

# IMF Working Paper

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## Revisiting the Link Between Finance and Macroeconomic Volatility

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## IMF Working Paper

Strategy, Policy, and Review Department

### Revisiting the Link Between Finance and Macroeconomic Volatility

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#### Abstract

This paper examines the impact of financial depth on macroeconomic volatility using a dynamic panel analysis for 110 advanced and developing countries. We find that financial depth plays a significant role in dampening the volatility of output, consumption, and investment growth, but only up to a certain point. At very high levels, such as those observed in many advanced economies, financial depth amplifies consumption and investment volatility. We also find strong evidence that deeper financial systems serve as shock absorbers, mitigating the negative effects of real external shocks on macroeconomic volatility. This smoothing effect is particularly pronounced for consumption volatility in environments of high exposure—when trade and financial openness are high—suggesting significant gains from further financial deepening in developing countries.

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## I. INTRODUCTION

The global financial crisis has re-ignited the policy debate on the role of finance in propagating and dampening macroeconomic fluctuations. Shallow financial systems in low-income and emerging market countries imply insufficient instruments for households, enterprises, and governments to diversify risk, manage the volatility of their income streams, and insure against unexpected events. Given their higher vulnerability to external shocks, and inherently greater volatility, these countries seem to have the most to gain from financial deepening. On the other hand, larger financial systems may also indicate higher leverage on the part of economic agents, which implies more risk and lower stability. Indeed, it is argued that the excessive size of financial systems in many advanced economies was a causal factor behind the global crisis (Smaghi, 2010).

This paper aims to shed light on these issues. Do deeper financial systems dampen output, consumption and investment volatility? Are there non-linearities in this relationship, with financial depth amplifying macroeconomic volatility at very high levels? Does financial depth reduce the effect of real external shocks on volatility, and what role do structural characteristics related to trade and financial openness play in this regard? Answers to these questions have important welfare implications, especially in light of the fact that macroeconomic volatility is not only a major source of business cycle uncertainty but also a determinant of growth performance.<sup>1</sup>

Economic theory and evidence at the industry, firm, and household levels suggest a number of channels through which financial depth can affect volatility. Yet, in contrast to the finance-growth literature (Levine et al., 2005), there is little robust empirical evidence at the aggregate level of a causal link between finance and volatility. A number of empirical studies have attempted to examine whether financial depth reduces macroeconomic volatility using a variety of approaches. The results, however, appear to be sensitive to the measures of financial development considered, the sets of controls, aggregation periods, country samples, and the estimation techniques employed.

Our paper contributes to this literature by rigorously examining the link between financial depth and volatility using a dynamic panel analysis for 110 advanced and developing countries over the years 1974-2008. We find strong support of a beneficial role of financial depth (proxied by the level of private credit extended by banks and other institutions as a share of GDP) in dampening the volatility of output, consumption, and investment across countries, but only up to a certain point. At very high levels (over 100 percent of GDP), well

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<sup>1</sup> A burgeoning literature that has documented a negative relationship between volatility and growth (Ramey and Ramey, 2005) implies that volatility has first-order effects on welfare. The welfare costs of macroeconomic volatility in developing countries are particularly large, with output volatility reflected disproportionately in consumption and investment volatility. Volatility has a negative effect on output growth, and thus future consumption, through its links with various forms of uncertainty—economic, political, and policy-related (Loayza et al., 2007).

above those observed in most developing countries, we find that financial depth magnifies consumption and investment volatility.

We find strong evidence that deeper financial systems serve as shock absorbers, mitigating the negative effects of real external shocks on macroeconomic volatility. When country-specific external shocks are interacted with its level of financial depth, the results prove to be robust and highly significant. Moreover, this effect is more pronounced in smoothing consumption and investment volatility, which tends to be relatively high in developing countries. We also find that the volatility dampening role of finance is related to the degree of openness of an economy. In particular, financial depth helps reduce the impact of terms of trade, external demand, and commodity price shocks on consumption volatility particularly in environments of high exposure—that is, when trade and financial openness are high.

The results appear to hold intact against a variety of standard robustness tests, including allowing for alternative control variables, countries' income levels, and considering different time periods. Alternative measures of financial depth and shocks are also considered and to address the problem of endogeneity of financial depth, we use techniques within the GMM methodology. All these tests contribute to making us confident that the empirical results are indeed robust and capture the causality from financial depth to macroeconomic volatility.

The remainder of the paper is organized as follows. Section II provides a review of the literature. Section III describes the data and methodology. Section IV discusses the main findings, while Section V presents a battery of robustness checks. Section VI concludes.

## **II. THEORETICAL AND EMPIRICAL EVIDENCE**

The theoretical literature outlines various mechanisms through which financial depth can affect macroeconomic volatility, which motivates our analysis. Financial frictions and the underlying agency and informational asymmetries can play a role in propagating real sector shocks through the credit channel (i.e., conditions that limit the availability of funds or increase the cost of funds needed to make production and investment decisions). In particular, shocks to the net worth of non-financial borrowers in the presence of credit market imperfections limit the country's ability to reallocate resources, amplifying macroeconomic fluctuations and contributing to their persistence (Bernanke and Gertler, 1990; Kiyotaki and Moore, 1997; Greenwald and Stiglitz, 1991). While these papers do not explicitly model the level of financial development as a source of instability, an implication is that financial institutions and intermediaries that mitigate or even overcome these frictions can dampen aggregate volatility.

A related literature shows that deeper financial systems relax borrowing constraints and promotes risk sharing, thereby enhancing the economy's ability to absorb shocks. Deeper financial systems can dampen volatility by alleviating firms' cash constraints, particularly in economies with tight international financial constraints (Caballero and Krishnamurty, 2001). Aghion et al. (1999) show that in the presence of financial market imperfections and unequal access to investment opportunities, economies with poorly developed financial systems tend

to be more volatile, as both the demand for and supply conditions for credit tend to be more cyclical. Deeper financial systems may also facilitate greater diversification, reducing risk and dampening fluctuations (Acemoglu and Zilibotti, 1997).

At the same time, financial development can lead to more risk-taking by entrepreneurs and banks or facilitate over-leverage, both of which could potentially drive up volatility (Shliefer and Vishny, 2010; Wagner, 2010). Several recent papers show that while financial intermediaries and institutions can mitigate frictions, propagation and amplification mechanisms within the financial sector and from the financial sector to the real economy can exacerbate volatility (see Brunnermeier et al., 2012; and Quadrini, 2011, for surveys of recent models).

A vast body of empirical literature has examined the relationship between financial depth and volatility. One strand of literature to which our paper is related finds that deeper financial systems stabilize intra-sectoral output and induce an inter-sectoral reallocation of output away from sectors with a large contribution to aggregate volatility. Braun and Larrain (2005) and Raddatz (2006) use data on sectoral value added in a large cross-sections of countries, and find that financial development lowers output volatility, more so in financially vulnerable industries. As long as industrial shares and the correlations of sectoral output remain constant, these results imply a reduction in overall volatility. Manganelli and Popov (2012) find that financial development affects the speed with which an economy's actual industrial composition converges to its optimally diversified benchmark level.<sup>2</sup>

Our paper is more closely related to cross-country empirical studies that examine the link between finance and volatility. Using panel data for 60 countries, Easterly et al. (2000) find a U-shaped relationship between volatility and financial sector depth. Their point estimates suggest that output volatility starts increasing when credit to the private sector reaches 100 percent of GDP. Using a similar methodology, but different controls and aggregation periods, Denizer et al. (2002) generally support a negative correlation between financial depth and growth, consumption, and investment volatility. However, they do not find private sector credit as a fraction of GDP to be a significant determinant of macroeconomic volatility. Moreover, Acemoglu, et al. (2003) and Beck et al. (2006) do not find a robust relation between financial intermediary development and growth volatility.

Finally, our paper is related to a large literature that examines the structural determinants of macroeconomic volatility and the role of financial development in mediating the impact. Kose et al. (2003) find that trade and financial openness is positively correlated with output volatility suggesting that more open economies are more vulnerable to external shocks. Rodrik (1998) provides evidence that higher income and consumption volatility is strongly associated with exposure to external risk, proxied by the interaction of overall trade openness

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<sup>2</sup> Acharya et al. (2011) show that branching deregulation in the U.S. state reduced business cycle volatility due to more efficient reallocation of resources across industries.

and terms of trade volatility. Popov (2011) finds that countries with deeper domestic credit markets benefit more from financial liberalization in terms of lower tail risk. Beck et al. (2006), find weak evidence that financial intermediaries dampen the effect of terms of trade shocks on output volatility, while Loayza and Raddatz (2007) find that domestic financial depth plays a role in stabilizing more open economies.<sup>3</sup>

### III. METHODOLOGY AND DATA

Our approach in this paper relies on a dynamic panel regression framework. While this has some limitations, it enables us to provide a broad-brush characterization of the effects of financial depth on volatility at the macroeconomic level. One potential problem we have to contend with is that of reverse causality—the possibility that macroeconomic volatility itself hinders financial development, and the related problem of endogeneity—macroeconomic volatility and financial depth could both be responding to some other unobserved forces.

We tackle the endogeneity issue, in the presence of unobserved country fixed effects, by using the system GMM dynamic panel data estimator developed in Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) and we compute robust two-step standard errors by following the methodology proposed by Windmeijer (2004). This approach addresses the issues of joint endogeneity of all explanatory variables in a dynamic formulation and of potential biases induced by country-specific effects.

We estimate the following baseline regression:

$$V_{i,t} = \alpha V_{i,t-1} + \gamma_1 FD_{i,t} + \beta X_{i,t} + u_t + \mu_i + \varepsilon_{i,t} \quad (1)$$

where  $V$  is a measure of macroeconomic volatility at time  $t$  for country  $I$ ;  $FD$  is a measure of financial depth;  $X$  is a set of other control variables;  $u_t$  is the time-specific effect (for each non-overlapping five-year period);  $\mu_i$  is the country-specific effect; and  $\varepsilon_{i,t}$  is the error term.

As is now standard in the literature, a panel dataset is constructed by transforming the time series data into five-year averages. Our panel comprises data over the period 1974–2008 for 110 countries (34 high-income, and 76 middle- and low-income countries). Although the potential instability associated with a large financial sector is central to our argument, we exclude the recent crisis from the sample period in order to draw more general conclusions. We use data from the IMF’s International Financial Statistics and World Economic Outlook, and supplement this with data from various other sources, including databases maintained by the World Bank. The panel of country and time-period observations is unbalanced. Appendix I presents the list of countries included in the sample.

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<sup>3</sup> Beck et al. (2006) find that while there is weak evidence that financial intermediary development dampens the impact of terms-of-trade shocks, it serves to amplify the impact of monetary shocks.

To evaluate the empirical predictions advanced by the variety of theoretical models on the relationship between financial depth and macroeconomic volatility, we would ideally like to construct measures of the ability of financial systems to ameliorate information asymmetries, ease risk management, and facilitate resource mobilization. Financial depth, however, is a multidimensional concept and, as such, difficult to quantify, particularly for a broad cross-section of countries over the past four decades. Following King and Levine (1993), we measure financial depth by the aggregate private credit provided by deposit money banks and other financial institutions as a share of GDP. To assess the robustness of our results, we also consider three alternative measures, including total liquid liabilities, depository banks' assets, and total deposits in financial institutions, all measured as a share of GDP.

Following Denizer et al. (2002), we distinguish between overall macroeconomic volatility (volatility in real per-capita output growth) and sectoral volatility (volatility of real per-capita final and private consumption and total investment growth). Such a sectoral disaggregation can reveal whether financial depth has different influences on the household and business sectors. Our benchmark measure of volatility is the standard deviation of the per-capita growth rate of the relevant variable. To assess the robustness of our results, we also consider the deviation of the per-capita growth rate of output, consumption, and investment from its Hodrick-Prescott filter trend.

To study the responsiveness of macroeconomic volatility to real external shocks, we consider two measures of real external shocks, including shocks to the country-specific terms of trade and external demand. External demand shocks are measured as the standard deviation of partner country growth. As a robustness test, we also consider country-specific commodity price shocks, using the approach outlined in Aghion et al. (2010).<sup>4</sup> Financial crisis is a dummy variable indicating the frequency of a banking crisis within each five-year interval, taken from Laeven and Valencia (2010).

As controls we include a number of variables drawn from papers that have examined various aspects of volatility. The set includes beginning-of-period real GDP per capita to control for economic size, as smaller economies may concentrate more on particular industries, resulting in higher macroeconomic volatility. We also include the standard deviation of real exchange rates changes to control for macroeconomic stability, as exchange rate changes can affect production and consumption decisions. Other control variables, measured as averages within each 5-year period, include the ratio of government balance to GDP, the inflation rate, and growth rates of real per-capita GDP, consumption or investment. Structural variables to capture exposure to shocks include trade openness, as measured by the ratio of exports plus imports to GDP, and financial openness, measured by gross inflows as in Kose et al. (2009). Finally, we include an index of the type of political regime (Polity index) which captures the

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<sup>4</sup> This approach uses innovations in commodity prices, weighted by the contribution of these commodities in net exports.

institutionalized qualities of governing authority, and may have a bearing on economic stability. Definition and sources for all variables are given in Appendix II.

Tables 1-2 present the summary statistics. Simple bivariate regressions show a negative correlation between financial depth and volatility. Figure 1 plots private credit as a share of GDP against real per capita GDP, consumption, and investment growth volatilities over the horizon covered in dataset. The linear fitted lines and 95-percent confidence interval band are also displayed in the figures, suggesting that countries with higher levels of financial system depth experience less volatility.

#### **IV. REGRESSION RESULTS**

This section presents regression analysis of the relationship between financial depth and macroeconomic volatility. We start with simple cross-section regressions and then move on to dynamic panel regressions to exploit the time series dimension of the data as well. We then examine the presence of non-linearity in the financial depth-volatility nexus. Finally, we examine the role of financial depth in dampening the effect of external shocks on macroeconomic volatility, taking into account the extent of trade and financial openness of the economy.

##### **A. Baseline Results**

We begin with simple reduced-form cross-section regression to more formally characterize the correlation between financial depth and macroeconomic volatility across different time periods. Columns 1-4 of Table 3 show the basic cross-country regression for the full sample. The coefficients on private credit are negative and statistically significant in all regressions, suggesting that countries with deeper financial systems experience less macroeconomic volatility. The control variables generally enter with the expected signs. Trade openness is associated with higher variability of consumption but not investment or GDP, while financial openness is associated with greater GDP volatility. Exchange rate volatility is associated with higher GDP volatility. There is also evidence that countries with stronger fiscal positions experience lower private and total consumption volatility. Finally, stronger political institutions are associated with reduced macroeconomic volatility.

The empirical results are broadly consistent across different country groups. Columns 5-8 of Table 3 report the regression results for the sample of low- and middle-income countries. We still find a positive and statistically significant correlation between private credit and output and consumption volatility, with coefficient estimates that are larger for consumption volatility than those obtained for the full sample. It is well documented that consumption volatility tends to be substantially higher in developing countries (Loayaza et al., 2007). In line with this, we find that the beneficial effect of financial depth in smoothing consumption and investment volatility is more significant in these countries.

Financial depth has changed markedly over time across countries. To exploit the time series variation in the data, we now move on to using dynamic panel regressions based on non-

overlapping five-year averaged data for each country. Table 4 reports the GMM regression results for the full sample (Columns 1-4), and separately for a sample of developing countries (Columns 5-8).<sup>5</sup> The coefficient on private credit is significantly negative in all regressions, implying that greater financial depth is associated with lower macroeconomic volatility across different country groups. The estimates are also economically significant: a one-standard deviation increase in private credit to GDP (37.4 percent of GDP in the sample) reduces the volatility of growth, consumption, and investment by over 15 percent. As in the simple OLS regressions, the point estimate of the coefficient on private credit is larger in the sub-sample of middle-and low-income countries, suggesting that greater financial depth has a more pronounced effect in smoothing consumption volatility in these countries.

### Non-linear relationship

We have so far considered a linear relationship between financial depth and volatility. To investigate the presence of a non-monotonic relationship between the two, as in Easterly et al. (2000), we introduce a quadratic term to the baseline regressions reported in Table 4. Specifically, we estimate the following regression:

$$V_{i,t} = \alpha V_{i,t-1} + \gamma_1 FD_{i,t} + \gamma_2 FD_{i,t}^2 + \beta X_{i,t} + u_t + \mu_i + \varepsilon_{i,t} \quad (2)$$

From the above equation the marginal impact of financial depth on volatility is given by  $\gamma_1 + 2\gamma_2 FD_{i,t}$ . Therefore, the threshold at which the impact of financial development on volatility changes from negative to positive (i.e. magnifies volatility) is  $(-\gamma_1/2\gamma_2)$

As shown in Table 5, both the linear and the quadratic terms are statistically significant in almost all regressions. In general, the results suggest a U-shaped effect of private credit in smoothing volatility. Deeper financial systems reduce the volatility of macroeconomic aggregates, but only up to a certain threshold.<sup>6</sup> The coefficient estimates indicate that this threshold is approximately 132 percent of GDP for final consumption, 119 for private consumption, and above 106 percent of GDP for investment (Columns 2-4). Above these levels, consumption and investment volatility increases with the level of financial depth.<sup>7</sup> This suggests that consumption and production smoothing possibilities provided by the

<sup>5</sup> The bottom panel of the table reports the standard specification tests and shows that all regressions reject the null of no first order autocorrelation and do not reject the null of second order autocorrelation. The Hansen tests of over-identifying restrictions never reject the null, and thus provide support for the validity of the exclusion restrictions.

<sup>6</sup> We conducted joint F-tests for the coefficients of the first and second degrees of financial depth measures (the null hypotheses that  $\gamma_1$  and  $\gamma_2 \neq 0$ ) and Wald Test for the thresholds with the null hypothesis that the thresholds are equal to zero (i.e., the effects are linear and such thresholds do not exist). The results are reported in Table 5.

<sup>7</sup> For the GDP volatility regressions, the non-linear relationship between financial depth and output volatility is only significant for a sub-sample of high- and middle-income countries. The point estimates suggest that the marginal effect of financial depth becomes negative when credit to the private sector reaches 117 percent of GDP (available upon request)

existence of a deep financial system might reduce volatility, but up to a limit. As the financial system becomes larger relative to GDP, the increase in risk and leverage become relatively more important, and act to reduce stability.

Figure 3 plots the marginal effect of credit to the private sector on final consumption volatility based on the estimates of Column 2 in Table 5. It shows that the positive effect of financial depth in reducing consumption volatility is no longer statistically significant when credit to the private sector reaches 105 percent of GDP (over 18 percent of the observations in the regression of Column 2 are above this threshold). In 2008, the last year included in the dataset, there were 20 countries above this level, most of which are advanced countries significantly affected by the global financial crisis: the United States, Ireland, the United Kingdom, Spain, Portugal, and Cyprus.

## **B. Shocks**

It is well documented that external shocks, such as fluctuations in the terms of trade, commodity prices, and external demand, play an important role in fueling macroeconomic volatility. In this section we first augment the baseline specification to examine whether financial depth reduces volatility, controlling for real and financial shocks. Second, we examine the role of financial depth in mitigating or amplifying the impact of external shocks on macroeconomic volatility. Finally, we consider whether this impact depends on the structural characteristics of an economy (e.g., degree of trade and financial openness).

### **Controlling for shocks**

Table 6 extends the analysis in Table 4 and studies whether the association between financial depth and volatility is robust to controlling for measures of external shocks (measured as standard deviation of the terms-of-trade and external demand) and financial shocks (as proxied by banking crises). All regressions include the full set of control variables and control one-by-one, respectively for banking crises (Columns 1, 5, 9, and 13), fluctuations in the terms-of-trade (Columns 2, 6, 10, and 14) and external demand (Columns 3, 7, 11, and 15). In line with the literature, fluctuations in the terms-of-trade increase the overall volatility of output, consumption, and investment. However, external demand (partner growth) volatility is only associated with higher output volatility. The coefficient on external demand is insignificant for consumption and investment volatility. Finally, the results suggest that banking crises are an important determinant of output and investment volatility.

In almost all regressions, the impact of financial depth in reducing macroeconomic volatility remains negative and statistically significant. Columns 4, 8, 12, and 16 in Table 6 show that the association between financial depth and macroeconomic volatility also remains significant when all the shock variables are included simultaneously. All these results taken together suggest that financial depth helps mitigate macroeconomic volatility even after controlling for external shocks, thus providing support for the role of financial systems in fostering risk diversification and reducing information asymmetries within an economy.

### Interacting financial depth and exogenous shocks

We now turn to the interaction between exogenous shocks and financial depth to examine whether finance plays an amplifying or mitigating role through these shocks. The following form of equations is estimated:

$$V_{i,t} = \alpha V_{i,t-1} + \gamma_1 FD_{i,t} + \gamma_2 Shock_{i,t} + \gamma_3 FD_{i,t} \cdot Shock_{i,t} + \beta X_{i,t} + u_t + \mu_i + \varepsilon_{i,t} \quad (3)$$

where *Shock* is a measure of real external shocks and the other terms are defined as earlier.

Table 7 illustrates the impact of domestic financial depth in reducing the impact of terms-of-trade fluctuations across different measures of economic volatility (Columns 1-4). The interaction term is negative and statistically significant, suggesting that the more financially developed an economy, the less it is adversely affected by terms of trade volatility. We also find some evidence on the role of financial depth in reducing the impact of external demand shocks. The regressions indicate that the interaction term of partner country volatility and financial depth is negative and significant for private consumption volatility (Columns 5-8), although the effects are less significant for output and investment volatility.

### Financial Depth, shocks, and structural characteristics

Theoretical considerations suggest that greater openness to trade may expose the country to external shocks, but leave it less vulnerable to internally generated shocks. Greater financial openness might in principle provide a mechanism by which a country could smooth shocks, but at the same time could expose it to greater volatility, as exogenous shifts in those capital flows disrupt economic activity. It has been argued that financial depth helps reduce the impact of external shocks particularly in environments of high exposure—that is, when trade and financial openness are high. We examine this issue by including a triple interaction between financial depth, openness, and shocks.

The results, reported in Table 8, confirm that the role of financial depth in dampening macroeconomic volatility depends on economies' structural characteristics. Specifically, we find that while trade openness increases macroeconomic volatility, financial depth reduces the impact of terms-of-trade shocks on private consumption volatility in more open economies (Column 3). The results also point to a non-linear effect of external demand shocks on consumption volatility. Columns 6-7 illustrate that financial depth dampens the effect of external demand shocks on total and private consumption volatility in economies with greater trade openness. These results suggest that domestic financial depth plays an important role in stabilizing consumption in environments of high trade exposure.

Table 9 illustrates a similar positive role of financial depth in the case of financial openness. Although financial openness is associated with higher macroeconomic volatility, the impact of external demand and terms-of-trade shocks on consumption volatility, in particular, is reduced with greater financial depth (Columns 2-3, and 6-7). This finding suggests that

financial deepening plays an important role in attenuating the impact of external shocks on consumption volatility in more financially open economies.

## V. ROBUSTNESS CHECKS

In this section we report evidence from a battery of robustness tests to show that the set of regressions presented in Tables 3-8 offers solid evidence that financial depth plays an important role in dampening volatility and in mitigating the negative effects of external shocks on consumption volatility, particularly in more open economies. Our results of a U shaped relationship between depth and volatility are also robust to alternative measures of financial depth.

### **Alternative definition of volatility**

So far we have considered the standard deviation of the per-capita growth rate of the relevant variable as the measure of volatility. To assess the robustness of our results, we consider the deviation of the per-capita growth rate of output, consumption, and investment from its Hodrick- Prescott filter trend as the relevant measure. As can be seen from Table 10, our main results of a negative and significant relationship between financial depth and the volatility of growth, consumption, and investment still holds. Further, we confirm the existence of a non-monotonic relationship between depth and macroeconomic volatility.

### **Alternative definition of financial depth**

Our initial and preferred measure is private credit to GDP from banks and other financial institutions. Very similar results on the role of financial depth in dampening macroeconomic volatility are obtained when we consider three alternative measures of financial depth, all measured as percent of GDP: (i) total liquid liabilities, (ii) depository banks' assets, and (iii) total deposits in financial institutions.

Table 11 presents the robustness test to the three different financial depth measures. In all instances, our result that greater financial depth reduces macroeconomic volatility is confirmed. Further, we find evidence of a non-linear relationship between finance and consumption and investment volatility. As in the regressions with private credit, the non-linear relationship with output volatility only holds for the sub-sample of advanced and emerging market countries. We also find evidence that financial depth plays an important role in mitigating the negative effects of exogenous shocks on macroeconomic volatility. Moreover, the result on complementarities between financial depth and country structural characteristics continue to hold across different measures (not reported here but available upon request).

### **Endogeneity issues**

At this point, the main qualification to our results would be the standard question of endogeneity. To examine whether this is a serious issue in our context, we make various tests

with the GMM methodology. The dynamic panel procedure using the GMM estimator controls for the potential endogeneity of all the explanatory variables and accounts explicitly for the biases induced by including the initial level of volatility in the regressions. It is true that the estimation procedure is valid only under the assumption of *weak exogeneity* of the explanatory variables. That is, they are assumed to be uncorrelated with future realizations of the error term. This assumption can be tested using a Hansen test of over-identification which evaluates the entire set of moment conditions in order to assess the overall level of the instruments. The results of the Hansen tests shown in Tables 3-12 indicates that the validity of the instruments cannot be rejected.<sup>8</sup>

As a robustness check, we re-estimated all regressions by substituting in the instrument matrix the third lag level of the explanatory variables for the second lag level. The results, not reported here but available upon request, show that lagging the set of internal instruments yields very similar estimates and ensures that our results are not biased by the presence of some omitted variables that could be correlated with financial depth and might have an independent effect on the next period's volatility.

Finally, our empirical approach has several features that make it less vulnerable to a potential endogeneity bias. In addition to examining the direct effect of financial depth on volatility, we also focus on identifying contrasting volatility effects of real external shocks at different levels of financial depth, and for different degrees of openness of economies. Endogeneity is less of an issue with interaction terms than with single variables. Further, similar results are obtained for various measures of financial development, as well as for other measures of shocks (see below), and volatility.

### **Other robustness tests**

To further test the robustness of our results, we conducted a large number of additional tests and found that the results are indeed robust.

### ***Alternative definition of shocks***

To test that our results are robust to different external shocks, we also consider country-specific commodity price shocks, using the approach outlined in Aghion et al. (2010). This measure takes into account countries' export characteristics, assigning a higher weight to large net commodity exporters for a given change in commodity prices. As can be seen from Table 12, the interaction term between financial depth and commodity price shocks is negative and significant, suggesting that while commodity shocks increase volatility, this effect is dampened in countries with deeper financial systems. Further, the results suggest

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<sup>8</sup> A second test examines whether the differenced error term is second-order serially correlated, a necessary condition for the consistency of the estimation. In all regressions, we can safely reject second-order serial correlation.

that this volatility dampening effect of finance is particularly pronounced for countries that exhibit greater trade and financial openness.

### ***Different time horizons***

The empirical results are broadly consistent across different time horizons (Table 13). When shorter time period are considered (3 years), we still find a negative and statistically significant relationship between private credit and macroeconomic volatility. However, given the large number of instruments, the power of the Hansen test of over-identification becomes low, resulting in very high p-values (close to 1). Still, the AR-2 test ensures validity of the specification and the results. Estimating the model for a longer 7 year period shows that the results remain significant, and that validity of instruments cannot be rejected.

### ***Omission of continents and inclusion of other controls***

Our main results remain stable and significant when sub-groups of countries are omitted in a systematic way. We also considered other control variables, such as including banking crises in all regressions, and replacing the Polity index with other measures of institutional quality. The thrust of our results remains essentially unchanged and is available upon request.

## **VI. CONCLUSIONS**

This paper shed light on the ongoing debate on the effects of financial depth on macroeconomic volatility. It provides solid evidence that deeper financial systems dampen the volatility of output, consumption, and investment growth and can help cushion against adverse real external shocks. Our results also emphasize the consumption smoothing role of financial depth in countries with high trade and financial openness. Given the high welfare costs of volatility, and the more pronounced vulnerability of low-income and emerging market economies to sharp swings in commodity prices and the terms of trade, and trading partner volatility, our findings suggest that these countries can benefit from further financial deepening.

Our findings also suggest that there may be levels beyond which the beneficial effects on stability of financial depth diminish, and even become negative. This volatility amplifying effect of financial depth is largely driven by advanced economies and is also borne out from their experience in the global financial crisis. Several explanations have been put forward in the wake of the crisis for this non-linear effect of financial depth, ranging from a misallocation of funds, to the role of implicit safety nets in inducing aggressive risk-taking by banks.

Further empirical research is needed to gain insights into the factors that influence these threshold effects and the channels through which high levels of financial depth propagate and amplify instability. Policies could then be carefully calibrated for different economies in order to maximize the benefits of financial deepening in dampening macroeconomic volatility.

Figure 1. Financial Depth and Macroeconomic Volatility, 1974-2008  
(with linear fitted lines and 95-percent confidence interval bands)

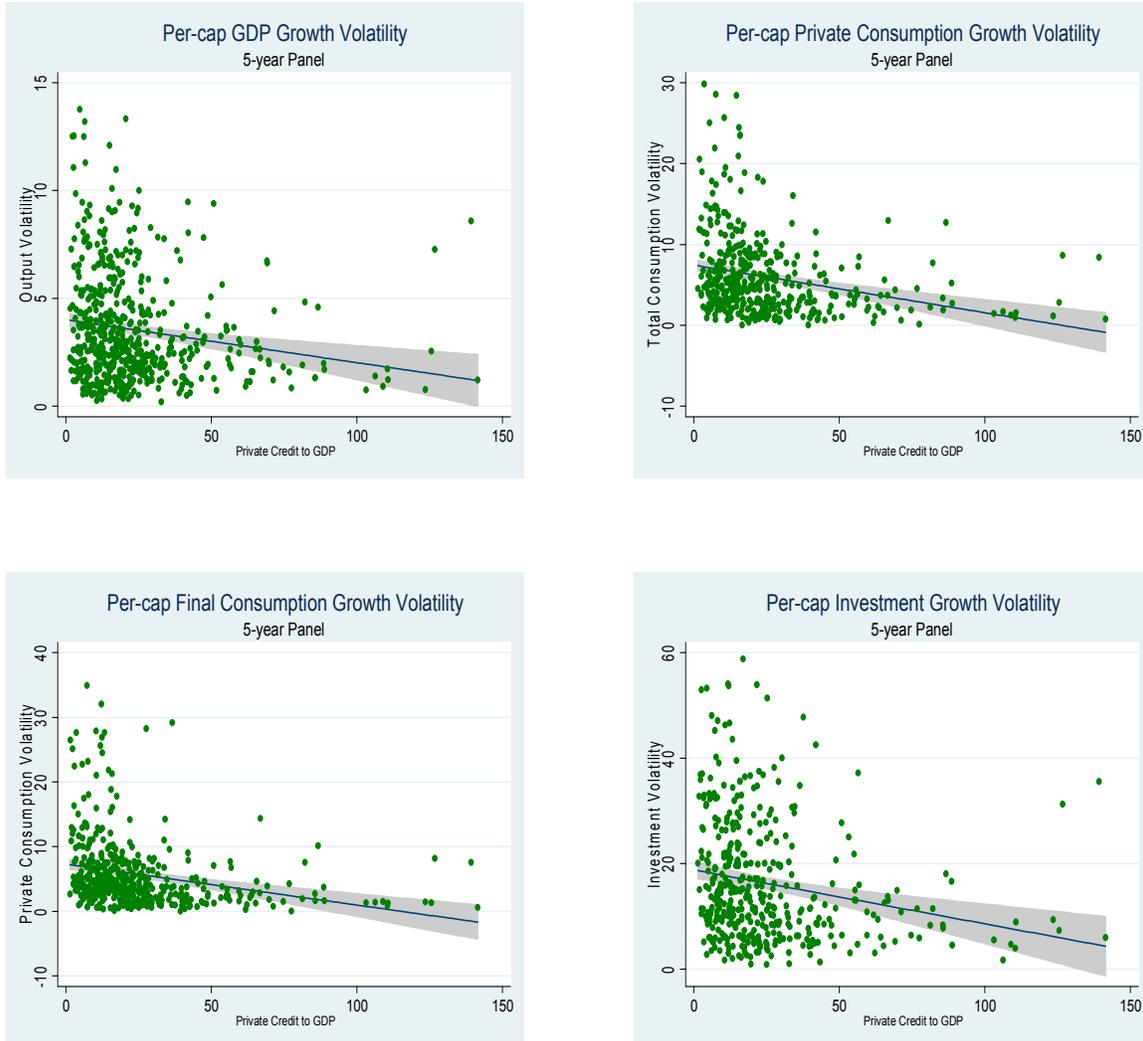
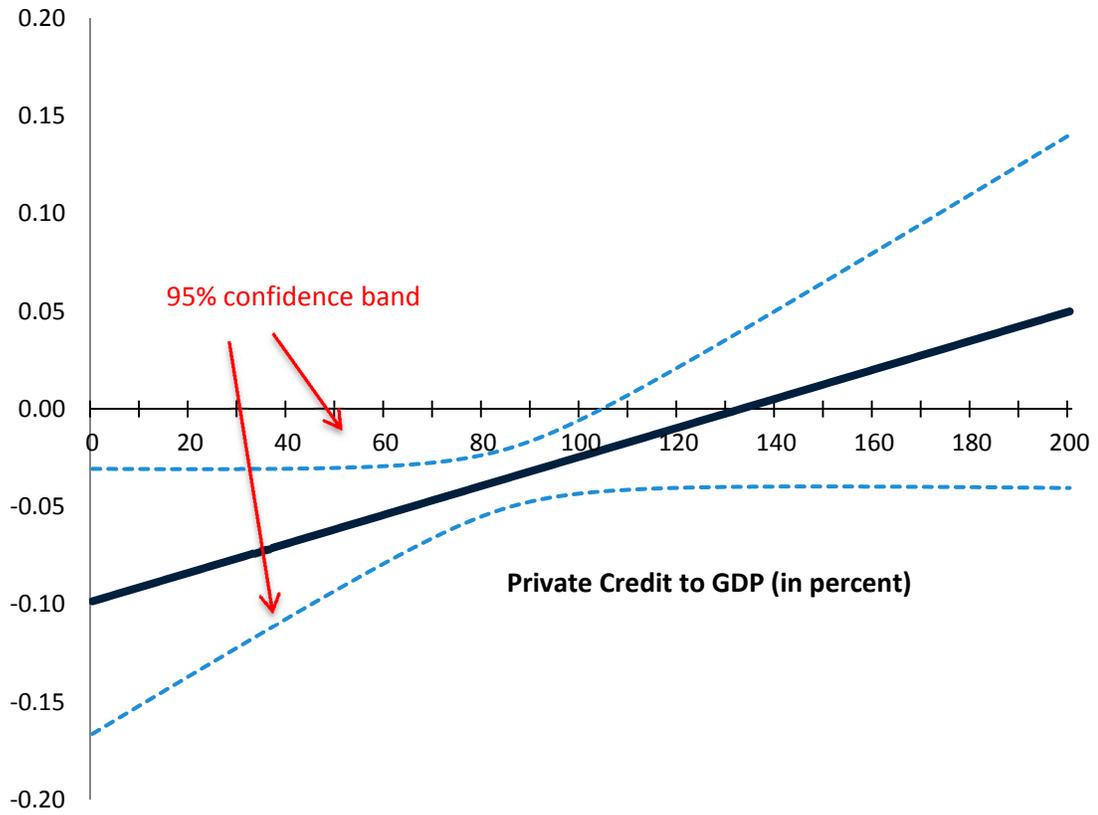


Figure 2. Marginal Effect of Private Credit on Final Consumption Volatility



Note: This figure shows the projected effect using the coefficients on both the ratio of private credit to GDP and its square in the final consumption volatility regression.

**Table 1. Summary Statistics**  
(Five-year panel)

Variable	Obs	Mean	Std. Dev.	Min	Max
SD of real per-capita growth of					
GDP	880	3.47	3.37	0.06	34.39
Final consumption	641	5.00	8.85	0.04	176.10
Private consumption	663	5.90	10.31	0.01	178.62
Investment	635	15.14	14.43	0.00	124.86
Real per-capita growth of					
GDP	880	1.87	3.57	-21.96	31.64
Final consumption	653	1.92	6.36	-23.61	129.38
Private consumption	677	2.07	6.65	-19.85	131.25
Investment	649	1.93	10.95	-83.19	56.72
Financial depth measures					
Liquid liabilities	703	42.31	28.85	0.65	223.09
Bank assets	717	44.04	38.85	1.99	241.28
Private credit	728	39.74	37.44	1.39	195.77
Deposits	718	37.28	30.52	1.74	211.73
Shocks					
Partner growth volatility	875	1.15	1.23	-2.48	11.93
Terms-of-Trade volatility	850	0.03	6.85	-57.61	28.79
Commodity export price volatility	818	0.04	0.23	-1.18	1.52
Banking crisis	880	0.31	0.83	0.00	5.00
Other controls					
Trade openness	723	54.99	39.74	8.88	346.82
Financial openness	852	2.77	6.58	-14.41	92.24
Inflation rate	752	29.77	140.66	-9.43	2282.40
Government balance	819	-3.20	5.41	-24.78	27.83
Polity index	827	-1.14	13.10	-88.00	10.00
Real exchange rate volatility	822	7.68	15.73	0.00	164.00
Initial real GDP per-capita	770	10.76	2.22	6.42	16.67

**Table 2. Correlation Matrix**  
(Five-year panel correlations between variables reported in Table 1)

	GDP growth	Final consumption growth	Private consumption growth	Investment growth	GDP volatility	Final consumption volatility	Private consumption volatility	Investment volatility	Liquid liabilities	Bank assets	Private credit	Deposits	Partner Growth volatility	Terms-of-trade volatility	Commodity price volatility	Banking crisis	Trade openness	Financial openness	Inflation rate	Government balance	Polity index	Real exchange rate volatility	Initial real GDP per-capita
GDP growth	1																						
Final consumption growth	0.6601	1																					
Private consumption growth	0.5793	0.9578	1																				
Investment growth	0.575	0.4264	0.3789	1																			
GDP volatility	-0.0686	0.0109	0.0221	-0.0888	1																		
Final consumption volatility	-0.0255	-0.0032	0.0148	0.0232	0.5378	1																	
Private consumption volatility	-0.0336	0.0215	0.0408	-0.0062	0.4362	0.9211	1																
Investment volatility	-0.2164	-0.1495	-0.1171	-0.0351	0.4429	0.4049	0.369	1															
Liquid liabilities	0.1174	0.0894	0.0758	-0.0212	-0.2841	-0.3523	-0.3163	-0.3385	1														
Bank assets	0.1146	0.08	0.0724	-0.0149	-0.2932	-0.3652	-0.3274	-0.3561	0.9178	1													
Private credit	0.0918	0.069	0.0599	-0.0322	-0.2732	-0.3613	-0.3238	-0.3396	0.8319	0.9143	1												
Deposits	0.1391	0.0971	0.0831	-0.01	-0.2924	-0.3566	-0.3176	-0.3444	0.982	0.9266	0.8644	1											
Partner growth volatility	0.229	0.2018	0.1778	0.1042	0.0195	0.0875	0.144	0.0051	0.1471	0.1356	0.1492	0.1957	1										
Terms-of-trade volatility	0.014	0.1493	0.1411	0.0596	0.1118	0.0771	0.0216	0.0068	-0.0078	0.018	0.0087	-0.0115	0.0812	1									
Commodity price volatility	0.1215	0.273	0.2317	0.1308	0.0374	0.0003	0.0239	0.0781	0.0134	0.0019	-0.0033	0.0174	0.2104	0.4189	1								
Banking crisis	-0.1808	-0.198	-0.1811	-0.1052	0.1889	0.0567	0.028	0.1306	-0.0444	-0.0315	-0.0337	-0.0474	-0.1221	-0.0335	-0.0771	1							
Trade openness	0.2363	0.1953	0.1647	0.0676	-0.0016	0.0165	0.0611	-0.0219	0.1903	0.1684	0.1722	0.2359	0.8311	0.0323	0.1708	-0.1148	1						
Financial openness	0.3083	0.261	0.2234	0.1335	0.0863	0.0552	0.1075	-0.1014	0.2361	0.2938	0.2999	0.2383	0.3408	-0.017	0.0816	-0.0123	0.3398	1					
Inflation rate	-0.0851	-0.0457	-0.0096	-0.0095	0.1293	0.1227	0.205	0.0433	-0.1264	-0.1003	-0.1068	-0.1163	-0.0156	-0.0562	-0.0371	0.121	-0.0646	0.0119	1				
Government balance	0.2463	0.2798	0.2147	0.1737	-0.1559	-0.18	-0.1986	-0.1496	0.0565	0.095	0.1604	0.094	0.2951	0.2386	0.4709	-0.0665	0.2598	0.1492	-0.0864	1			
Polity index	0.3209	0.1843	0.1571	0.1808	-0.2738	-0.2855	-0.2794	-0.2937	0.311	0.3646	0.3408	0.3401	-0.0189	0.0675	-0.0075	-0.0147	0.0241	0.1218	-0.0669	0.1005	1		
Real exchange rate volatility	-0.1218	-0.0458	0.0007	-0.0604	0.2711	0.2717	0.3527	0.1784	-0.251	-0.226	-0.2384	-0.2451	-0.0112	-0.0362	-0.0238	0.2315	-0.0757	0.0107	0.8022	-0.1119	-0.1364	1	
Initial real GDP per-capita	-0.0248	-0.0264	-0.0248	0.0086	0.0274	0.0636	0.0272	0.0964	-0.0784	-0.0621	-0.0255	-0.0688	-0.0415	0.0401	-0.0166	0.0692	-0.1171	-0.0548	-0.0906	0.0721	-0.0142	-0.0819	1

**Table 3. Financial Depth and Volatility: Cross-Section Regressions (OLS)**

Dependent variable (volatility of growth rate of):	FULL SAMPLE				EMERGING & LICs			
	GDP	Final Consumption	Private consumption	Investment	GDP	Final Consumption	Private Consumption	Investment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(ln) Initial per-capita GDP	0.125 (0.0962)	0.688*** (0.250)	0.804** (0.318)	1.240* (0.686)	0.133 (0.0989)	0.609* (0.321)	0.712* (0.415)	1.471 (0.940)
Per-capita growth	0.0119* (0.00664)	0.00688 (0.0177)	0.0213 (0.0224)	0.0622 (0.0481)	-0.214 (0.157)	1.869*** (0.155)	1.757*** (0.197)	-0.0759 (0.563)
Trade openness	0.151 (0.139)	1.812*** (0.132)	1.712*** (0.165)	0.0117 (0.420)	0.0270** (0.0103)	0.0208 (0.0337)	0.0610 (0.0436)	0.0779 (0.0996)
Financial openness	0.105* (0.0592)	0.219 (0.150)	0.295 (0.191)	0.194 (0.419)	0.0508 (0.0960)	0.0835 (0.312)	0.335 (0.404)	0.482 (0.939)
Polity index	-0.0501* (0.0278)	-0.155** (0.0747)	-0.245** (0.0951)	-0.434** (0.201)	-0.0206 (0.0286)	-0.183* (0.0959)	-0.238* (0.124)	-0.364 (0.277)
Inflation	-0.00487 (0.00512)	0.00579 (0.0135)	0.0408** (0.0172)	-0.00810 (0.0378)	-0.00261 (0.00485)	0.0102 (0.0160)	0.0430** (0.0207)	-0.0135 (0.0490)
Government balance	0.00177 (0.0758)	-0.362* (0.198)	-0.495* (0.251)	-0.494 (0.541)	0.0280 (0.0853)	-0.511* (0.279)	-0.603* (0.360)	-0.667 (0.817)
(sd) Real FX change	0.0488** (0.0199)	0.0254 (0.0552)	0.0556 (0.0703)	0.0193 (0.149)	0.0492** (0.0188)	0.00383 (0.0658)	-0.0747 (0.0851)	0.0321 (0.192)
Private Credit	-0.0315*** (0.00843)	-0.0682*** (0.0222)	-0.0793*** (0.0281)	-0.125** (0.0605)	-0.0119*** (0.00327)	-0.106** (0.0452)	-0.152** (0.0584)	-0.102 (0.131)
Constant	2.667* (1.347)	-4.493 (3.454)	-5.316 (4.394)	5.518 (9.521)	2.729* (1.510)	-4.744 (4.768)	-5.600 (6.165)	1.599 (14.22)
Observations	110	110	110	110	76	76	76	76
R-squared	0.424	0.756	0.682	0.235	0.419	0.771	0.694	0.130

Standard errors in parentheses

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

**Table 4. Financial Depth and Volatility: Panel Regressions (GMM)**

Dependent variable (volatility of growth rate of):	FULL SAMPLE				EMERGING & LICs			
	GDP (1)	Final Consumption (2)	Private consumption (3)	Investment (4)	GDP (9)	Final Consumption (10)	Private Consumption (11)	Investment (12)
Lagged dependent variable	0.0238 (0.0749)	0.0274 (0.0396)	0.115 (0.113)	0.0180 (0.204)	-0.0354 (0.0809)	0.0252 (0.0377)	0.0999 (0.102)	0.00579 (0.207)
Per-capita growth	-0.103 (0.102)	-0.117 (0.291)	-0.0835 (0.232)	0.103 (0.157)	-0.168* (0.0955)	-0.326 (0.197)	-0.128 (0.227)	0.109 (0.204)
(ln) Initial per-capita GDP	0.0594 (0.0729)	0.139 (0.168)	0.193 (0.202)	0.790* (0.450)	-0.0212 (0.0899)	0.0462 (0.212)	0.0123 (0.264)	0.625 (0.546)
Trade openness	0.00498 (0.00486)	0.0101 (0.0128)	0.0228 (0.0180)	0.0318* (0.0178)	0.00637 (0.00790)	0.0293 (0.0235)	0.0614* (0.0321)	0.0491 (0.0372)
Financial openness	0.0888 (0.0577)	0.141** (0.0697)	0.238* (0.138)	0.0346 (0.0947)	0.0320 (0.0246)	0.105 (0.104)	0.324 (0.273)	0.110 (0.170)
Polity index	-0.0329** (0.0145)	-0.0708** (0.0323)	-0.0970*** (0.0364)	-0.137 (0.126)	-0.0151 (0.0168)	-0.0564* (0.0314)	-0.0874* (0.0493)	-0.137 (0.107)
Inflation	0.00179 (0.00195)	-0.00158 (0.00351)	-0.00374 (0.00873)	-0.0149 (0.0165)	0.000583 (0.00173)	0.000445 (0.00317)	-0.00200 (0.00851)	-0.0123 (0.0152)
Government balance	-0.00129 (0.0555)	-0.0615 (0.0953)	-0.352 (0.216)	-0.567** (0.257)	-0.102 (0.0887)	-0.00825 (0.160)	-0.425 (0.307)	-0.593 (0.371)
(sd) Real FX change	0.000271 (0.0269)	0.0410 (0.0447)	0.118 (0.120)	0.206 (0.165)	0.0156 (0.0239)	0.0146 (0.0438)	0.0942 (0.112)	0.131 (0.161)
Private credit	-0.0149** (0.00650)	-0.0362*** (0.0103)	-0.0455*** (0.0149)	-0.0631*** (0.0231)	-0.0154* (0.00877)	-0.0618** (0.0255)	-0.109** (0.0424)	-0.110** (0.0489)
Constant	1.299 (1.071)	1.882 (2.167)	-0.0445 (2.851)	-0.728 (4.127)	2.542** (1.242)	3.416 (2.517)	1.082 (3.969)	0.882 (6.282)
Observations	628	485	506	481	437	326	326	326
Number of Countries	110	110	110	110	79	79	79	79
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.272	0.604	0.305	0.677	0.997	0.943	0.883	0.939
A-B AR(2) test p-value	0.865	0.294	0.138	0.893	0.683	0.537	0.155	0.988

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5. Non-linear Relationship Between Financial Depth and Volatility: Panel Regressions (GMM)**

Dependent variable (volatility of growth rate of):	GDP (1)	Final Consumption (2)	Private Consumption (3)	Investment (4)
Lagged dependent variable	-0.00175 (0.0778)	0.0232 (0.0388)	0.107 (0.105)	0.0261 (0.187)
Per-capita growth	-0.120 (0.101)	-0.167 (0.322)	-0.0967 (0.166)	0.0241 (0.159)
(ln) Initial per-capita GDP	0.0415 (0.106)	0.131 (0.149)	0.131 (0.206)	0.471 (0.336)
Trade openness	0.00686 (0.00440)	0.0141* (0.00833)	0.0284 (0.0188)	0.0477*** (0.0177)
Financial openness	0.0955 (0.0697)	0.154* (0.0895)	0.243 (0.151)	0.0545 (0.0989)
Polity index	-0.0228 (0.0181)	-0.0610** (0.0289)	-0.0858*** (0.0298)	-0.100 (0.105)
Inflation	0.00203 (0.00203)	-0.00152 (0.00358)	-0.00421 (0.00779)	-0.0112 (0.0120)
Government balance	-0.0180 (0.0559)	-0.118 (0.0967)	-0.398** (0.183)	-0.537** (0.257)
(sd) Real FX change	-0.00702 (0.0276)	0.0334 (0.0456)	0.110 (0.110)	0.109 (0.122)
Private credit (PC)	-0.0397* (0.0214)	-0.0985*** (0.0346)	-0.126*** (0.0446)	-0.326** (0.126)
PC Squared	0.000135 (0.000103)	0.000371* (0.000198)	0.000529** (0.000254)	0.00154** (0.000712)
Constant	2.061 (1.344)	3.153 (2.245)	1.812 (2.906)	8.299 (5.504)
Fin Depth Joint Eff p-value	0.0378	1.69e-05	0.00205	0.00243
Threshold Value		132.9	118.6	106.0
SE of Threshold Value		27.78	20.10	11.06
Threshold 95% CI		(78.5,187.4)	(79.2,158.0)	(84.3,127.7)
Observations	628	485	506	481
Number of Countries	110	110	110	110
Time Dummies	YES	YES	YES	YES
Hansen test p-value	0.697	0.712	0.757	0.737
A-B AR(2) test p-value	0.750	0.333	0.153	0.783

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 6. Financial Depth, Shocks, and Macroeconomic Volatility: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	GDP				Final Consumption				Private Consumption				Investment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Lagged dependent Variable	-0.148 (0.128)	-0.139 (0.128)	-0.0516 (0.127)	0.00697 (0.0725)	-0.00426 (0.0141)	-0.00245 (0.0140)	0.133 (0.186)	0.286** (0.130)	0.0452 (0.0612)	0.0526 (0.0633)	0.224** (0.0933)	0.376*** (0.0692)	-0.112 (0.154)	-0.116 (0.137)	-0.110 (0.185)	0.0556 (0.195)
Per-capita growth	0.00797 (0.121)	-0.00201 (0.108)	-0.0259 (0.127)	-0.0401 (0.0879)	0.0779 (0.353)	0.0542 (0.338)	0.0202 (0.295)	-0.00665 (0.304)	0.0126 (0.376)	0.00169 (0.378)	0.0371 (0.292)	0.0306 (0.183)	0.221 (0.184)	0.246 (0.197)	0.242 (0.163)	0.0150 (0.187)
(ln) Initial per-capita GDP	0.115 (0.0966)	0.136 (0.0863)	0.113 (0.0839)	0.0242 (0.0899)	0.257 (0.174)	0.260 (0.182)	0.137 (0.187)	0.0799 (0.141)	0.227 (0.208)	0.190 (0.194)	0.170 (0.197)	0.0795 (0.144)	1.029*** (0.362)	0.999*** (0.337)	0.970*** (0.339)	0.433 (0.354)
Trade openness	0.0117** (0.00476)	0.00103 (0.00523)	0.00753* (0.00414)	-0.00144 (0.00411)	0.00703 (0.00726)	0.00576 (0.00698)	0.00470 (0.00639)	0.00518 (0.00580)	0.0190 (0.0127)	0.0169 (0.0132)	0.0201 (0.0126)	0.0157 (0.0138)	0.0397* (0.0212)	0.0183 (0.0271)	0.0400** (0.0196)	0.0185 (0.0221)
Financial openness	0.0420 (0.0577)	0.0443 (0.0562)	0.0309 (0.0564)	0.0688 (0.0508)	0.0820** (0.0368)	0.0729 (0.0450)	0.0668 (0.0471)	0.111 (0.0711)	0.204* (0.106)	0.215* (0.119)	0.172 (0.122)	0.165 (0.109)	-0.0346 (0.184)	-0.0677 (0.191)	-0.0662 (0.197)	0.0363 (0.0828)
Polity index	-0.0472** (0.0188)	-0.0430** (0.0192)	-0.0414** (0.0185)	-0.0298 (0.0191)	-0.0662* (0.0355)	-0.0643* (0.0333)	-0.0349 (0.0476)	-0.0402 (0.0253)	-0.0494 (0.0520)	-0.0497 (0.0481)	-0.0423 (0.0418)	-0.0615** (0.0281)	-0.170 (0.109)	-0.171 (0.105)	-0.151 (0.109)	-0.118 (0.105)
Inflation	-0.0113 (0.0109)	-0.00874 (0.00936)	-0.00681 (0.00626)	0.00199 (0.00191)	0.0132 (0.0198)	0.0149 (0.0206)	0.00799 (0.0141)	-0.000423 (0.00269)	0.0107 (0.0204)	0.00874 (0.0197)	0.00681 (0.0194)	-0.00146 (0.00612)	-0.0351* (0.0195)	-0.0378* (0.0200)	-0.0348 (0.0234)	-0.00865 (0.0103)
Government balance	-0.0558 (0.0716)	-0.0590 (0.0709)	-0.0200 (0.0668)	-0.0136 (0.0620)	-0.195* (0.104)	-0.201** (0.0988)	-0.103 (0.0764)	-0.00982 (0.0938)	-0.640*** (0.203)	-0.633*** (0.187)	-0.574** (0.259)	-0.299 (0.255)	-1.105*** (0.236)	-1.142*** (0.230)	-1.078*** (0.255)	-0.432* (0.259)
(sd) Real FX change	0.108 (0.0678)	0.102* (0.0605)	0.117** (0.0449)	0.000278 (0.0245)	0.100 (0.0794)	0.105 (0.0796)	0.0613 (0.0754)	0.0156 (0.0308)	0.124 (0.108)	0.128 (0.125)	0.0936 (0.112)	0.0811 (0.0860)	0.406* (0.238)	0.469* (0.246)	0.460* (0.251)	0.0788 (0.116)
(sd) Term-of-Trade Growth			0.0392* (0.0211)	0.0533** (0.0223)			0.0899** (0.0415)	0.125** (0.0547)			0.120** (0.0536)	0.165*** (0.0565)			0.114 (0.122)	0.175** (0.0828)
(sd) Partner Growth		1.373* (0.757)		1.059 (0.642)		0.429 (0.501)		0.363 (0.705)		0.411 (0.425)		0.744 (0.609)		3.438 (3.633)		3.166 (2.696)
Banking crisis	0.382* (0.228)			0.271 (0.232)	0.0918 (0.320)			0.296 (0.456)	0.519 (0.406)			-0.239 (0.711)	0.123* (0.0651)			2.818* (1.458)
Private credit	-0.0146*** (0.00494)	-0.0160*** (0.00604)	-0.0113** (0.00559)	-0.0108** (0.00544)	-0.0217** (0.0109)	-0.0196* (0.0106)	-0.0195* (0.0112)	-0.0227* (0.0118)	-0.0268* (0.0140)	-0.0278** (0.0133)	-0.0178 (0.0119)	-0.0157 (0.0100)	-0.0732** (0.0337)	-0.0731** (0.0353)	-0.0517* (0.0296)	-0.0706*** (0.0222)
Constant	-0.409 (1.529)	-0.393 (1.413)	-0.678 (1.437)	1.395 (1.016)	-0.806 (3.112)	-0.977 (3.219)	-0.127 (3.083)	0.718 (2.102)	-1.553 (3.756)	-1.282 (3.513)	-3.183 (3.454)	-0.0157 (0.0100)	-3.153 (5.783)	-2.847 (5.411)	-4.087 (5.270)	2.495 (4.054)
Observations	628	628	614	614	485	485	478	478	506	506	499	499	481	481	474	474
Number of countries	110	110	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.463	0.439	0.283	0.723	0.834	0.735	0.647	0.693	0.840	0.795	0.476	0.965	0.745	0.768	0.791	0.733
A-B AR(2) test p-value	0.401	0.228	0.790	0.292	0.387	0.355	0.253	0.341	0.237	0.206	0.131	0.264	0.614	0.597	0.635	0.746

Standard errors in parentheses

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

**Table 7. Interacting Financial Depth and External Shocks: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	TERMS-OF-TRADE GROWTH				PARTNER GROWTH			
	GDP (1)	Final Consumption (2)	Private Consumption (3)	Investment (4)	GDP (5)	Final Consumption (6)	Private Consumption (7)	Investment (8)
Lagged dependent variable	0.0383 (0.0808)	0.268** (0.134)	0.376*** (0.0681)	0.0132 (0.208)	0.00868 (0.0703)	0.0337 (0.0433)	0.111 (0.109)	0.0908 (0.185)
Per-capita growth	-0.0113 (0.150)	-0.0184 (0.280)	0.0613 (0.177)	0.0162 (0.164)	-0.0829 (0.0930)	-0.115 (0.285)	-0.0988 (0.199)	0.105 (0.186)
(log) Initial per-capita GDP	0.0528 (0.0856)	0.103 (0.135)	0.179 (0.184)	0.618 (0.390)	0.0749 (0.0810)	0.225 (0.166)	0.238 (0.198)	0.649* (0.356)
Trade openness (TO)	0.00483 (0.00462)	0.00925 (0.00735)	0.0230* (0.0123)	0.0283* (0.0162)	-0.00188 (0.00340)	0.00621 (0.00804)	0.0210 (0.0137)	0.00381 (0.0171)
Financial openness (FO)	0.0526 (0.0328)	0.0729 (0.0517)	0.146** (0.0712)	-0.0220 (0.106)	0.0893 (0.0631)	0.145 (0.0894)	0.218* (0.124)	0.0261 (0.0831)
Polity index	-0.0257 (0.0164)	-0.0430 (0.0263)	-0.0627** (0.0297)	-0.139 (0.111)	-0.0272* (0.0139)	-0.0743** (0.0294)	-0.0950** (0.0368)	-0.129 (0.110)
Inflation	0.000579 (0.00209)	0.000573 (0.00239)	-0.000638 (0.00496)	-0.0143 (0.0147)	0.00171 (0.00192)	-0.000641 (0.00448)	-0.00143 (0.00855)	-0.0162 (0.0137)
Government Balance	-0.0189 (0.0551)	-0.0255 (0.0869)	-0.282 (0.179)	-0.322 (0.301)	-0.0357 (0.0598)	-0.0480 (0.104)	-0.335* (0.193)	-0.568** (0.257)
(sd) Real FX change	0.0146 (0.0299)	0.00499 (0.0301)	0.0592 (0.0601)	0.172 (0.139)	0.00241 (0.0282)	0.0287 (0.0575)	0.104 (0.117)	0.194 (0.135)
Private credit (PC)	-0.00328 (0.00584)	-0.00868 (0.0125)	-0.00795 (0.0163)	-0.00901 (0.0289)	-0.0152** (0.00677)	-0.0335*** (0.00913)	-0.0191 (0.0180)	-0.0793*** (0.0275)
(sd) Terms-of-Trade Growth	0.128*** (0.0395)	0.187** (0.0783)	0.305*** (0.0997)	0.477*** (0.178)				
(sd) Partner Growth					1.237 (0.872)	2.584 (1.940)	6.303** (2.717)	1.983 (5.278)
PC x (sd) ToT Growth	-0.00338*** (0.00117)	-0.00332* (0.00174)	-0.00583** (0.00280)	-0.0132** (0.00612)				
PC x (sd) Partner Growth					-0.00200 (0.00773)	-0.0255 (0.0183)	-0.0670** (0.0311)	0.0272 (0.0449)
Constant	0.175 (1.417)	-0.597 (2.123)	-4.745 (3.264)	-1.302 (4.120)	1.088 (1.188)	0.482 (2.448)	-2.454 (3.654)	1.471 (4.025)
Observations	614	478	499	474	628	485	506	481
Number of Countries	108	108	108	108	110	110	110	110
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.768	0.883	0.904	0.830	0.802	0.840	0.872	0.850
A-B AR(2) test p-value	0.849	0.142	0.0379	0.952	0.560	0.313	0.178	0.572

Standard errors in parentheses

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

**Table 8. Financial Depth, External Shocks, and Trade Openness: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	TERMs-OF-TRADE GROWTH				PARTNER GROWTH			
	GDP (1)	Final Consumption (2)	Private consumption (3)	Investment (4)	GDP (5)	Final Consumption (6)	Private Consumption (7)	Investment (8)
Lagged dependent variable	0.0484 (0.0783)	0.269** (0.127)	0.365*** (0.0692)	0.0342 (0.233)	0.00453 (0.0777)	0.0288 (0.0384)	0.116 (0.110)	0.0830 (0.166)
Per-capita growth	0.0134 (0.161)	-0.0213 (0.278)	0.0650 (0.182)	-0.00640 (0.181)	-0.0617 (0.100)	-0.0775 (0.296)	-0.0659 (0.194)	0.0809 (0.177)
(log) Initial per-capita GDP	0.0130 (0.0940)	0.0514 (0.119)	0.124 (0.149)	0.519 (0.413)	0.0572 (0.0819)	0.172 (0.162)	0.224 (0.238)	0.614* (0.356)
Trade openness (TO)	0.00735 (0.00594)	0.0141 (0.0102)	0.0367** (0.0175)	0.0529* (0.0274)	-0.00233 (0.00330)	0.00854 (0.00780)	0.0271* (0.0157)	0.00403 (0.0189)
Financial openness (FO)	0.0672* (0.0383)	0.106* (0.0612)	0.162* (0.0894)	-0.00354 (0.0907)	0.0711 (0.0531)	0.128* (0.0764)	0.188 (0.114)	-0.00705 (0.0840)
Polity index	-0.0296* (0.0170)	-0.0443* (0.0265)	-0.0610* (0.0345)	-0.124 (0.112)	-0.0272* (0.0143)	-0.0752** (0.0317)	-0.0934*** (0.0352)	-0.146 (0.108)
Inflation	0.000710 (0.00234)	7.36e-06 (0.00279)	-0.000615 (0.00648)	-0.0171 (0.0151)	0.00108 (0.00220)	-0.000732 (0.00372)	-0.00174 (0.00886)	-0.0141 (0.0137)
Government balance	-0.0224 (0.0554)	-0.0268 (0.0793)	-0.327 (0.247)	-0.390 (0.287)	-0.00713 (0.0530)	-0.0582 (0.0947)	-0.353* (0.207)	-0.534** (0.230)
(sd) Real FX change	0.0164 (0.0317)	0.0122 (0.0338)	0.0654 (0.0908)	0.209 (0.139)	0.0122 (0.0313)	0.0331 (0.0475)	0.107 (0.120)	0.177 (0.137)
Private credit (PC)	-0.00801 (0.00623)	-0.0213** (0.00939)	-0.00858 (0.0140)	-0.0125 (0.0268)	-0.0115* (0.00639)	-0.0382*** (0.0101)	-0.0399*** (0.0144)	-0.0627*** (0.0214)
(sd) Term-of-Trade growth	0.0651*** (0.0238)	0.132** (0.0641)	0.225*** (0.0745)	0.300* (0.173)				
(sd) Partner growth					1.677** (0.729)	2.517** (1.247)	3.695** (1.510)	6.219 (3.908)
PC x (sd) TOT growth x TO	-1.07e-05 (1.03e-05)	-2.11e-05 (1.73e-05)	-4.83e-05* (2.60e-05)	-0.000121 (0.000110)				
PC x (sd) Partner growth x TO					-3.28e-05 (2.20e-05)	-9.30e-05** (4.27e-05)	-0.000153*** (5.57e-05)	-7.47e-05 (0.000101)
Constant	0.600 (1.425)	0.0735 (2.379)	-4.374 (2.969)	-1.094 (4.534)	0.997 (1.248)	0.805 (2.423)	-1.832 (3.691)	0.547 (4.102)
Observations	614	478	499	474	628	485	506	481
Number of Countries	108	108	108	108	110	110	110	110
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.767	0.890	0.922	0.808	0.924	0.815	0.696	0.862
A-B AR(2) test p-value	0.855	0.0975	0.0336	0.949	0.574	0.321	0.153	0.628

Standard errors in parentheses

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

**Table 9. Financial Depth, External Shocks, and Financial Openness: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	TERMS-OF-TRADE GROWTH				PARTNER GROWTH			
	GDP	Final Consumption	Private Consumption	Investment	GDP	Final Consumption	Private Consumption	Investment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependent variable	0.107 (0.0705)	0.304** (0.126)	0.359*** (0.0773)	0.0459 (0.215)	0.0466 (0.0784)	0.0302 (0.0440)	0.102 (0.0914)	0.0713 (0.177)
Per-capita growth	0.106 (0.184)	0.0318 (0.217)	0.0106 (0.161)	-0.0322 (0.165)	-0.102 (0.0983)	-0.241 (0.276)	-0.253 (0.170)	0.105 (0.172)
(log) Initial per-capita GDP	0.0471 (0.0873)	0.0721 (0.152)	0.137 (0.159)	0.628* (0.342)	0.0444 (0.0946)	0.174 (0.175)	0.296 (0.205)	0.650* (0.371)
Trade openness	0.00217 (0.00356)	0.00483 (0.00644)	0.0176* (0.00991)	0.0284** (0.0132)	-0.00366 (0.00346)	0.00304 (0.00694)	0.0164 (0.0122)	0.00172 (0.0182)
Financial openness (FO)	0.0918* (0.0468)	0.203** (0.0807)	0.402* (0.209)	0.0723 (0.155)	0.110 (0.0882)	0.318** (0.147)	0.553*** (0.209)	0.0529 (0.135)
Polity index	-0.0398* (0.0209)	-0.0430* (0.0254)	-0.0665* (0.0344)	-0.120 (0.105)	-0.0263** (0.0128)	-0.0740** (0.0305)	-0.0956** (0.0376)	-0.138 (0.0999)
Inflation	-0.000159 (0.00229)	7.25e-05 (0.00273)	-0.000143 (0.00590)	-0.0125 (0.0127)	0.00163 (0.00210)	-0.000307 (0.00385)	-0.00145 (0.00678)	-0.0139 (0.0141)
Government Balance	-0.0445 (0.0579)	-0.0741 (0.0916)	-0.336 (0.227)	-0.316 (0.268)	-0.0111 (0.0587)	-0.0440 (0.130)	-0.336* (0.199)	-0.488* (0.252)
(sd) Real FX change	0.0304 (0.0327)	0.00750 (0.0378)	0.0521 (0.0824)	0.159 (0.124)	0.00135 (0.0296)	0.0216 (0.0455)	0.0806 (0.0879)	0.183 (0.148)
Private Credit (PC)	-0.00266 (0.00517)	-0.0193** (0.00816)	-0.00860 (0.0118)	-0.0439** (0.0203)	-0.0129** (0.00622)	-0.0348*** (0.0110)	-0.0389*** (0.0110)	-0.0615** (0.0238)
(sd) Term of Trade growth (TOT)	0.0594** (0.0239)	0.127** (0.0604)	0.191*** (0.0612)	0.175* (0.0923)				
PC x FO x (sd) ToT	-8.33e-05 (7.21e-05)	-0.000247* (0.000131)	-0.000658* (0.000379)	-0.000249 (0.000368)				
(sd) Partner growth					1.445** (0.629)	2.611** (1.182)	4.771*** (1.771)	4.907* (2.889)
PC x (sd) Partner growth x TO					-0.000393 (0.000424)	-0.00190* (0.00100)	-0.00363** (0.00172)	-0.000361 (0.00132)
Constant	-0.265 (1.662)	-0.336 (2.793)	-3.726 (2.728)	0.416 (3.792)	1.230 (1.515)	0.852 (2.556)	-3.194 (3.222)	0.217 (4.594)
Observations	614	478	499	474	628	485	506	481
Number of Countries	108	108	108	108	110	110	110	110
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.821	0.793	0.934	0.815	0.850	0.729	0.892	0.907
A-B AR(2) test p-value	0.676	0.0654	0.0312	0.891	0.877	0.350	0.277	0.655

Standard errors in parentheses

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

**Table 10. Financial Depth and HP-filtered Volatility: Panel-Regressions (GMM)**

Dependent variable (deviation from HP filter in growth of):	GDP		Final Consumption		Private Consumption		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependent variable	0.207*** (0.0667)	0.177** (0.0828)	0.264** (0.107)	0.229*** (0.0856)	0.383*** (0.0902)	0.342*** (0.0881)	0.132 (0.158)	0.0666 (0.127)
Per-capita growth	-0.0572 (0.0439)	-0.0672 (0.0634)	0.157* (0.0813)	0.200*** (0.0721)	0.145** (0.0719)	0.179*** (0.0544)	0.0810 (0.111)	0.0549 (0.101)
(log) Initial per-capita GDP	0.0307 (0.0438)	0.0183 (0.0500)	0.133 (0.0814)	0.132 (0.0967)	0.161* (0.0814)	0.0854 (0.111)	0.504** (0.195)	0.194 (0.234)
Trade openness	0.00286 (0.00265)	0.00386 (0.00281)	0.00471 (0.00434)	0.00695 (0.00512)	0.0137** (0.00637)	0.0154** (0.00606)	0.0139 (0.00899)	0.0256** (0.0116)
Financial openness	0.0481 (0.0461)	0.0519 (0.0404)	0.0806* (0.0483)	0.0699 (0.0461)	0.121 (0.0763)	0.121* (0.0612)	0.0568 (0.0528)	0.0271 (0.0714)
Polity index	-0.0193** (0.00902)	-0.0121 (0.00770)	-0.0421*** (0.0149)	-0.0378*** (0.0143)	-0.0582*** (0.0180)	-0.0516*** (0.0178)	-0.114* (0.0654)	-0.0816 (0.0639)
Inflation	-7.62e-05 (0.00145)	0.000224 (0.00110)	-0.000673 (0.00197)	-0.000882 (0.00231)	-0.00163 (0.00489)	-0.00142 (0.00515)	-0.00348 (0.00748)	-0.000797 (0.00682)
Government Balance	-0.0114 (0.0350)	-0.0173 (0.0310)	-0.0995* (0.0508)	-0.133** (0.0577)	-0.308* (0.166)	-0.313** (0.128)	-0.304 (0.190)	-0.371** (0.148)
(sd) Real FX change	0.0113 (0.0188)	0.00487 (0.0143)	0.0185 (0.0250)	0.0211 (0.0306)	0.0647 (0.0611)	0.0630 (0.0607)	0.0590 (0.0886)	-0.00240 (0.0779)
Private Credit	-0.00743* (0.00414)	-0.0282** (0.0112)	-0.0247*** (0.00640)	-0.0682*** (0.0182)	-0.0214*** (0.00695)	-0.0859*** (0.0243)	-0.0494*** (0.0187)	-0.280*** (0.0703)
PC Squared		0.000117** (5.31e-05)		0.000316*** (9.93e-05)		0.000429*** (0.000134)		0.00142*** (0.000400)
Constant	0.476 (0.640)	1.103 (0.797)	-0.956 (0.996)	-0.443 (1.176)	-2.723** (1.260)	-0.874 (1.561)	-1.275 (2.256)	7.265** (3.586)
Fin Depth Joint Eff p-value		0.0188		0.000253		0.00164		0.000161
Threshold Value		120.6		107.7		100.1		98.39
SE of Threshold Value		11.78		8.864		7.814		5.984
Threshold 95% CI		(97.6,143.7)		(90.3,125.1)		(84.7,115.4)		(86.7,110.1)
Observations	628	628	565	565	577	577	563	563
Number of Countries	110	110	110	110	110	110	110	110
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.247	0.723	0.270	0.897	0.299	0.830	0.430	0.884
A-B AR(2) test p-value	0.891	0.941	0.786	0.75	0.113	0.101	0.475	0.530

Standard errors in parentheses

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

**Table 11. Alternative Measures of Financial Depth: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	GDP			Final Consumption			Private Consumption			Investment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged dependent variable	0.0417 (0.0974)	-0.00175 (0.0776)	-0.0184 (0.0690)	0.0132 (0.0311)	0.0189 (0.0348)	0.0183 (0.0341)	0.0903 (0.108)	0.0910 (0.0996)	0.0950 (0.104)	0.0295 (0.196)	0.0899 (0.175)	-0.0148 (0.181)
Per-capita growth	-0.139 (0.113)	-0.125 (0.116)	-0.101 (0.111)	-0.154 (0.309)	-0.112 (0.305)	-0.127 (0.318)	-0.146 (0.224)	-0.0768 (0.201)	-0.0936 (0.233)	0.00222 (0.170)	-0.0330 (0.148)	-0.00973 (0.159)
(log) Initial per-capita GDP	0.0178 (0.0877)	0.0374 (0.0841)	0.0537 (0.0879)	0.0344 (0.167)	0.103 (0.149)	0.0397 (0.181)	0.0139 (0.233)	0.0401 (0.184)	0.00706 (0.257)	0.275 (0.397)	0.310 (0.320)	0.184 (0.371)
Trade openness	0.00784* (0.00463)	0.00642 (0.00478)	0.00718 (0.00473)	0.0154* (0.00911)	0.0118 (0.00907)	0.0166* (0.00891)	0.0341** (0.0169)	0.0352** (0.0161)	0.0363** (0.0173)	0.0494** (0.0213)	0.0453*** (0.0170)	0.0568*** (0.0184)
Financial openness	0.0860 (0.0533)	0.0916 (0.0645)	0.0830 (0.0536)	0.146 (0.0889)	0.141* (0.0835)	0.131 (0.0858)	0.200* (0.119)	0.245* (0.127)	0.209 (0.130)	0.0219 (0.0968)	0.0750 (0.0814)	0.0139 (0.0876)
Polity index	-0.0213 (0.0147)	-0.0226 (0.0181)	-0.0265* (0.0155)	-0.0616* (0.0326)	-0.0663** (0.0314)	-0.0640** (0.0297)	-0.0887** (0.0376)	-0.0735* (0.0374)	-0.0895** (0.0395)	-0.121 (0.102)	-0.0860 (0.100)	-0.100 (0.0894)
Inflation	0.00107 (0.00193)	0.00144 (0.00184)	0.00149 (0.00162)	-0.00298 (0.00384)	-0.00171 (0.00401)	-0.00270 (0.00392)	-0.00435 (0.00833)	-0.00365 (0.00845)	-0.00552 (0.00924)	-0.0157 (0.0127)	-0.0113 (0.0119)	-0.0164 (0.0130)
Government Balance	-0.0228 (0.0596)	-0.0231 (0.0593)	-0.0171 (0.0581)	-0.159 (0.102)	-0.0646 (0.0938)	-0.114 (0.105)	-0.466** (0.228)	-0.424* (0.219)	-0.406* (0.233)	-0.611** (0.299)	-0.632** (0.300)	-0.591** (0.249)
(sd) Real FX change	0.000914 (0.0247)	-0.000299 (0.0257)	-0.00141 (0.0258)	0.0470 (0.0480)	0.0422 (0.0495)	0.0451 (0.0505)	0.108 (0.108)	0.105 (0.105)	0.121 (0.119)	0.167 (0.119)	0.120 (0.119)	0.173 (0.125)
Liquid Liabilities (LL)	-0.0505* (0.0286)			-0.126** (0.0583)			-0.166** (0.0661)			-0.309*** (0.113)		
LL Squared	0.000178 (0.000129)			0.000477* (0.000274)			0.000646** (0.000298)			0.00120** (0.000577)		
Bank Assets (BA)		-0.0321** (0.0155)			-0.0821*** (0.0251)			-0.142*** (0.0461)			-0.248*** (0.0944)	
BA Squared		8.64e-05 (6.65e-05)			0.000259** (0.000111)			0.000536** (0.000207)			0.000943** (0.000467)	
Deposits (DP)			-0.0431* (0.0227)			-0.104** (0.0474)			-0.144** (0.0579)			-0.357*** (0.107)
DP Squared			0.000156 (0.000106)			0.000388* (0.000227)			0.000595** (0.000287)			0.00154** (0.000591)
Constant	2.855** (1.223)	2.156* (1.226)	2.091* (1.246)	5.769* (2.955)	3.493 (2.349)	4.332 (2.736)	5.625 (4.242)	3.557 (3.081)	3.718 (3.795)	13.07* (7.241)	9.416* (5.205)	14.30** (6.535)
Fin Depth Joint Eff p-value	0.00266	0.0111	0.00491	2.25e-06	4.30e-06	1.91e-05	0.00435	0.000787	0.00332	0.00182	0.00117	0.000652
Threshold Value				132.5	158.3	134.3	128.6	132.6	120.6	129.2	131.4	115.8
SE of Threshold Value				16.23	22.78	19.07	11.30	11.93	12.66	20.25	18.93	14.88
Threshold 95% CI				(100.7,164.3)	(113.6,202.9)	(96.9,171.6)	(106.4,150.7)	(109.2,156.0)	(95.8,145.5)	(89.5,168.9)	(94.3,168.5)	(86.7,145.0)
Observations	610	621	621	472	480	480	493	501	501	468	476	476
Number of Countries	109	110	110	108	109	109	108	110	110	108	109	109
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.796	0.695	0.690	0.945	0.715	0.816	0.808	0.821	0.705	0.859	0.902	0.923
A-B AR(2) test p-value	0.611	0.740	0.760	0.321	0.272	0.313	0.169	0.161	0.154	0.803	0.575	0.963

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 12. Financial Depth and Commodity Export Shocks: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	Trade openness				Financial Openness			
	GDP	Final Consumption	Private Consumption	Investment	GDP	Final Consumption	Private Consumption	Investment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependent variable	-0.00725 (0.0950)	0.0224 (0.0350)	0.101 (0.0930)	0.0479 (0.188)	0.00939 (0.0758)	0.0207 (0.0328)	0.0942 (0.0894)	0.0431 (0.184)
Per-capita growth	-0.0156 (0.118)	0.0106 (0.263)	0.0433 (0.221)	0.110 (0.211)	-0.0699 (0.112)	-0.0850 (0.296)	-0.0704 (0.204)	0.136 (0.196)
(log) Initial per-capita GDP	0.0411 (0.0912)	0.104 (0.171)	0.0691 (0.186)	0.545 (0.381)	0.0143 (0.0850)	0.107 (0.161)	0.122 (0.189)	0.644* (0.361)
Trade openness (TO)	0.00347 (0.00510)	0.0125 (0.00959)	0.0348** (0.0175)	0.0219 (0.0238)	0.000666 (0.00409)	0.0132 (0.00986)	0.0330* (0.0178)	0.0204 (0.0195)
Financial openness (FO)	0.0851* (0.0490)	0.133 (0.0807)	0.219 (0.141)	0.0337 (0.0955)	0.106 (0.0654)	0.221* (0.119)	0.352** (0.174)	0.0516 (0.0859)
Polity index	-0.0279* (0.0145)	-0.0723** (0.0304)	-0.0937*** (0.0340)	-0.146 (0.107)	-0.0262** (0.0130)	-0.0707** (0.0279)	-0.0907*** (0.0291)	-0.160 (0.114)
Inflation	0.00157 (0.00205)	-0.000610 (0.00296)	-0.00288 (0.00852)	-0.0137 (0.0141)	0.00148 (0.00210)	0.000690 (0.00317)	-0.00101 (0.00676)	-0.0144 (0.0155)
Government balance	-0.0447 (0.0542)	-0.0726 (0.0972)	-0.362* (0.212)	-0.532 (0.322)	-0.0192 (0.0493)	-0.0538 (0.0987)	-0.312 (0.210)	-0.574* (0.296)
(sd) Real FX change	0.00564 (0.0313)	0.0297 (0.0386)	0.108 (0.119)	0.177 (0.139)	0.00295 (0.0310)	0.0129 (0.0422)	0.0820 (0.0954)	0.190 (0.154)
(sd) Commodity export price	2.158*** (0.736)	4.388*** (1.622)	7.253*** (2.301)	3.074 (3.172)	1.785** (0.696)	3.741** (1.448)	6.621*** (2.363)	3.264 (3.207)
Private Credit to GDP (PC)	-0.0109* (0.00649)	-0.0385*** (0.00986)	-0.0390*** (0.0127)	-0.0596*** (0.0225)	-0.0129** (0.00649)	-0.0378*** (0.00879)	-0.0374*** (0.0123)	-0.0641** (0.0247)
PC x TO x (sd) Commodity export price	-0.000117* (6.89e-05)	-0.000286** (0.000129)	-0.000532** (0.000221)	6.63e-05 (0.000302)				
PC x FO x (sd) Commodity export price					-0.00142 (0.00140)	-0.00666** (0.00327)	-0.0117** (0.00535)	0.00220 (0.00507)
Constant	0.958 (1.385)	1.491 (2.492)	-0.611 (3.073)	2.103 (4.372)	1.606 (1.278)	1.440 (2.326)	-1.193 (3.246)	1.182 (4.150)
Observations	621	481	502	477	621	481	502	477
Number of Countries	110	110	110	110	110	110	110	110
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	0.879	0.736	0.863	0.870	0.843	0.799	0.834	0.838
A-B AR(2) test p-value	0.635	0.358	0.125	0.728	0.790	0.365	0.188	0.757

Standard errors in parentheses

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

**Table 13. Financial Depth and Volatility over Different Time Horizons: Panel-Regressions (GMM)**

Dependent variable (volatility of growth rate of):	Three-year Panel				Seven-year Panel			
	GDP	Final Consumption	Private Consumption	Investment	GDP	Final Consumption	Private Consumption	Investment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependent variable	0.0648 (0.0760)	0.0398 (0.0543)	0.179 (0.142)	0.333** (0.136)	0.0261 (0.0861)	-0.00898 (0.0548)	0.0684 (0.101)	0.0137 (0.216)
Per-capita growth	-0.132* (0.0737)	-0.114 (0.218)	-0.175 (0.210)	-0.241 (0.198)	-0.113** (0.0545)	-0.0192 (0.159)	0.354 (0.325)	0.451 (0.354)
(log) Initial per-capita GDP	0.00798 (0.0997)	0.155 (0.177)	0.0368 (0.197)	0.476** (0.234)	0.0590 (0.0855)	0.260 (0.208)	0.271 (0.239)	0.980** (0.396)
Trade openness	0.00595 (0.00382)	0.00854 (0.00706)	0.0231* (0.0119)	0.0199 (0.0126)	0.0108* (0.00600)	0.00775 (0.00861)	0.0102 (0.00916)	0.0381** (0.0188)
Financial openness	0.0359 (0.0315)	0.147 (0.0984)	0.195 (0.130)	0.0779 (0.0599)	0.0298 (0.0387)	0.0983 (0.0878)	0.0724 (0.0828)	-0.0101 (0.110)
Polity index	-0.0409*** (0.0139)	-0.0615** (0.0309)	-0.0629 (0.0424)	-0.0580 (0.0862)	-0.0336** (0.0164)	-0.0601* (0.0336)	-0.122** (0.0495)	-0.377** (0.173)
Inflation	-0.00157 (0.00116)	-0.00420** (0.00202)	-0.00385 (0.00294)	-0.0121 (0.00792)	0.00627** (0.00287)	0.00490 (0.00975)	0.00680 (0.00994)	0.0235 (0.0152)
Government balance	-0.0557 (0.0510)	-0.0847 (0.0962)	-0.333* (0.184)	-0.280* (0.158)	0.0170 (0.0977)	-0.0418 (0.118)	-0.176 (0.135)	-0.327 (0.387)
(sd) Real FX change	0.0122 (0.0119)	0.0749 (0.0456)	0.189 (0.122)	0.164 (0.114)	-0.0340 (0.0265)	0.00278 (0.0758)	0.0576 (0.0738)	-0.159 (0.143)
Private Credit	-0.00755* (0.00453)	-0.0388*** (0.0109)	-0.0372** (0.0143)	-0.0434** (0.0189)	-0.0174*** (0.00601)	-0.0405*** (0.0107)	-0.0326*** (0.0117)	-0.0410 (0.0560)
Constant	1.958 (1.182)	1.637 (2.698)	1.692 (3.208)	-0.350 (3.211)	2.079 (1.328)	1.915 (2.708)	-0.0299 (3.568)	-1.646 (8.855)
Observations	1,014	799	822	791	458	332	354	329
Number of Countries	110	110	110	110	110	110	110	110
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Hansen test p-value	1	1.000	1.000	1.000	0.672	0.317	0.338	0.366
A-B AR(2) test p-value	0.358	0.533	0.560	0.161	0.787	0.159	0.242	0.809

Standard errors in parentheses

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

### Appendix 1. List of Countries

High Income	Middle Income		Low Income
Australia	Albania	Paraguay	Bangladesh
Austria	Algeria	Peru	Benin
Bahrain	Angola	Philippines	Burkina Faso
Canada	Argentina	Poland	Burundi
Cyprus	Armenia	Russian Federation	Cote d'Ivoire
Czech Republic	Botswana	South Africa	Cambodia
Denmark	Brazil	Thailand	Chad
Equatorial Guinea	Cameroon	Tunisia	Ethiopia
Estonia	Cape Verde	Turkey	Gambia, The
Finland	Chile	Uruguay	Ghana
France	China	Venezuela, RB	Guinea-Bissau
Germany	Colombia		Haiti
Greece	Congo, Rep.		Kenya
Hungary	Costa Rica		Kyrgyz Republic
Ireland	Croatia		Lao PDR
Israel	Dominican Republic		Madagascar
Italy	Egypt, Arab Rep.		Malawi
Japan	El Salvador		Mali
Korea, Rep.	Gabon		Mauritania
Netherlands	Guatemala		Mozambique
New Zealand	Honduras		Nepal
Norway	India		Niger
Oman	Indonesia		Nigeria
Portugal	Iran, Islamic Rep.		Pakistan
Saudi Arabia	Kazakhstan		Papua New Guinea
Singapore	Latvia		Rwanda
Slovak Republic	Lesotho		Senegal
Slovenia	Libya		Sierra Leone
Spain	Lithuania		Solomon Islands
Switzerland	Malaysia		Tanzania
United Kingdom	Mauritius		Togo
United States	Mexico		Uganda
	Morocco		Zambia

## Appendix 2. Variables Used in Regression Analysis

Variables	Description	Source
GDP growth	Annual percentage growth of per-capita real GDP.	IMF WEO
Final Consumption growth	Annual percentage growth of per-capita real final consumption.	IMF WEO
Private Consumption growth	Annual percentage growth of per-capita real private consumption.	IMF WEO
Investment growth	Annual percentage growth of per-capita real investment.	IMF WEO
GDP volatility	Standard deviation of real GDP growth.	IMF WEO
Final consumption volatility	Standard deviation of real final consumption growth.	IMF WEO
Private consumption volatility	Standard deviation of real private consumption growth.	IMF WEO
Investment volatility	Standard deviation of real investment growth.	IMF WEO
Liquid liabilities	M3 as percentage of GDP.	World Bank
Bank assets	Depository banks's assets as percentage of GDP	World Bank
Private credit	Private credit supplied by depository banks and other financial institutions as percentage of GDP.	World Bank
Deposits	Deposit to depository banks and other financial institutions as percentage of GDP.	World Bank
External demand shocks	Standard deviation of the partner's percentage growth weighted by a country's export ratio.	IMF WEO
Terms of trade shocks	Standard deviation of percentage change in term of trade of goods.	IMF WEO
Commodity price shocks	Standard deviation of percentage change in commodity export prices weighted by share of commodity exports in total exports.	IMF WEO
Banking Crisis	Dummy variable for banking crises.	Laeven and Valencia (2010)
Trade openness	Sum of exports and imports as a share of GDP.	IMF WEO
Financial openness	Sum of gross foreign direct investment, portfolio and equity investment liabilities as percentage of GDP.	IMF WEO
Inflation	Inflation measured by consumer price index.	IMF WEO
Government balance	Central government balance as percentage of GDP.	IMF WEO
Polity index	Index ranging from -10 (autocratic regimes) to +10 (democratic regimes).	POLITY IV
Real exchange rate volatility	Standard deviation of real exchange rate in unit of national currency per US dollar.	IMF WEO
Initial real GDP per capita	Natural log of real GDP per capita at the beginning of each period.	IMF WEO

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