents in the economy. Several papers including Beck et al (2000); Favara (2003) and Deidda and Fattouh (2002) suggest to employ M3/GDP, which is a less liquid monetary

[11] Appendices 2 and 3 report the summary statistics and describe all the variables utilized in the empirical analysis, and also provide a list of sources.

[12] We initially considered stock market indicators, such as market capitalization, turnover, and stock returns, as measures of financial development, along with bank-based indicators. However, due to missing data, we had to exclude these and utilize only the bank-based data. This mirrors the practice in much of the related literature on emerging economies which focuses on the banking sector and omits stock market development, either because of data unavailability, or because the banking sector is the dominant sector in these countries. For individual country examples, see Demetriades and Luintel, 1996, and Bhattacharya and Sivasubramanian, 2003, for the case of India; Matos and Orlando, 2002, for Brazil; Ang and McKibbin, 2007, for Malaysia; Ozturk, 2008, and Halicioglu, 2007, for Turkey. For middle income countries, see, for example, Hassan et all, 2011; Hauner, 2009. Given that Demirguc-Kunt and Levine (1999) find in a cross-section of 150 countries that the stock market tends to play a more important role in high income countries than in middle and lower income countries, we feel we should not lose much by not being able to include stock market variables.

aggregate, as a proxy for financial development. Therefore, in this paper we use the M3, as a proportion of GDP.

Although M3/GDP shows the amount of liquid liabilities of the financial system, including the liabilities of banks, central banks and other financial intermediaries that reflects financial deepening, which is positively related with financial services, King and Levine (1993); Demetriades and Hussein (1996); Favara (2003). Nevertheless, Fry (1997) and Ang and McKibbin (2007) among others indicate that monetary aggregates are not good enough as proxies for financial development since they reflect the extent of transaction services provided by the financial system rather than the ability of the financial system to channel funds from depositors to investors. Therefore, credit to the private sector as a proportion of GDP is the third most widely used alternative measure of financial development. It is often argued that credit to the private sector is a better proxy of financial development (see Demetriades and Hussein, 1996; King and Levine, 1993a; Beck et al, 2000; Favara, 2003; Liang and Teng, 2006; Arcand et al., 2011). The importance of this measure rests in the fact that it only accounts for credit granted to the private sector that enables the utilization of funds and their allocation to more efficient and productive activities. It also excludes credit issued by the central bank and thus is a more accurate measure of the savings that financial intermediaries channel to the private sector.

Another frequently used variable is the ratio of commercial bank assets divided by the sum of commercial bank and central bank assets (see, Ang and McKibbin, 2007; Campos and Kinoshita, 2008). This variable measures the relative importance of a specific type of financial institutions (commercial banks) in the financial system. Ang and McKibbin (2007) argue that the advantage of this measure is that commercial banks make more efficient use of funds than central banks by channelling savings to profitable investment opportunities.

Based on this review, we construct an aggregate indicator of financial development as a composite variable that represents the overall development in the financial sector. The resulting variable combines three widely used indicators of financial development in the literature: the ratio of liquid liabilities (or M3) to nominal GDP (denoted *m3*), the ratio of commercial bank assets to the sum of commercial bank assets and central bank assets (*basset*) and the ratio of bank credit to the private sector to GDP (*private*). The source of these data is the 2008 version of World Bank's Financial Structure Dataset (Beck et al.,2008).[13] We follow the work of Ang and McKibbin (2007); Gries et al. (2009) and Campos

[13]Available at http://econ.worldbank.org/staff/tbeck.

and Kinoshita (2010), among others, to combine these variables into a single indicator by using principal components analysis (PCA). We denote the resulting variable as FD.

Our justifications for the need to construct this single variable are as follows: First, when we include all three financial variables in each regression, in most cases we obtain inconsistent results, which might be because financial development variables are highly correlated amongst themselves.[14] Thus, we use this index to overcome the problems of multicollinearity. Second, studies attempting to investigate the link between financial development and growth have no uniform argument as to which proxies are most appropriate for capturing this linkage: they choose a number of different measures and subsequently come up with different results (see Chuah and Thai, 2004; Khan and Senhadji, 2003; King and Levine, 1993a; Savvides, 1995; among others). We believe that this new index of financial development is able to capture most of the information from the original data and is a better indicator than the individual variables.

Table 1 presents the results of the principal component analysis. The financial development indictor (FD) corresponds to the first component, which is the only one with an eigenvalue greater than 1 and which explains about 63% of the variation of the dependent variable. The second principal component explains another 28%, and the last principal component accounts for only 9% of the variation. Hence, it is clear that the first principal component has the maximum explanatory power.

III. Methodology and Model Specification

In this section, we briefly review the general framework for analysing panel data. First, we discuss, in terms of efficiency and consistency, the method employed in this study and compare it with other standard methods. Then, we rationalize the case for the use of a panel ARDL model based on the three estimators: the mean group (MG) of Pesaran and Smith (1995), pooled mean group (PMG), and dynamic fixed effect (DFE) estimators developed by Pesaran et al. (1999).

[14] Appendix 4 reports the correlation matrix among financial development variables. However, we have repeated all empirical exercises presented in the paper with the individual measures of financial development. These results are very similar to those using the FD indicator, except with the sum of commercial bank assets and central bank assets (basset), which appears significant and positive in the long-run only in the case of middle income countries, we have omitted them from the main analysis and present them in the appendix.

Static models

The standard panel models such as pooled OLS, fixed effects and random effects models have some serious shortcomings. For instance, pooled OLS is a highly restrictive model since it imposes common intercept and slope coefficients for all cross sections, and thus disregards individual heterogeneity. The fixed effects model, on the other hand, assumes that the estimator has common slopes and variance but country-specific intercepts. Both the cross sectional and time effects can be observed through the introduction of dummy variables, especially in two-way fixed models; however, this estimator faces severe problems due to the loss of degrees of freedom (Baltagi, 2008). Furthermore, the parameter estimates produced by the fixed effects model are biased when some regressors are endogenous and correlated with the error terms (Campos and Kinoshita, 2008). In contrast to the fixed effects model, the random effects model is relatively less problematic in terms of degrees of freedom by assuming common intercepts. Nevertheless, the random effects model has another limitation in that it considers the model to be time invariant. This implies that the error at any period is uncorrelated with the past, present and future, known as strict exogeneity (Arellano, 2003). In real life, this assumption is very often invalid. Additionally, according to Loayza and Ranciere (2006), static panel estimators do not take advantage of the panel dimension of the data by distinguishing between the short and long-run relationships. Furthermore, Holly and Raissi (2009) argue that conventional panel data models assume homogeneity of the coefficients of the lagged dependent variable. This can lead to serious bias when in fact the dynamics are heterogeneous across the cross section units.

To conclude, the static panel approaches are unable to capture the dynamic nature of the data, which is a fundamental issue in the empirical growth literature. In addition, these estimators can only deal with the structural heterogeneity in the form of random or fixed effects, but impose homogeneity in the model's slope coefficients across countries even when there may be substantial variations between them.

Dynamic panel model

Roodman (2006) states that when the data feature a large numbers of countries (N) relative to the time period (T), the GMM-difference estimator proposed by Arellano and Bond (1991) and the GMM-system estimator by Arellano and Bover (1995) and Blundell and Bond (1998) work well. These two estimators are typically used to analyse micro panel datasets (Eberhardt, 2012). However, a wide range of recent literature have applied GMM techniques to macro panel data, including in the area of financial development and growth (e.g Arcand, 2012). Roodman (2006) argues that in the small N and large T case, the GMM estimators are likely to produce spurious results for two reasons. First, small N might lead to unreliable autocorrelation test.[15] Second, as the time span of the data gets larger, the number of instruments will get larger too. This affects the validity of the Sargan test of over identification restriction and cause the rejection of the null hypothesis of the exogeneity of instruments. Hence, we have doubts about the reliability and consistency of the results obtained using GMM. Another point is that GMM captures only the short-run dynamics and the stationarity of the variables tends to be ignored because these models are mostly restricted to short time series. Thus, it is not clear whether the estimated panel models represent a structural long–run equilibrium relationship or a spurious one (Christopoulos and Tsionas, 2004). More importantly, Kiviet (1995) argues that in GMM estimation the imposition of homogeneity assumptions on the slope coefficients of lagged dependent variables could lead to serious biases.[16] These estimation procedures are likely to produce inconsistent and misleading long-run coefficients unless the slope coefficients are indeed identical (Pesaran and Smith, 1995; Pesaran, 1997; Pesaran and Shin, 1999).

Based on Pesaran et al. (1999), the dynamic heterogeneous panel regression can be incorporated into the error correction model using the autoregressive distributed lag ARDL (p,q)[17] technique and stated as follows (Loayza and Ranciere, 2006):

Equation (1)

$$\Delta(y_i)_t = \sum_{j=1}^{p-1} \gamma_j^i \Delta(y_i)_{t-j} + \sum_{j=0}^{q-1} \delta_j^i \Delta(X_i)_{t-j} + \varphi^i[(y_i)_{t-1} - \{\beta_0^i + \beta_1^i (X_i)_{t-1}\}] + \epsilon_{it}$$

where **y** is the GDP growth rate[18], **X** is a set of independent variables including the financial development indicator, $\boldsymbol{\gamma}$ and $\boldsymbol{\delta}$ represent the short-run coefficients of lagged dependent and independent variables respectively, $\boldsymbol{\beta}$ are the long-run coefficients, and $\boldsymbol{\varphi}$ is the coefficient of speed of adjustment to the long run- equilibrium. The subscripts **i** and **t** represent country and time, respectively. The term in the square brackets of equation (1) contains the long-run growth regression, which includes the long-run coefficients of X vectors, which is derived from the following equation.

[15] The test of the (AR) by Arrelano-Bond is based on the assumption that there is no second-order serial correlation in the residuals of the first-difference equation.
[16] See Bond (2002) for further information about the use of GMM panel estimators in the empirical growth studies.
[17] p is the lag of the dependent variable, and q is the lag of the independent variables.
[18] We also tried the GDP per capita growth rate and the results were similar.

Equation (2)

$$(y_i)_t = \beta_0^i + \beta_1^i (X_i)_t + \mu_{i,t} \qquad where\ \mu_{i,t} \sim I(0)$$

Equation (1) can be estimated by three different estimators: the mean group (MG) model of Pesaran and Smith (1995), the pooled mean group (PMG) estimator developed by Pesaran et al. (1999), and the dynamic fixed effects estimator (DFE). All three estimators consider the long-run equilibrium and the heterogeneity of the dynamic adjustment process (Demetriades and Law, 2006) and are computed by maximum likelihood. Pesaran and Smith (1995), Pesaran (1997) and Pesaran and Shin (1999) present the autoregressive distributed lag (ARDL) model in error correction form as a relatively new cointegration test. However, here the emphasis is on the need to have consistent and efficient estimates of the parameters in a long-run relationship. According to Johansen (1995); Philipps and Hansen (1990), the long-run relationships exist only in the context of cointegration among variables with the same order of integration. Nevertheless, Pesaran and Shin (1999) argue that panel ARDL can be used even with variables with different order of integration irrespective of whether the variables under study are I (0) or I (1). In addition, both the short-run and long-run effects can be estimated simultaneously from a data set with large cross-section and time dimensions. Finally, the ARDL model, especially PMG and MG, provides consistent coefficients despite the possible presence of endogeneity because it includes lags of dependent and independent variables (Pesaran et al, 1999). For further understanding of the key features of the three different estimators in the dynamic panel formwork, we present the assumptions relating to each estimator.

Pooled Mean Group (PMG) model

The main characteristic of PMG is that it allows short-run coefficients, including the intercepts, the speed of adjustment to the long-run equilibrium values, and error variances to be heterogeneous country by country, while the long-run slope coefficients are restricted to be homogeneous across countries. This is particularly useful when there are reasons to expect that the long-run equilibrium relationship between the variables is similar across countries or, at least, a sub-set of them. The short-run adjustment is allowed to be country-specific, due to the widely different impact of the vulnerability to financial crises and external shocks, stabilization policies, monetary policy and so on. However, there are several requirements for the validity, consistency and efficiency of this methodology. First, the existence of a long-run relationship among the variables of interest requires the coefficient on the error–correction term to be negative and not lower than -2. Second, an important assumption for the consistency of the ARDL model is that the resulting residual of the error-correction model be serially uncorrelated and the explanatory variables can be treated as exogenous. Such conditions can be fulfilled by including the ARDL (p,q) lags for the dependent (p) and independent variables (q) in error-correction form. Third, the relative size of T and N is crucial, since when both of them are large this allows us to use the dynamic panel technique, which helps to avoid the bias in the average estimators and resolves the issue of heterogeneity. Eberhardt and Teal (2010) argue that the treatment of heterogeneity is central to understanding the growth process. Therefore, failing to fulfil these conditions will produce inconsistent estimation in PMG.

Mean Group (MG) estimator

The second technique (MG) introduced by Pesaran and Smith, (1995) calls for estimating separate regressions for each country and calculating the coefficients as unweighted means of the estimated coefficients for the individual countries. This does not impose any restrictions. It allows for all coefficients to vary and be heterogeneous in the long-run and short-run. However, the necessary condition for the consistency and validity of this approach is to have a sufficiently large time-series dimension of the data. The cross-country dimension should also be large (to include about 20 to 30 countries). Additionally, for small N the average estimators (MG) in this approach are quite sensitive to outliers and small model permutations (see Favara, 2003).

Dynamic Fixed Effects (DFE) model

Finally, the dynamic fixed effects estimator (DFE) is very similar to the PMG estimator and imposes restrictions on the slope coefficient and error variances to be equal across all countries in the long run. The DFE model further restricts the speed of adjustment coefficient and the short-run coefficient to be equal too. However, the model features country-specific intercepts. DFE has cluster option to estimate intra-group correlation with the standard error (Blackburne and Frank, 2007). Nevertheless, Baltagi, Gri, and Xiong (2000) point out that this model is subject to a simultaneous equation bias due to the endogeneity between the error term and the lagged dependent variable in case of small sample size.

Model Selection

We estimate equation (1) for the whole sample with PMG, MG and DFE and then apply the Hausman test to see whether there are significant differences among these three estimators. After that, we include dummy variables that should capture if there is a differential impact of financial development upon economic growth according to the income level (upper and lower-middle income). The first dataset consists 23 Upper Middle Income countries and the second dataset includes 29 Lower Middle Income with same variables used in our baseline specification.[19]

As we consider a sample of middle-income countries, we expect this group of countries to be homogenous with respect to economic growth and financial development. However, in the short run, there is bound to be country-specific heterogeneity due to the effect of local laws and regulations. The PMG estimator offers more efficient estimates as compared to the MG estimators under the assumption of long-run homogeneity. Moreover, the time span for this study is 28 years, and the MG estimator may lack degrees of freedom. Consequently, the PMG estimation is more relevant for this analysis. However, to identify the choice among the MG, PMG and DFE methods, the Hausman test is used to test whether there is a significant difference between these estimators. The null of this test is that the difference between PMG and MG or PMG and DFE estimation is not significant. If the null is not rejected, the PMG estimator is recommended since it is efficient. The alternative is that there is a significant difference between PMG and MG or PMG and DFE and the null is rejected. If there are outliers the average estimator may have a large variance and in that case the Hausman test would have little power. The PMG will be used if the P-value is insignificant at the 5% level. On the other hand, if it happens to have a significant P-value, then the use of a MG or DFE estimator is appropriate.

Another important issue is that ARDL lag structure should be determined by some consistent information criterion.[20] Based on the Schwartz Bayesian criterion we impose the following lag structure (1,1,1,1,1) for the GDP growth rate, Fixed Capital, Government Expenditure, Population growth and Financial Development indicator respectively (Table 10).

IV. Results and Discussion

Unit root test

Since our data-set includes time period which is fairly long (28 years), it is very likely that the macroeconomic variables will follow a unit root process (Nelson and Plosser, 1982). We employ three different types of panel unit root tests: (i) Im, Pesaran and Shin, (ii) Breitung, and (iii) Levin, Lin and Chu to determine the order of integration between all the series in our data-set. Though testing for the

[19] This break-down is based on the World Bank's classification in 2010.
[20] Lag structure might also be imposed according to the data limitation. When the time dimension is not long enough to overextend the lags, one can impose a common lag structure across countries (see, Loayza and Ranciere, 2006; Demetriades and Law, 2006).

order of integration of variables is not important when applying the ARDL model as long as the variables of interest are I(0) and I(1), (Pesaran and Smith, 1995; Pesaran, 1997; Pesaran et al, 1999), we carry out these tests just to make sure that no series exceeds I(1) order of integration.[21]

Table 2 reports the results of unit root tests, which suggest that most of the variables under consideration are stationary of order I(0) with constant and trend, while financial development (FD), the ratio of liquid liabilities to nominal GDP (M3), the ratio of commercial bank assets to the sum of commercial bank assets and central bank assets (BASSET), and the ratio of credit issued to the private sector by banks to GDP (PRIVATE) are integrated of order I(1). Due to these mixed orders of integration , panel ARDL approach rather than the traditional panel cointegration test is appropriate.

Results of PMG, MG and DFE

In order to identify the impact of the variables of interest, error correction based on autoregressive distributed lag ARDL (p,q) model has been used, with focus on the exclusive feature of PMG model over the other error-correction based estimations, MG and DFE. Table 3 reports the results of PMG, MG and DFE estimation along with the Hausman *h*-test to measure the comparative efficiency and consistency among them. The results indicate that financial development has a negative weakly significant impact in the long run and no impact in the short run on economic growth according to the PMG estimator, whereas the MG estimator suggests a positive and insignificant coefficient in the long run but negative and significant coefficient in the short run. The DFE model, in turn, suggests a significant and negative impact of FD on growth in the long as well as short run. The validity of the long run homogeneity restriction across countries, and hence the efficiency of the PMG estimator over the other estimators, is examined by the Hausman test. As expected, the Hausman test accepts the null hypothesis of the homogeneity restriction on the regressors in the long run, which indicates that PMG is more efficient estimator than MG. Similarly, comparing the result of DFE and PMG, the Hausman test again clearly favors the PMG specification over DFE.

Next, we examine to what extent the above finding varies with the income level by re-estimating the models for the clustered sample, the upper middle income countries (UMIC) and lower middle income countries (LMIC). The results for the UMIC are reported in Table 4. As shown in Table 4, the coefficient of FD this time appears highly significant with the negative sign under PMG and DFE approaches, but insignificant under MG in the long-run. As regards the short run FD coefficients, they

[21]Asteriou and Monastiriotis (2004) indicate that when some variables are I(2), the estimations are not consistent.

appear negative and statistically significant with all three estimators. Again, the Hausman test confirms that PMG estimate is the efficient estimator over MG and DFE in the case of UMIC.

In contrast, when LMIC are considered as shown in Table 5, all the three approaches find a statistically insignificant impact of FD on long and short-run growth.

To summarize, there is no evidence that financial development has a positive linear and significant impact on economic growth in the MIC as a whole and also in the LMIC in the long-run. However, financial development has a negative and significant impact on long-run growth in the UMIC. Furthermore, financial development does not contribute to economic growth in the short-run, with the three models, PMG, MG and DFE, yielding similar results.[22] Furthermore, the results from the Hausman test for the three samples; MIC and the sub–samples, UMIC and LMIC, suggest that the regressors have homogeneous long run and heterogeneous short run effects on growth.

Our findings contradict the common assumption that financial development plays an essential role in promoting economic growth. What is more, they are also different from the findings of Loyaza and Rancier (2006) who found a positive homogenous association between financial intermediation and economic growth in the long–run, and a heterogeneous negative impact in the short-run using the same methodology. Nevertheless, our findings are in line with Ang and McKibbin (2007), who find that the return from financial development depends on the mobilization of savings and allocation of funds to productive investment projects. Due to frictions in the market in the form of high transaction costs and improper allocation of resources, the interaction between savings and investment and its link with economic growth is not strong in developing countries.

Our findings of an adverse effect of financial development on economic growth in UMIC are consistent with Arcand et al. (2011), Easterly et al. (2000), and Deidda and Fattouh (2002). These studies find either a negative or insignificant impact of financial development on economic growth, in different cross–county samples. Furthermore, our results tally with Sundarajan and Balino (1991) and Gavin and Hausman (1998), who found a weak and sometimes negative impact of financial development on economic growth. They attribute their finding to the expansion in credit along with a lack of regulatory

[22] As a robustness check, we have repeated all empirical exercises presented in the paper with the individual measures of financial development: the ratio of liquid liabilities (M3) to GDP, private credit/GDP and bank asset/GDP Since these results are essentially almost the same as those using FD indicator, we have omitted them from the main text and report them in appendix 6 to appendix 14. As another robustness check, we changed the lag structure to (1,0,0,0,0) according to the data limitation (Loyza and Ranciere (2006)) but the results remain the same for FD variable that is either negative and significant or has no impact on growth. Therefore, we omit them in this version of the paper but can make them available upon request.

control and monitoring from the bankers. This may result in an inappropriate selection of projects, which could show up as an adverse impact of financial development on economic growth.

Robustness checks

Quadratic form of FD Series:

Arcand et al. (2011), Easterly et al. (2000), and Deidda and Fattouh (2002) find a non-monotonic association between FD and economic growth. Specifically, Deidda and Fattouh (2002), focusing on high and low income countries, conclude that the relationship between financial development and economic growth is non-linear. Therefore, we check for the existence of a non-monotonic relationship. To accomplish the task, we first include a quadratic term of FD in the panel ARDL model, which is shown in Tables 6, 7 and 8. Interestingly, Table 6 reveals that FD has a positive and significant coefficient, while FD^2 has a negative and significant coefficient under PMG estimation in the whole sample (MIC). Hausman test results confirm that PMG is a better estimator than MG and DFE. This result supports the hypothesis of "Too Much Finance" presented by Arcand et al. (2011). It confirms that the marginal effect of financial development is positive up to a certain threshold point, but the marginal impact of FD is significantly negative after the threshold. In the case of upper middle income countries in particular, the size of the financial sector may be too large with respect to the socially optimal level. Hence, increasing FD can have a negative marginal effect on GDP growth. Note that these findings are almost the same for the whole sample, UMIC and LMIC.

Sufficient Condition for a Quadratic Relationship:

Lind and Mehlum (2010) point out that the conventional econometric model is not suitable for testing the composite null hypothesis that at the left side of the interval the relationship is decreasing, and at right side of the interval the relationship is increasing, or vice-versa. Moreover, Arcand et al. (2011) argue that if the model does not allow non-monotonocity, it may lead to a downward bias in the estimating effect of financial development on economic growth. Therefore, to confirm our finding of an inverted U shaped relationship, we conduct the U test of Lind and Mehlum (2010). To accomplish this, we estimate the following model:

$gdpg_i = aFD + bFD_i^2 + Z_iC + \varepsilon_i,$

And then test the joint hypothesis:

$$H_0: (a + b2FD_{min} \leq 0) \cup (a + b2FD_{max} \geq 0)$$

against the alternative hypothesis:

$$H_1: (a + b2FD_{min} > 0) \cup (a + b2FD_{max} < 0)$$

Here FD_{min} and FD_{max} represent the minimum and maximum values of financial development, respectively. If the null hypothesis is rejected, this confirms the existence of a U shape.

It can be seen from Table 9 that the lower bound slope of FD is positive (0.74) while the upper bound slope of FD is negative (-1.04). Both are statistically significant which means that the null hypothesis of no inverted U-shape is rejected. We also conduct this test for the sub-samples. Table 9 shows that the lower bound slope of FD is positive (0.82) while the upper bound slope is negative (-0.87) for the UMIC subsample. Both are statistically significant at 10 % which again means that the null hypothesis of no inverted U-shape is rejected for the upper middle income countries. Similarly, the U-Test also indicates that inverted U shape exits in the lower middle-income countries as the lower bound of FD is positive (0.92) while the upper bound slope is negative (-1.21). Both are highly significant at 1% (Table 9). The SLM test in the bottom panel of Table 9 for MIC, UMIC and LMIC shows that the null hypothesis is rejected which indicates that our results are consistent with the presence of an inverted U relationship between financial development and economic growth.[23]

As regards the control variables[24], all the models used in this paper found more or less similar results. Trade had a positive and significant long-run impact on economic growth in the whole set of middle income countries (and also for upper middle and lower middle income countries). While in the short run trade exhibits a negative but insignificant impact on growth for all MIC, UMIC and LMIC, except in one case as shown in Table 5, the short-run trade coefficient appears to be negative and significant in the LMIC.

Surprisingly, we found a mixed impact of fixed capital formation: we found the long run impact of the fixed capital to be positive and significant for the lower middle income countries but positive and insignificant impact for the all middle income countries. However, Tables 4 and 7 reveal that fixed capital formation adversely affects economic growth for upper middle income countries in the long run.

[23] Further robustness checks have been carried out for detecting both the outliers and leverage points. This resulted in removing Tonga, Vanuatu, Dominica, Indian and Indonesia (Appendix 21) from the analysis. These had little influence on the estimators as can be clearly seen in Appendix 15 to Appendix 20.

[24] Initially we considered additional control variables, such as the initial real GDP per capita that should capture the tendency for growth rates to converge across countries over time, life expectancy as an indicator of human capital, inflation as an indicator of the stability of the macroeconomic and business environment. However, when including all variables in the regression, several turned out to be insignificant. We, therefore, proceeded to omit the insignificant explanatory variables one by one until we were left with a model that contained trade openness (trd), government expenditure (gov), population (pop), and fixed capital formation (lnc) as control variables. The full results are available upon request.

The negative impact of physical capital in the long-run could imply the absence of proper market incentives in these countries which renders physical capital relatively unproductive.

In all models, the government expenditure negatively and significantly impacts on economic growth in both long run and short run. This can happen because an increase in government consumption expenditure increases the tax burden on citizens which leads to a reduction in private spending and investment. This empirical finding is in line with Barro (1991) and Loayza (2006). Finally, we find an insignificant impact of population growth on long run and short run economic growth.

V. Conclusions

Financial development and economic growth have been strange bedfellows. Most studies conclude that on the whole, financial development plays a significant role in fostering growth. However, some recent studies find that financial deepening adversely affects growth. In this paper, we apply advanced econometric techniques to assess the impact of FD on growth. These include the error-correction based autoregressive distributed lag ARDL (p,q) model, which offers three different tests, namely, mean group (MG) presented by Pesaran and Smith (1995), pooled mean group (PMG) developed by Pesaran et al. (1999), and dynamic fixed effect (DFE) estimators. The results obtained from these estimations confirm that financial development and economic growth are negatively associated in the long run when one considers all middle income countries. Though the finding of this research is partially in line with Loayza and Ranciere (2006) who found that FD negatively influences economic growth in the short run, but it strongly contradicts their findings that FD fosters economic growth in the long run.

In an effort to go beyond Loayza and Ranciere (2006), we explore the possible non-monotonic impact of FD on growth in further detail. Our findings demonstrate that financial development and economic growth are not linearly related; rather they are non-monotonically linked to each other, as in Arcand et al. (2011). We also followed Lind and Mehlum (2007) and conducted their U-test to obtain sufficient conditions for the existence of an inverted U relationship. These results suggest that more finance might be not always better in the case of the (MIC).

Nevertheless, we also conclude that the impact of financial development varies across the countries due to the heterogeneous nature of economic structures, institutional quality, financial markets, and so on. However, we believe that our results are of potential importance to policymakers in terms of optimizing the financial deepening that needs to be undertaken to ensure that the maximum possible gain for the economy can be achieved through the banking sector.

Tables

Table 1: Principal component analysis for financial depth index[25]:

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.88	1.02	0.62	0.62
Comp2	0.85	0.58	0.28	0.91
Comp3	0.26	.	0.09	1.00

Table 2: Unit Root tests

	Level			1st Difference		
	Im, Pesaran and Shin	Breitung	Levin, Lin, Chu	Im, Pesaran and Shin	Breitung	Levin, Lin & Chu
GDPG	-20.98***	-10.81***	-19.83***	-37.89***	-15.29***	-29.96***
LNCA	-4.51***	-3.22***	-4.98***	-22.25***	-13.58***	-21.62***
LNGOV	-2.52***	-2.19***	-1.43*	-22.99***	-14.25	-21.44***
LNTRD	-2.97***	0.32	-2.43***	-24.72***	-13.37***	-22.05***
POPG	-5.45***	4.21	-7.53***	-17.84***	0.05	-8.10***
FD	1.18	4.66	1.71	-17.55***	-11.41***	-17.32***
PRIVATE	0.90	2.82	1.63	-11.81***	-9.42***	-12.27***
BASSET	-2.15***	0.88	-2.72***	-20.92***	-12.51***	-20.23***
M3	-1.18	1.87	1.86	-15.42***	-10.95***	-16.07***

[25] The full version of PCA analysis is presented in the Appendix 5.

Table 3: All the Middle Income Countries

	Pooled Mean Group		Mean Group		Hausman Test		Dynamic Fixed Effect	
Variable	Coef.	Std. Error	Coef.	Std. Error	h-test	p-value	Coef.	Std. Error
Long-Run Coefficients								
Trade	2.799***	-0.436	6.063***	-2.209			4.098***	-0.673
Fixed Capital	0.0605	-0.474	0.0306	-1.271			0.454	-0.741
Government Expenditure	-2.151***	-0.482	-6.17***	-2.198			-2.861***	-0.704
Population Growth	-0.111	-0.182	0.188	-1.332			0.624**	-0.283
Financial Development	-0.145	-0.115	0.0122	-0.635			-0.498***	-0.186
			Hausman Test[26]		3.92	0.560		
			Hausman Test[27]		4.18	0.523		
Error correction Coefficient	-0.891***	-0.0433	-1.128***	0.0392			-0.794***	-0.025
Δ Trade	-1.61	-1.693	0.647	-2.075			-0.794	-0.966
Δ Fixed Capital	11.59***	-1.516	9.906***	-1.567			8.077***	-0.797
Δ Government Expenditure	-10.97***	-1.963	-11.67***	-2.238			-4.801***	-1.04
Δ Population Growth	4.144	-4.881	12.87*	-7.289			-0.239	-0.297
Δ Financial Development	-0.847	-0.542	-1.474**	-0.647			-1.032***	-0.363
Intercept	-1.766***	-0.296	-2.229	-11.26			-6.736**	-3.04
Country	52		52				52	
Observation	1,454		1,454				1,454	

Note:*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population and Financial Development. All the middle income countries, annual data 1980–2008. Source: Authors' estimations.

[26]PMG is more efficient estimation than MG under null hypothesis.
[27] PMG is more efficient estimation than DFE under null hypothesis.

Table 4: Upper Middle Income

	Pooled Mean Group		Mean Group		Hausman Test		Dynamic Fixed Effect	
Variable	Coef.	Std. Error	Coef.	Std. Error	h-test	p-value	Coef.	Std. Error
Long-Run Coefficients								
Trade	2.481***	-0.715	5.081**	-2.124			3.883***	-0.987
Fixed Capital	-1.474**	-0.747	-1.679	-2.09			-1.016	-1.11
Government Expen.	-3.326***	-0.709	-11.10***	-3.594			-2.841***	-0.969
Population Growth	-0.352*	-0.293	-0.488	-2.06			0.347	-0.43
Financial Development	-0.327**	-0.163	-0.0471	-0.477			-0.72***	-0.255
			Hausman Test[28]		5.25	0.386		
			Hausman Test[29]		2.03	0.844		
Error correction Coefficient	-0.938***	-0.0626	-1.171***	-0.058			-0.85***	-0.0368
Δ Trade	-0.773	-2.805	1.379	-3.065			-1.083	-1.463
Δ Fixed Capital	15.00***	-2.297	13.65***	-2.698			10.52***	-1.159
Δ Government Expenditure	-11.12***	-2.376	-14.27***	-2.654			-4.64***	-1.546
Δ Population Growth	7.873	-12.88	12.3	-14.26			-0.438	-0.521
Δ Financial Development	-1.602*	-0.945	-2.081*	-1.114			-1.50***	-0.566
Intercept	7.092***	-0.707	16.64	-17.85			-2.069	-4.723
Country	23		23				23	
Observation	644		644		644		644	

Note: *, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population and, Financial Development. Upper Middle Income, annual data 1980–2008. Source: Authors' estimations.

[28] PMG is more efficient estimation than MG under null hypothesis.

[29] PMG is more efficient estimation than DFE under null hypothesis.

Table 5: Lower Middle Income

	Pooled Mean Group		Mean Group		Hausman Test		Dynamic Fixed Effect	
Variable	Coef.	Std. Error	Coef.	Std. Error	h-test	p-value	Coef.	Std. Error
Long-Run Coefficients								
Trade	2.924***	-0.545	6.842*	-3.617			3.729***	-0.926
Fixed Capital	1.265**	-0.605	1.386	-1.552			1.840*	-0.993
Government Expen.	-1.892***	-0.67	-2.258	-2.548			-3.32***	-1.032
Population Growth	0.128	-0.247	0.724	-1.767			0.905**	-0.382
Financial Development	0.0995	-0.168	0.0592	-1.085			-0.164	-0.278
			Hausman Test[30]		0.88	0.971		
			Hausman Test[31]		2.54	0.770		
Error correction Coefficient	-0.851***	-0.058	-1.0***	-0.053			-0.74***	-0.0337
Δ Trade	-0.851***	-0.058	-1.09***	-0.053			-0.74***	-0.0337
Δ Fixed Capital	-2.442	-2.084	0.0667	-2.86			-0.361	-1.29
Δ Government Expen.	8.528***	-1.776	6.93***	-1.665			4.865***	-1.127
Δ Population Growth	-10.71***	-3.203	-9.60***	-3.408			-4.959***	-1.391
Δ Financial Development	3.035	-3.405	13.33*	-6.847			-0.236	-0.358
Intercept	-6.167***	-0.504	-17.19	-14.04			-7.963**	-3.994
Country	29		29				29	
Observation	810		810				810	

Note: *, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population and Financial Development. Lower Middle Income countries, annual data 1980–2008. Source: Authors' estimations.

[30] PMG is more efficient estimation than MG under null hypothesis.
[31] PMG is more efficient estimation than DFE under null hypothesis.

Table 6 for All Middle Income Country

Model: GDPG =ƒ (Trade, Fixed Capital, Government, Population Growth, Financial Development, Financial development Square).

	Pooled Mean Group		Mean Group		Hausman Test		Dynamic Fixed Effect	
Variable	Coef.	Std. Error	Coef.	Std. Error	h-test	p-value	Coef.	Std. Error
Long-Run Coefficients								
Trade	2.923***	-0.46	5.528**	-2.468			3.954***	-0.669
Fixed Capital	0.22	-0.468	1.007	-1.393			0.553	-0.741
Government Expen.	-2.31***	-0.511	-6.60***	-2.36			-3.29***	-0.712
Population Growth	0.0268	-0.187	0.0916	-1.469			0.528*	-0.281
Financial Development	0.246**	-0.125	-2.97	-1.817			-0.29	-0.197
Financial Development SQ	-0.12***	-0.0385	-0.938	-0.986			-0.15***	-0.0608
			Hausman Test[32]		4.15	(0.656)		
			Hausman Test[33]		5.76	(0.450)		
Error correction Coefficient	-0.89***	-0.044	-1.17***	-0.039			-0.79***	-0.025
Δ Trade	-1.645	-1.687	0.754	-2.101			-0.856	-0.961
Δ Fixed Capital	11.12***	-1.483	9.442***	-1.585			7.818***	-0.795
Δ Government Expenditure	-10.5***	-2.005	-10.75***	-2.344			-4.87***	-1.034
Δ Population Growth	4.876	-4.891	15.07	-9.361			-0.209	-0.295
Δ Financial Development	0.777*	-1.595	-0.752	-1.72			-0.94***	-0.361
Δ Financial Development Sq	-0.289*	-0.669	-0.858	-0.801			-0.43***	-0.104
Intercept	-2.26***	-0.322	-2.668	-14.18			-5.198*	-3.064
Country	52		52				52	
Observation	1,454		1,454				1,454	

Note:*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects.While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population, Financial Development and Financial development Square. All the middle income countries, annual data 1980–2008. Source: Authors' estimations.

[32] PMG is more efficient estimation than MG under null hypothesis.
[33] PMG is more efficient estimation than DFE under null hypothesis.

Table 7 for All Upper Middle Income Country

Model: GDPG =ƒ (Trade, Fixed Capital, Government, Population, Financial Development, Financial development Square).

	Pooled Mean Group		Mean Group		Hausman Test		Dynamic Fixed Effect	
Variable	Coef.	Std. Error	Coef.	Std. Error	h-test	p-value	Coef.	Std. Error
Long-Run Coefficients								
Trade	2.550***	-0.715	4.637**	-2.296			3.878***	-0.983
Fixed Capital	-1.505**	-0.744	-0.0252	-2.044			-0.963	-1.115
Government Expen.	-3.484***	-0.754	-9.81***	-2.827			-3.03***	-0.991
Population Growth	-0.314	-0.296	-1.161	-2.308			0.314	-0.428
Financial Development	0.443**	-0.201	-1.494	-2.068			-0.575*	-0.296
Financial Development Sq	-0.195***	-0.0637	-0.267	-1.161			-0.0873*	-0.0942
			Hausman Test[34]		5.14	(0.525)		
			Hausman Test[35]		5.22	(0.515)		
Error correction Coefficient	-0.938***	-0.0667	-1.21***	-0.0556			-0.85***	-0.0367
Δ Trade	-0.983	-2.808	1.936	-3.244			-1.033	-1.459
Δ Fixed Capital	14.79***	-2.376	12.54***	-2.585			10.17***	-1.164
Δ Government Expenditure	-10.92***	-2.5	-11.6***	-2.662			-4.85***	-1.543
Δ Population Growth	8.343	-11.2	9.162	-13.3			-0.438	-0.52
Δ Financial Development	1.197	-1.037	0.857	-1.912			-1.187**	-0.579
Δ Financial Development Sq	-0.128	-0.665	0.262	-0.789			-0.380**	-0.154
Intercept	7.543***	-0.703	8.917	-19.69			-1.546	-4.795
Country	23		23				23	
Observation	644		644				644	

Note:*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth , Financial Development and Financial development Square. Upper Middle Income Countries, annual data 1980–2008. Source: Authors' estimations.

[34] PMG is more efficient estimation than MG under null Hypothesis.
[35] PMG is more efficient estimation than DFE under null hypothesis.

Table 8: for All Lower Middle Income Country

Model: GDPG =ƒ (Trade, Fixed Capital, Government, Population, Financial Development, Financial development Square).

	Pooled Mean Group		Mean Group		Hausman Test		Dynamic Fixed Effect	
Variable	Coef.	Std. Error	Coef.	Std. Error	h-test	p-value	Coef.	Std. Error
Long-Run Coefficients								
Trade	3.471***	-0.602	6.235	-4.071			3.529***	-0.922
Fixed Capital	1.490**	-0.601	1.826	-1.919			1.995**	-0.994
Government Expen.	-1.898***	-0.698	-4.061	-3.562			-3.830***	-1.031
Population Growth	0.262	-0.249	1.085	-1.91			0.774**	-0.379
Financial Development	0.264	-0.175	-4.141	-2.83			0.0137	-0.28
Financial Development SQ	-0.102*	-0.057	-1.471	-1.521			-0.197**	-0.081
			Hausman Test[36]		1.72	(0.943)		
			Hausman Test[37]		3.43	(0.753)		
Error correction Coefficient	-0.86***	-0.0572	-1.14***	-0.0557			-0.75***	-0.0338
∆ Trade	-2.31	-2.035	-0.184	-2.792			-0.436	-1.285
∆ Fixed Capital	7.835***	-1.56	6.983***	-1.885			4.713***	-1.123
∆ Government Expenditure	-10.09***	-3.206	-10.00***	-3.672			-4.905***	-1.383
∆ Population Growth	3.955	-5.212	19.75	-13.2			-0.175	-0.356
∆ Financial Development	0.62	-2.797	-2.029	-2.692			-0.838*	-0.469
∆ Financial Development Sq	-0.669	-1.134	-1.747	-1.282			-0.42***	-0.145
Intercept	-8.84***	-0.687	-11.86	-20.19			-6.22	-4.003
Country	29		29				29	
Observation	810		810				810	

Note:*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population, Financial Development and Financial development Square. Lower Middle Income Countries, annual data 1980–2008. Source: Authors' estimations.

[36] PMG is more efficient estimation than MG under null Hypothesis.

[37] PMG is more efficient estimation than DFE under null hypothesis.

Table 9: U-Test:

The table reports the results of the Sasabuchi-Lind-Mehlum test for inverse U-shaped relationship. There model have been consider i) Whole Middle Income Country (MIC) ii) Upper Middle Income Country (UMIC) and iii) Lower Middle Income Country (LMIC)

	MIC	UMIC	LMIC
Slope at FD_{min}	0.74***	0.82**	0.92***
	(2.36)	(0.07)	(2.34)
Slope at FD_{Max}	-1.04***	-0.87*	-1.21***
	(-2.49)	(-1.32)	(-2.13)
SLM test for inverse U shape	2.36	1.96	2.14
P Value	0.009	0.06	0.01

T- Value in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Panel VAR Model for Lag Order Selection

Endogenous variables: GDPG, LNCA, POPG, FD, LNTRD and LNGO. Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7984.050	NA	0.044721	13.91995	13.94632	13.92990
1	-1200.593	13484.19	3.51e-07	2.164796	2.349397*	2.234486
2	-1083.804	230.9329	3.05e-07	2.024048	2.366880	2.153472*
3	-1039.770	86.61016	3.01e-07	2.010052	2.511114	2.199210
4	-1002.074	73.74899*	3.00e-07*	2.007098*	2.666390	2.255991

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

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