Two Faces of Financial Systems:

Provision of services versus shock-smoothing

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Abstract

Banks and financial markets contribute to economic growth directly – by providing information, liquidity and other services to investors and borrowers, and indirectly – by dampening the impact of exogenous shocks on growth. Do banks and markets perform equally well in both? Our panel of 44 developing and 29 developed countries in 1975-2017 demonstrates significance of only the service channel in advanced economies: they perform better if they are market-based. In less developed economies, financial structure has no direct relevance for growth but offers shock-smoothing advantages through banks; market trading activity makes shocks absorbed faster and transmitted to the real sector quicker.

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1 Introduction

The current coronavirus crisis and the associated drop in oil prices revive attention to those building blocks of our economies that help promote growth in tough times and protect from the harmful impact of exogenous shocks. A bulk of governments' responses to COVID-19 is financial in its nature, including interest rate cuts and stimuli to increase lending by financial intermediaries. Looking backwards at a less turbulent period, where sporadic oil shocks were not associated with the spread of diseases, we want to learn whether the ability of a country to sustain growth and withstand exogenous shocks depends on the structure of its financial system.

There seems to be a consensus among economists that banks and markets matter for growth, however there is less agreement on the relative importance of the two. An extensive body of literature examines the impact of financial structure, given by the relative weights of intermediaries and capital markets in the country's financial sector, on economic growth. Some argue that whether a country is more market-based or bank-based, is of little relevance to economic growth. Others suggest that this irrelevance result crucially depends on economic, financial and institutional development. Policy-makers stress importance of either banks or markets in different contexts.[1] Remarkably, the literature focuses mainly on the direct link between financial structure and economic growth. We take a broader view by also investigating the indirect link arising through the role of financial systems in smoothing exogenous shocks and by extending the analysis to the medium term. On the one hand, this adds a macro-

[1] For example, speaking about Tunisia in September 2015, IMF's Managing Director Christine Lagarde emphasized the need in a sound banking system, as a "key to maintaining growth and creating jobs," (Statement by IMF Managing Director Christine Lagarde at the Conclusion of her Visit to Tunisia, Press Release No. 15/407, September 9, 2015. Available online at: http://www.imf.org/external/np/sec/pr/2015/pr15407.htm) yet in another speech the same month she stressed the role of financial markets, indicating that China needs to transition "to a stable, more market-driven financial system." ("Managing the Transition to a Healthier Global Economy," Address by Christine Lagarde, Managing Director, IMF at an event hosted by Council of the Americas, Washington, D.C., September 30, 2015, http://www.imf.org/external/np/speeches/2015/093015.htm.)

perspective to the recent micro-level empirical evidence on the ability of banks and markets to smooth shocks (for example Bolton et al., 2013; Sette and Gobbi, 2015; Levine et al., 2016; Abuka et al., 2019; Kokas et al., 2020; Levine et al., 2020). On the other hand, it extends the macroeconomic research of the direct impact of financial systems on growth (La Porta et al., 2000; Levine, 2002; Luintel et al. 2016) by explicitly distinguishing between the two micro-founded functions of financial systems – provision of services and shock-smoothing – and empirically testing them simultaneously.

As for the direct relationship between financial structure and growth, the literature offers several views. According to the *bank-based view*, financial systems, where intermediaries have a greater weight than the financial market, stimulate growth because banks provide liquidity (Diamond and Dybvig, 1983; Bencivenga and Smith, 1991), information (Diamond, 1984; Chakraborty and Ray, 2006), help build up reputation (Diamond, 1991) and enable renegotiation (Chemmanur and Fulghieri, 1994). In contrast, the *market-based view* stresses that the system with a greater weight of financial markets promotes growth because capital markets offer advantages such as ensuring commitment to contract terms (Dewatripont and Maskin, 1995), facilitating good governance (Tadesse, 2004), as well as offering better hedging opportunities, among others. Importantly, in Fecht et al. (2008), it is the liquidity provision by banks that constrains their ability to promote growth: to insure against liquidity shocks, banks have to hold reserves, thus removing funds from productive investment. Empirically, a number of studies suggest that the financial structure does not matter for growth (La Porta et al., 2000; Levine, 2002) as intermediaries and financial markets offer complementary financial services, which is referred to as the *financial services view*. Finally, according to the *hybrid view*, the relative importance of banks and markets is contingent on the level of countries' economic and financial development (Boyd and Smith, 1998; Tadesse, 2002, Allen et al., 2018). For example, Ergungor (2008) shows that markets outperform banks

in promoting growth in economies with flexible legal systems, Luintel et al. (2016) find the same holds for the high-income but not for the middle- and low-income countries, Cave et al. (2020) report the effect of stock market development on growth reverts from positive to negative when markets become better developed, while Zhu et al. (2020) find a diminishing effect of financial development on innovations and innovation-led growth.

[FIGURE 1]

As for the role of the composition of financial systems in dampening the effects of exogenous shocks on growth, not much is known. Theoretically, banks are able to smooth shocks because they spread the impact across time periods by accumulating safe assets (Allen and Gale, 1997) or by rolling the deficit or surplus over from period to period (Gersbach and Wenzelburger, 2001; Vinogradov, 2011). Well-developed markets, especially in open economies, may provide protection against exogenous shocks through hedging instruments (Borensztein et al., 2013) and offer an alternative source of finance to firms when banks fail to do so (Levine et al., 2016). Empirically, the smoothing role of banks is visible in the relationship lending where banks ensure smooth funding to long-term customers (Bolton et al., 2013; Sette and Gobbi, 2015). The ability to smooth, however, may differ across banks and banking sectors. In a developing country context, Abuka et al. (2019) focus on monetary policy shocks and find stronger transmission of the latter to the customers of banks with higher leverage and sovereign debt exposure. Globally, Kokas et al. (2020) show the smoothing ability crucially and non-trivially depends on the banking industry structure, with competitive banks and super-power banks alike being able to smooth the impact of deposit fluctuations on lending better than banks in the middle of the spectrum. These studies show shock-smoothing benefits certain cohorts of bank customers. Whether shock smoothing is beneficial for the economy as

a whole, is still an open question, which requires a macro-level answer. Addressing the latter, Aghion et al. (2010) demonstrate that financial development, as measured by the size of the banking sector, reduces the impact of shocks on macroeconomic growth. However, as Figure 1 shows, the size of the banking sector is highly correlated with that of financial markets. It remains therefore unclear if the shock dampening effect in Aghion et al. (2010) is achieved through banks or markets, or maybe both. Beck et al. (2014a) show that financial intermediation is negatively associated with macroeconomic volatility, while direct finance (non-intermediation) is associated with higher volatility, mainly in high-income countries. Their results suggest banking sectors may potentially outperform markets in smoothing out business cycle fluctuations. Still, it remains to establish whether they smooth the impact of exogenous shocks on growth, and whether banks or markets perform better in this role.

[FIGURE 2]

To capture exogenous shocks, we focus on the commodity terms-of-trade (CTOT) volatility. On the one hand, commodity prices are determined in global commodity markets especially so for developing economies who are price-takers in the global market (Broda, 2004, Blattman et al., 2007).[2] This index is known to affect economic growth (Spatafora and Tytell, 2009; Cavalcanti et al., 2015), real exchange rates (Ricci *et al.,* 2013; Aizenman *et al.*, 2012) and social welfare indicators such as child mortality (Makhlouf *et al*., 2017). Developing countries are more vulnerable to commodity price volatility as they tend to have less-diversified economies (Bloom, 2014, Makhlouf *et al*., 2015). Figure 2 shows the negative relationship between CTOT volatility and economic growth for developing countries, in stark

[2] Gruss and Kebhaj (2019) illustrate that CTOT index is exogenous for most countries as only handful of countries have a dominant position in any commodity market. In addition, they show that domestic output growth Granger-cause changes in commodity terms of trade only for large economies and market-dominant countries (although the results are significant only at 10% confidence level). Thus, we use GMM estimator to avoid the potential endogeneity issue.

contrast to developed economies. On the other hand, focusing on the country-specific index such as CTOT allows us to capture the differential impact of global price movements on individual countries in our sample.

We study a panel of 73 countries over the period of 1975-2017. Splitting the whole period into non-overlapping 3-year segments allows us to focus on medium- and long-term effects, which is crucial in our setup as shock-smoothing may be undetectable in shorter periods.[3] All variables are defined as three-year averages; exogenous shocks are captured by the three-year volatility of the country's annual CTOT. Financial structure is determined both by the relative size of the stock market to the outstanding credit by domestic banks and by the relative activity (trading and loan issuing) of the two; this follows Levine (2002). We then estimate the impact of financial structure on GDP growth, as well as on the relationship between exogenous shocks and growth. The latter is determined by the interaction term between CTOT volatility and financial structure. We also check if results are robust to including other factors that may determine the response of GDP growth to exogenous shock such as exchange rate regimes and the institutional quality.

Our main finding is that financial structure matters for growth both in terms of the direct impact and in terms of the shock smoothing effect. In our sample and period, better-developed economies tend to grow faster with a market-based system. As for the second effect, banking systems do protect against exogenous shocks, yet this holds only for developing countries, which are also those suffering from higher CTOT volatility. All in one, we obtain a clear dichotomy of the roles markets and banks play: banks protect developing economies from exogenous shocks while markets promote growth in better-developed economies. Dissecting the market size measure into total capitalization (measures the ability of firms to obtain funds

[3] Similar approach is used in Demirgüç-Kunt et al. (2013) and Makhlouf et al.(2020) although their focus is different from ours; in particular they do not study the shock-smoothing role of financial systems.

in the primary market) and trading volume (measures the secondary market activity and the resulting liquidity) helps identify the mechanics behind this dichotomy: the result is mainly driven by the market activity measure. Intuitively, active markets respond faster to exogenous shocks, market liquidity dries up, creating a friction. In contrast, bank lending is less responsive, bank loans cannot be easily recalled, and as such reliance on bank finance is free from the illiquidity friction.

These findings support lending policies of the World Bank and IMF, which more often require reforms in the banking sector, and place less emphasis on the development of financial markets (see, for example, Cull, 1997). For developing countries, indeed, a well-functioning banking sector is crucially important both as a stimulus for growth and as a damper of exogenous shocks. Although markets also have a capacity to smooth exogenous shocks, this role seems conditioned on the integration of the country in the international financial system, which is low in developing economies. In times of systemic global shocks, when international diversification is rather questionable, reliance on banks appears to be more effective in withstanding shocks, which lends further support to the recent decisions of central banks to cut interest rates and ease lending conditions amidst the COVID-19 outbreak.

2 Literature Review and Hypotheses

2.1. Theoretical arguments

Banks offer investors services like liquidity provision (Diamond and Dybvig, 1983), information provision (Diamond, 1984), as well as reduction of transaction costs (Benston and Smith, 1976, etc. These services help improve allocation of resources, contributing to economic growth. Well-functioning financial markets also contribute to growth as they facilitate risk management (Levine, 1991) and performance monitoring (Holmström and Tirole, 1993). Competitive capital markets are able to aggregate information signals and transmit them to

investors, thus resolving asymmetric information problems and ensuring optimal allocation of resources (Boot and Thakor, 1997; Allen and Gale, 1999). On top of that, markets are free from inefficiencies inherent to banks; intermediation is costly. For instance, profit-maximizing behavior of banks under asymmetric information gives rise to credit rationing: some borrowers are unable to obtain funding (Stiglitz and Weiss, 1981). In a freely competitive market these borrowers would not be excluded although they might face a higher interest rate and/or a higher collateral requirement. As an active intermediary, banks make decisions based on beliefs that may differ from those of investors and borrowers, leading to underinvestment (Vinogradov, 2012). In Di Patti and Gobbi (2007) mergers between banks disrupt relationship lending thus resulting in an adverse effect on credit.

In the aforementioned roles, banks and markets help achieve the optimal allocation of resources but are unable to withstand systemic risks. Allen and Gale (1997) demonstrate that banks possess a capacity of smoothing systemic shocks intertemporally by spreading the impact of shocks across generations of players (*intergenerational* shock smoothing). However, co-existence with and competition against financial markets suppresses this shock-smoothing ability of banks. In Gersbach and Wenzelburger (2001, 2011) and Vinogradov (2011) banking systems recover after large shocks only if they are able to derive strictly positive and sufficiently high profits (for example through imperfect competition or appropriate regulation), otherwise banking systems are fragile and amplify the impact of shocks instead of smoothing them. Such an amplification of shocks, leading to crises, is not present in market-based systems. *Cross-sectional* shock smoothing occurs when the impact of shock is spread across investors of the same generation. This does not reduce the systemic risk in a closed economy yet opens a way to hedge against exogenous shocks in international markets. Borensztein et al. (2013) argue that the availability of hedging instruments in financial markets provides a facility to reduce the growth impact of shocks. Yet, shocks can be propagated in both directions (to

and from foreign markets), therefore a high degree of integration can also propagate financial crises (Lehkonen, 2015). Studies like Bolton et al. (2013), Sette and Gobbi (2015) and Beck et al.(2014b) show that the smoothing role of banks is more pronounced in the relationship lending: during economic downturns banks keep (and prefer) lending to borrowers with who they have developed long-term ties, offering them better lending conditions, which helps smooth business cycle fluctuations. Theoretically, this "smoothing" can come through cross-subsidization, at the expense of higher rates and tougher lending conditions in hard times for non-relationship customers, thus having zero net impact on the economy as a whole. Moreover, if banks are themselves affected by a crisis, financial markets take over as the source of funding for firms who lack bank finance (Levine et al., 2016). It is therefore unclear, whether banks or markets perform better in the intertemporal risk-smoothing role. We posit their effectiveness depends on a number of factors, *inter alia* those linked to economic development.

If relative benefits from banking outbalance intermediation costs, bank-based financial systems lead to higher economic growth, due to a better allocation of resources and a more efficient shock smoothing. Otherwise, a market-based financial system would grow faster. In most countries both bank credit and capital markets play prominent roles simultaneously, as shown in Figure 1. Theoretically, such a close relationship between the sizes of the market and the bank sectors can be explained by the complementing services they offer, as emphasized by Levine and Zervos (1998). For example, small firms are often riskier, lack reputation and face relatively high costs of access to the stock market, hence they resort to bank finance, yet would switch to market finance once they become large enough (see, for example, Boot and Thakor, 1997). For this reason, a larger banking sector implies better growth opportunities for small firms, and hence more of them turning to capital markets to raise funds once they achieve the necessary size, thus larger banking sectors should correspond to bigger stock markets. In Diamond (1997) bank finance supports the liquidity of financial markets,

which also suggests that markets and banks would grow simultaneously. Similarly, one could argue that with a larger and more sophisticated stock market banks can better diversify by using a larger variety of financial instruments, and hence themselves obtain better opportunities for growth. In Song and Thakor (2013) banks resort to markets for the purposes of securitization, which stimulates the development of markets, yet in better developed financial markets there is more informed trading which reduces the cost of capital. Less costly capital becomes also available to banks who can in turn grow, too, and finance more projects. This loop explains the co-evolution of banks and financial markets.

Still, Figure 1 reveals a noticeable variation in the composition of financial systems. Services provided by banks and markets as well as inefficiencies coming through both institutions, are of different significance for different economies. Facilitation of risk management and performance monitoring through financial markets require a certain degree of development of the latter. The need in liquidity provision by banks is more apparent if consumption shocks are severe and there are no alternative sources of funds when these shocks realize (Jacklin's, 1987, critique of the original Diamond and Dybvig, 1983, model is based on the availability of secondary markets). In Boyd and Smith (1998) economic development is associated with higher monitoring costs; this explains the faster growth of equity finance (investment in projects with observable outcomes) than of debt finance (funding of projects that need monitoring) relative to GDP per capita. This monitoring argument can be extended to banking (as in Diamond, 1984), suggesting that in developing economies funding through banks would be more pronounced than in the developed world. An additional behavioral argument arises from Bencivenga and Smith (1991) who show the contribution of banks to growth is more pronounced when risk-aversion is high. As risk-aversion is higher in developing countries (Haushofer and Fehr, 2014), this and similar arguments again would imply that bank

finance is more likely to have a greater impact on growth in the developing world, while market finance would have more benefits in the developed countries.

While these studies of distinct services offered by banks and markets imply importance of economic and financial development for the relationship between financial structure and growth, less attention has been paid so far to the shock-smoothing role of financial systems. Competition, both within the banking sector and between banks and markets, reduces the shock-smoothing capacity of the banking sector (Allen and Gale, 1997; Vinogradov, 2011). Berger et al. (2004), and references therein, emphasize that developing countries are marked with a high share of state-owned banks in the banking market and are usually associated with less competition than developed economies. This might be one reason to expect intertemporal risk-smoothing by banks to be more visible in the developing world. The relationship lending argument in favor of banks' ability to smooth shocks also suggests that this role is more likely to be detected in developing economies, "where relationship lending would be expected to be more prevalent" (De la Torre et al., 2010: 2281). Boot and Ratnovski (2016) obtain that in well-developed financial sectors banks are likely to engage more in risky short-term trading than in relationship lending. This would weaken banks' ability to smooth shocks. Simultaneously, Borensztein's et al. (2013) argument in favor of shock-smoothing ability of financial markets requires stronger integration in the global financial system, and thus the shock-smoothing role of markets is less likely to be observed in developing economies. The same conclusion follows from Levine's et al. (2016) view of well-developed stock markets as a "spare tire" that replaces banks when those reduce lending.

2.2. Empirical evidence

Empirical studies mainly focus on the direct link between financial structure and economic growth with a rather weak evidence of the relationship between the two. Levine

(2002) finds that neither financial structure itself nor its interaction with GDP, shareholder rights, or the rule of law, shows significant effects on economic growth. In Luintel et al. (2008) time-series analysis reveals that for six out of 14 countries in the sample higher growth is associated with being more market-based, only one country benefits from being bank-based, and the rest of the sample shows no significant relationship. In fact, the relationship between growth, on one side, and financial structure and financial development, on the other side, if present, differs across countries. Findings in Demirgüç-Kunt et al. (2013) confirm that the higher economic development, the stronger the contribution of financial markets to growth, and the weaker that of banks. Recently, modelling the bank and the stock market development separately as latent variables, Cave et al. (2020) report that banking development negatively correlates with growth in their 101-country wide 1990-2014 sample, while the stock market development has a positive effect on growth only when markets are not yet very well developed. Note that their notion of market and bank development differs from proxies used in other papers, yet the overall conclusion on the differential effect of markets and banks on growth holds. For the same time period, Zhu et al. (2020) report the positive effect of financial development on innovation and innovation-led growth vanishes for higher levels of development.

With respect to shock-smoothing, the most recent evidence in favor of the shock-smoothing role of banks is by Levine et al. (2020) who use the Covid-19 shock to study the role of banks in preventing its adverse effects on local economies: for example, they show employment and revenues of small firms fall by less in localities with higher density of small banks. This extends the relationship lending argument advanced in Bolton et al. (2013) and Sette and Gobbi (2015) and suggests small banks act countercyclically in their lending to small firms. However, as small businesses have limited access to markets, the conclusion does not directly extend to the economy-wide effects of banks relative to financial markets. Earlier,

Beck et al. (2006) provided some [weak] evidence that well-developed intermediaries may reduce the impact of exogenous shocks on macroeconomic volatility. Consequently, one would expect reduced macroeconomic volatility to promote growth (see Ramey and Ramey, 1995), yet the link between financial intermediation and the smoothed impact of exogenous shocks on growth still needs to be shown. Their study does not investigate the role of financial structure explicitly.[4] Neither does the study by Aghion et al. (2010) who show financial development reduces the impact of shocks on growth. Beck et al. (2014a) investigate the impact of the size of the financial services sector and the size of the banking sector on both economic growth and volatility. Importantly, their measure of the financial sector size is based on the value added data for the broad sector of financial services, which is different from the market size employed in other studies.[5] Although they do not study exogenous shocks, their results are instructive. In particular, they show that the size of financial intermediation is positively associated with growth in the long-run but this relationship vanishes in the medium run (5-year period); the size of the financial services sector is rather irrelevant to growth. At the same time, intermediation is negatively associated with macroeconomic volatility both in the long and in the medium term; non-intermediation is associated with higher volatility, mainly in high-income countries. Macroeconomic volatility captures economic uncertainty, which may be driven by many factors, while our focus is explicitly on exogenous shocks, their impact on growth, and and the role of financial systems in reducing the latter.

[4] A separate line of their study is devoted to endogenous monetary shocks (inflation), for which underdeveloped stock markets contribute to the amplification of the shock impact by financial intermediaries.

[5] To be precise, their measure is the value added for sector J in ISIC 3.1 classification (currently sector K in ISIC 4), which includes financial intermediation (defined broadly to include monetary intermediation, financial leasing, credit activities by non-intermediaries, financial holdings and investment in securities and property), pension, insurance and businesses auxiliary to financial intermediation such as dealership and brokerage. Although the wording for ISIC 3.1 contained "investment in securities" as part of "other financial intermediation", it was clarified as corresponding to "acting as a principal in the underwriting or dealing of securities" in US NAICS 2002, and is currently re-classified as "other financial service activities" (sector K in ISIC 4). The associated value-added measure therefore refers to the overall value of financial services produced in a country, as opposed to the overall size of investment made through either capital markets or financial intermediaries.

2.3. Hypotheses

The discussion in this section indicates two scenarios in which financial structure would be irrelevant for growth: (a) services provided by banks and markets are perfect substitutes, and (b) benefits from banks and markets are exactly outbalanced by their immanent inefficiencies. Both conditions seem quite strong to hold universally in a heterogeneous sample of countries. Distinguishing between developed and developing countries, one can expect substitution and inefficiencies diminish with economic development. The former is because services offered by banks and markets become more sophisticated and differentiated, the latter – due to economy on scale and innovative solutions and technologies reducing the costs of decision-making, *inter alia*. With this in mind, our main two hypotheses are: (1) market-based systems contribute more to economic growth in developed countries, while either bank-based systems do so better than those market-based in the developing world, or financial structure is irrelevant to economic growth in these latter countries, and (2) bank-based systems are more likely to lessen the impact of CTOT volatility on GDP growth in developing economies, while less difference between the two systems occurs in the developed world.

3 Methodology

As a first step, we will estimate the relationship between financial structure and growth through the following baseline regression:

$$GDPGrowth_{it} = \alpha + \beta_1\ STRUCT_{it} + \beta_2\ SIZE_{it} + \beta_3\ CTOTV_{it} + \varphi\ X_{it} + \delta_t + \mu_i + \varepsilon_{it} \quad (1)$$

where $GDPGrowth$ is the GDP per capita growth in the *i*-th country during the *t*-th 3-year period, $STRUCT$ is the financial structure variable, appropriately defined, $SIZE$ stands for the size of the financial system, $CTOTV$ is the volatility of the country *i*'s commodity terms-of-trade in period t and X is a set of controls (trade openness, government expenditure and population size, see details in Section 4); δ_t and μ_i are time- and country-specific effects, respectively; ε_{it} is the error term. For example, if financial structure matters for growth, β_1 should be significantly different from zero, and would have a positive sign when capital markets support stronger economic growth than banking systems (vice versa if $\beta_1 < 0$). If β_1 is insignificant, yet $\beta_2 > 0$, then banks and markets substitute each other in services they provide, and economies benefit from larger financial systems regardless of its structure. Estimating (1) also allows us to judge whether CTOT volatility plays a role for economic growth (sign and size of β_3). As common, the inclusion of the constant term, α, absorbs the overall bias of the regression model by forcing the residual mean to be zero.[6]

Our main interest is however in the role banks and markets, as captured by $STRUCT$, play in moderating the effect of CTOT volatility on growth (if in model 1 holds $\beta_3 < 0$). To this end, we estimate our model 2, which enriches (1) with an interaction term for the two variables of interest:

$$GDPGrowth_{it} = \alpha + \beta_1\ STRUCT_{it} + \beta_{13}\ (STRUCT \times CTOTV)_{it} + \beta_2\ SIZE_{it} + \beta_3\ CTOTV_{it} + \varphi\ X_{it} + \delta_t + \mu_i + \varepsilon_{it} \quad (2)$$

[6] A rather common interpretation of the intercept, α, would be the hypothetical mean value of the GDP growth *conditional* on zero values of all independent variables. While it may be tempting to imagine a benchmark case of zero exogenous shocks ($CTOTV = 0$) in a bank-based economy (by definition of $STRUCT$, as a ratio of market finance to banking finance), such an interpretation is not unproblematic as it would also imply a small banking sector ($SIZE = 0$, as measured by the log size of the financial sector) in an extremely small economy (as population size is one of controls in X, which also has to be set to zero). We therefore refrain from interpreting the intercept economically, although we report the value and significance in all estimates; the intercept is insignificant in most of them.

For example, a positive β_{13} would imply that countries with a larger financial market better counteract the exogenous volatility effect.

We will estimate models (1 - 2) for the overall sample, as well as for the subsamples of developing and developed countries separately. For robustness, we will re-estimate (2) controlling for the type of exchange rate regimes, financial openness and the quality of institutions, on top of the controls included in X_{it}. Some studies show that the floating exchange rates increase the economy's ability to absorb external shocks (Broda, 2004; Ramcharan, 2007). Financial openness can play important role on the development of equity market (Chinn and Ito, 2006). Furthermore, a growing number of studies highlight that the quality of institutions explains GDP variations across countries better than other variables such as geography, trade, or economic policies (Acemoglu et al., 2003), already captured by X_{it}.

As mentioned above, CTOT is exogenous for developing countries, who are seen as price-takers. However, CTOT might be endogenous for advanced economies, as these lead the global demand for commodities, and for some commodity-dependent developing counties. Endogeneity concerns may also arise for the financial development-growth nexus, potentially resulting from the simultaneity bias. These concerns are less relevant for our analysis, which focuses on financial structure, as the latter depends on factors other than growth, such as legal structure (Cecchetti, 1999), information disclosure requirements (Thakor, 1996), etc. Still, to avoid the potential endogeneity issue, we estimate our models using two-step system GMM[7] proposed by Blundell and Bond (1998). We use Windmeijer's (2005) approach to correct the two-step standard errors biased. Using GMM with small *N* (number of cross sections) and large *T* (number of time periods) can produce spurious results for two reasons. First, small *N* might

[7] Using too many instruments can produce biased results in GMM estimation (Roodman, 2009), our instrument set includes the second lag of the dependent and the first lag of all explanatory variables. This enables us to keep the number of instruments below the number of countries. We also use Stata's 'collapse' command to limit the instrument count as suggested by studies like (Roodman, 2009) and Cavalcanti et al. (2015).

affect the reliability of autocorrelation test. Second, large T will increase the number of instruments, which may affect the validity of the Sargan and Hansen tests of over-identification restrictions and lead to a rejection of the null hypothesis of exogeneity of instruments. We use 3-year observations within a 42-year time period, giving us a maximum $T = 14$, hence to ensure $N > T$ we need to have 15 or more countries, a condition our sample and subsamples meet.

4 Data

We use data from 1975 to 2017[8] for a panel of 73 countries, among which 44 developing and 29 developed.[9] This is the longest period for which the data, in particular on market capitalization, were available to us. In addition, as we need a reasonable number of observations for the financial structure, we had to drop countries with fewer than 20 observations of this index; dropping more would limit the application of the GMM methodology. Our resulting sample consists of unbalanced data on 73 countries. The source of all data is the Global Financial Development dataset, whilst CTOT is from the International Monetary Fund database. Source data are annual, collapsed for our purposes in non-overlapping 3-year periods.

Financial structure

We follow Levine (2002) to define the measure of financial structure as the first principal component of the following two ratios, labelled Structure-Activity and Structure-Size.[10] Structure-Activity represents the activity of stock markets relative to that of banks and

[8] The data of stock market, particularly stock market capitalization and total value traded, is available until 2017.
[9] See appendix A for the country list.
[10] Levine (2002) defines Financial structure as the first principal component of Structure-Activity, Structure-Size and Structure- Efficiency. The latter is the logarithm of (total value traded ratio ∗ overhead costs). However, the

other intermediaries. As a proxy for it, we use the *total value traded ratio*, which equals the total value, by the end of the year, of domestic and foreign equities, except for investment funds, unit trusts and alike, traded on domestic exchanges divided by GDP. We use the *private credit ratio*[11] as a measure of bank activity; it equals the value of domestic deposit institutions credit to the private sector as a share of GDP. Structure-Activity is then defined as the logarithm of the *total value traded ratio* to *private credit ratio.* Structure-Size reflects the size of stock markets relative to that of banks; it is measured by the logarithm of the *market capitalization* to *private credit* ratio. *Market capitalization* is the ratio of the value of domestic shares listed on domestic exchanges at the end of the year to GDP. *Private credit ratio* is defined above. Effectively, the difference between the two is the measure of the active trading of (both domestic and foreign) assets in domestic financial markets in the "activity" measure versus the total value of domestic companies listed on domestic exchanges in the "size" measure. This is important as the former emphasizes how active markets are, and the latter emphasizes to which extent local companies prefer market finance over bank finance. Larger values of the financial structure index indicate a more market-based (less bank-based) financial system.[12]

Financial system size

Financial system size is the first principal component of two variables, labelled Finance-Activity and Finance-Size. The former is the logarithm of *total value traded ratio* times *private credit ratio*, whilst the latter is *market capitalization ratio* plus *private credit ratio*. Financial system size reflects the development of the whole financial system, represented

overhead costs data is limited especially for developing countries thus we use only the Structure-Activity and Structure-Size (similar measure used by Luintel et al., 2016).

[11] Using this index allows us to compare the role of stock market with banks and other intermediaries (see Luintel et al., 2016)

[12] Literature highlights the growing role of the bond market; however, data limitations do not allow us to include bond markets in the analysis, especially for developing countries (we lose 67% of observations).

both by stock markets and by intermediaries. It equals the logarithm of *market capitalization* plus *private credit.* Larger values of this index signify a higher development of financial system.

Commodity Terms of trade (CTOT) volatility

CTOT index is the terms of trade using 45 commodities. It is defined as a weighted average of relative commodity prices to the manufacturing unit value (MUV), where the weights are the share of net exports of these three commodities to GDP. Thus, this index takes in account the importance of each commodity to national economies because the composition of a country's net commodity export determines the response of national CTOT to changes in global commodity prices. Weights are the averages of national export and import of each commodity to GDP from 1980 to 2015; for robustness we will also re-calculate weights using lagged 3-year rolling averages. The export and import shares of individual commodities used to construct the index are taken from the United Nations' COMTRADE database whilst the source of commodity prices is the IMF Commodity Price System database. The MUV data are obtained from UNCTAD's Handbook of Statistics database and the IMF's World Economic Outlook database. We measure the volatility of this index as the standard deviation of its growth in three-year intervals.

Developed economies, in contrast to less-developed countries, have a well-diversified trade structure and specialize in low price volatility goods such as manufacturing products. For this reason, the literature finds no significant impact of Terms of trade (TOT) volatility (Blattman et al., 2007) or Commodity terms of trade (CTOT) volatility (Cavalcanti et al., 2015) on these countries' GDP. We expect that CTOT volatility reduces economic growth in developing countries (more generally, it is harmful for welfare, see, e.g., Makhlouf et al., 2017,

who investigate its impact on child mortality). Therefore, our main interest will be in the shock-smoothing role of financial structure in developing rather than developed countries.

Control variables

We follow the traditional growth literature by controlling for trade openness, government expenditure and population. *Trade openness* equals the ratio of the sum of total exports and imports to GDP. *Government expenditure* is the ratio of government consumption to GDP.[13]

We also control for exchange rate regimes, financial openness and the quality of institutions on the robustness analysis. Exchange rate regime is a dummy variable coded 1 for a pegged regime. We use exchange rate regime classification suggested by Klein and Shambaugh (2008).According to Klein and Shambaugh (2008), the exchange rate regime is recognized as pegged in four cases; no fluctuation at all, movements with 1% bands, movements within 2% bands, a onetime devaluation with 0% change in the other 11 months. We also use an accountability index from Coppedge et al. (2018) as a proxy of the quality of institutions on the robustness analysis. Accountability index measures the constraints on using the political power by government through requirements for justification for government actions and potential sanctions. Financial openness is Chinn-Ito index (KAOPEN) index suggested by Chinn and Ito (2006) which measures the domestic degree of capital account openness. Further controls are employed in robustness checks.

Summary statistics

Table 1 provides descriptive statistics of the variables for both developing and developed countries in our sample. The income level in developed countries is higher than that

[13] Appendix B shows the correlation between these traditional control variables and the financial structure and financial development measures.

in developing countries. On average, developing countries have less market-based system t comparing with developed countries' financial systems are more market-based (positive mean financial structure). This is consistent with studies, like Rajan and Zingales (1998), that suggest countries with weak legal systems, which is the case for most developing countries, benefit from bank-based systems, but with more development, once legal system capabilities strengthen, there are more benefits from being more market-based. Financial system size (relative to GDP, in log) is positive for developed economies and negative for developing countries, also in line with Levine (2002). Developed countries, in our sample, are more open and have higher government expenditures than developing countries. Developing countries experience higher CTOT volatility than developed countries.

[TABLE 1]

To estimate regressions (1) – (2), we transform the annual series into non-overlapping three-year averages (with a maximum of 14 observations per country) for the following reasons. First, annual observations can fail to capture fully the medium and long-term effects of explanatory variables (Beck and Levine, 2004; Blattman *et al*., 2007). Second, we are interested in the shock-smoothing role of financial systems, which can be undetectable in shorter periods if banks and other financial institutions smooth shocks intertemporally. Three-year averages are typically considered reasonable to smooth out business cycle fluctuations. Last but not the least, we use three-year observations to measure CTOT volatility, a three-year standard deviation of CTOT growth.

5 Results

5.1. Main Results

First, we focus on the effect of the structure of financial systems and CTOT volatility on economic growth. Table 2 presents estimation results for model (1) using OLS. For the whole sample, we obtain an insignificant effect of financial structure on economic growth, which suggests financial structure does not matter for growth. The estimates also show a significant negative impact of financial development (the size of the financial system) on growth. On the one hand, the literature offers mixed views on this relationship, reporting either a negative or a negligible impact of financial development on growth (e.g., Ram 1999; Ang and McKibbin, 2007; Samargandi et al., 2015) along with the more traditional positive effect. The lack of the positive effect is mainly explained by a potential misallocation of funds to productive investment projects. In addition, the results support the "too much finance" hypothesis which illustrates that financial development can harm growth after a certain threshold.[14] On the other hand, this estimated negative effect of financial development emphasizes the need in a more detailed analysis of how and which parts of financial systems affect growth.

The whole sample includes countries with different levels of economic development. Consequently, we re-estimate (1) for developing and developed countries. The results reveal a positive effect of financial structure on growth, only observable in developed countries, while in developing economies, financial structure is irrelevant for growth. These estimates confirm the growth-enhancing role of financial markets on countries with good institutions as suggested by Rajan and Zingales (1998).

Given that services provided by banks and markets in developing economies are rather basic, they are likely to be substitutes, which explains the irrelevance. With better developed

[14] For example, Arcand et al. (2015) find that financial system can decrease the growth if credit to the private sector reaches 100 % of GDP (see also Law and Singh, 2014; Cave et al., 2020). In Table C1 in the Appendix we re-estimate the model from Table 2 with a squared financial system size term, which confirms the inverse U-shape relationship discussed in the literature: the non-linear effect is most pronounced on the whole sample and diminishes on subsamples of developed and developing countries where the variation of the size measures is lower. Notably, the effect of the financial system structure term, our key interest in this paper, is robust to this change in the model specification.

economies and financial systems, there is more differentiation between banking and market services. According to our result, benefits from financial markets in developed economies outweigh those from banks. However, recall from Figure 1 and Table 1 that the variation in the financial structure is not high, especially so in developed countries. On the one hand, this makes our result stronger as this positive impact of markets is visible even within a narrow range of financial structures. On the other hand, the result should be interpreted with caution, in terms of "more bank-based" and "more market-based" than the average, as extreme "bank-based" and "market-based" systems are not present. Although the optimal composition of the financial system is an open question, within the range of financial structures in our sample, our result implies there is a potential for improvement for an average developed economy by supporting the growth of financial markets rather than banking sectors. An alternative interpretation of this result would be that inefficiencies inherent to the banking sector impede economic growth of developed countries, which helps more market-based economies grow faster. With this in mind, the results provide an argument in favor of a policy that would stimulate more efficient banking services.

[TABLE 2]

Table 2 also demonstrates that CTOT volatility has a significant negative impact on growth for the whole sample. A re-estimation for developing and developed countries separately reveals that this negative effect is due to the developing subsample only. These countries have less-diversified economies and experience higher CTOT volatility, see Table 1. These findings are consistent with other studies such as Blattman et al. (2007) and Cavalcanti et al. (2015) who suggest different impact of terms of trade volatility between developing and developed countries.

Although CTOT index is exogenous for most countries, endogeneity concerns may arise for countries playing a major role in the commodity market. Therefore, our next step is to test the robustness of our results using a system GMM estimator. Results are in Table 3, confirming our main findings: financial structure has a positive effect on developed countries' growth and is insignificant for developing economies. In addition, CTOT volatility reduces economic growth in developing countries.

[TABLE 3]

Concluding from Tables 2 and 3 that financial structure plays no role for developing countries would be misleading as model (1) only considers the direct effect and does not control for shocks that may influence GDP growth. The estimates of model (2), shown in Table 4, confirm that CTOT volatility indeed negatively affects growth, and is amplified in more market-based financial systems (negative coefficient at the interaction term of CTOT volatility with financial structure; see column 1 in Table 4). This provides an argument in favor of the shock-smoothing role of banking systems.

Re-estimating model (2) for developing and developed countries separately allows testing whether the role of financial structure in dampening the growth impact of CTOT volatility differs across countries with different levels of economic development (see columns 2 and 3 in Table 4). CTOT volatility has no significant impact on growth in advanced economies, and financial structure demonstrates the same impact in model (2) as in model (1) : markets bring more benefits than banks. In contrast, CTOT volatility significantly reduces growth in developing countries, which makes the shock-smoothing role of banks visible: the interaction term has a negative sign, counteracting the volatility impact in more bank-based countries and amplifying it in more market-based systems. Yet, the direct impact of financial structure on growth in developing countries is insignificant, consistent with model (1).

There are various potential explanations to this dichotomy of the macroeconomic roles of financial system. The reasons for the insignificance of the direct (service) effect in developing economies have been discussed above. The insignificance of the indirect (shock-smoothing) effect in developed economies may be due to low CTOT volatility in developed countries in general.

We further check if our results are robust to controlling for the effect of the type of exchange rate regimes, and the quality of institutions, see Table 5. We re-estimate Model 2 for developing countries only as we find significant impact of CTOT volatility only on these countries. Table 5 shows that our results are robust to controlling the exchange rate regimes. CTOT volatility has a negative impact on growth and the bank-based system damping this impact. The classification by Klein and Shambaugh (2008) shows insignificant impact of exchange rate regime on growth. The results also show that our main findings are unaffected by accounting for the quality of institutions, proxied by the accountability index, and the financial openness, measured by KOPEN index.

[TABLE 4]

[TABLE 5]

We now re-estimate models (1) and (2) using Structure-Activity and Structure-Size (see data section for more details). The measure of the banking system size and activity is the private credit ratio. The main difference is that the stock market size is measured by the stock market capitalization whilst its activity is measured by the stock total traded values. Importantly, a bigger size of the stock market (large listings) does not necessarily mean that it is more active and vice versa (see Levine, 2002; Luintel et al. 2016). Therefore, re-estimating models (1) and (2) using financial structure components allows us to understand the reason for

the lacking capacity of the stock market ability to dampen exogenous shocks. Table 6 presents the results for developing countries (where we earlier found a negative effect of CTOT volatility on growth). The direct impact of both measures is insignificant which confirms the results obtained for the aggregate financial structure index, see columns (1) and (3). Interestingly, the interaction with CTOT volatility is now significant only for the Structure-Activity index. This indicates that the ability of companies to obtain funds from the stock market (the listing size) plays about the same role in moderating the exogenous shock effects as bank lending does, even though borrowing from the market is a rather lengthy process, which cannot be quickly arranged if needed to overcome the adverse conditions. Instead, when we focus on the trading activity in the stock market, bank-based system appear better prepared to overcome the negative effects of CTOT volatility. Intuitively, this may be due to a faster response of markets to adverse conditions, potentially resulting in liquidity dry-ups, while bank credit availability does not change that quickly.

[TABLE 6]

Finally, we re-estimate the model in Table 6 using a rolling CTOT index. The difference between CTOT and the rolling CTOT is that the weights of the latter are based on three-year rolling averages of trade values (to smooth fluctuations) and lagged (thus the fluctuations in index reflect variations in commodity prices rather than endogenous changes in trade volumes) (see Gruss and Kebhaj, 2019). Table 7 supports our earlier conclusions.

5.2. Robustness checks

In this section, we further check the robustness of our main results from Table 4, where we obtain a significant direct positive effect of financial structure on growth in developed countries and an indirect effect through smoothing the CTOT volatility in developing countries. In this

section we report results for estimations using alternative measures of financial development, institutional variables and financial volatility.

First, we check robustness of our results to using additional measures of financial development from the IMF. In particular, we consider the development of financial markets and financial institutions in terms of accessibility, depth and efficiency. Estimations with these measures of financial development confirm our main findings. Noteworthy, efficiency enhances growth particularly in developing countries. The remining measures have no significant effect, see Tables C2, C3 and C4 in Appendix.

Second, we use additional institutional factors that can potentially affect the relationship between financial structure and economic growth. These are political stability, rule of law and regulatory quality from Worldwide Governance Indicators (WGI) database. These measures are available only from 1996. We focus here on the developing countries as this is where we observe an shock-smoothing effect of financial structure, and where the need for institutional improvements is often highlighted in the literature. The estimations overall confirm our main results. In addition, the new estimates show the positive impact of institutional factors on growth, especially regulatory quality, see Table D1 in Appendix. Given the limited time period for which the Worldwide Governance Indicators are available, we also employ the regime durability index from the Polity IV Database (2014) as a proxy of political stability (see Elbahnasawy et al., 2016). Regime durability, from Polity IV Database, is the number of years since the most recent regime change. In addition, we use Regime end type form V-Dem database; this factor takes value between 0 (A military coup d'etat) to 13 (The regime still exists).[15] Furthermore, we use several measures of rule of law and quality of institution, such as property rights, judicial reform and judicial accountability from the V-Dem

[15] Other potential measures of political stability are Cabinet changes and/or Government Crise (see Aisen & Veiga, 2006, 2008, 2013, Roe & Siegel, 2011), however these factors are not publicly available.

database. The judicial reform index measures the variety of ways to influence the ability of courts to control the arbitrary use of power. The judicial accountability index shows how often judges are removed from their positions if they are found responsible for serious misconduct. The results, presented in Table D2 in Appendix, support our main findings.

Finally, financial volatility such as the global financial crisis in 2008, may affect the nexus between financial system and growth, thus we re-estimate the model using bank z-score as a proxy of financial stability (Sahay et al. 2015) and, separately, stock price volatility as an alternative proxy (Makhlouf et al., 2020). The source of both measures is Global Financial Development. A lower z-score means larger financial stability risks. These new results are in Tables E1 and E2 in Appendix. Overall, they confirm our main finding, i.e. the positive impact of financial structure on growth in developed countries and the indirect impact via smoothing CTOT volatility in developing countries.

[TABLE 7]

6 Conclusions

In our study of the relationship between financial structure and growth, we have accounted both for potential differences between developed and developing countries, and for two distinct channels through which financial structure may affect economies. The first channel refers to the direct impact of financial systems on growth through services offered by banks and markets that improve allocation of resources. The second channel refers to the ability of financial systems to smooth the impact of exogenous shocks; theoretically, both banks and financial markets can provide such a cushion against shocks. Financial structure matters only if banks or markets outperform each other either in the direct or in the indirect channel, or in both. Our main finding is that financial structure indeed matters for growth, yet there are qualitative

differences between countries: the direct channel is significant only in developed economies and economies with large financial systems, while the shock-smoothing channel appears significant only in developing countries with small financial systems.

Our results demonstrate a dichotomy of the roles financial systems play for growth. The direct channel is only detectable in advanced economies, where markets offer a better utilization of resources and hence higher growth. The indirect channel becomes evident in developing countries, where banks successfully reduce the negative impact of exogenous shocks, proxied by CTOT volatility, on growth.

The mechanics of the direct impact of financial systems on growth through services they provide to investors and borrowers is widely discussed in the literature, both theoretically and empirically. Less is known on the shock-smoothing mechanism. Theoretically, it works either intertemporally, by spreading the impact of shocks across several periods, or cross-sectionally, by exporting the shock impact to other countries. The latter mechanism requires a high level of financial integration, which is part of the IMF's definition of advanced economies. On the one hand, if cross-sectional shock smoothing through markets substitutes intertemporal smoothing through banks, financial structure would be irrelevant for shock smoothing, consistent with our observations for developed countries. On the other hand, this substitutability does not hold uniformly for all financial systems, since financial development per se does not improve the ability of financial systems to smooth the impact of CTOT volatility. Lack of financial integration, as well as the insufficient activity of stock market, in developing countries disables the cross-sectional mechanism and uncovers the role of banks in shock smoothing, confirming significance of the intertemporal mechanism. Similarly, the cross-sectional mechanism is likely to be dysfunctional when shocks are global. We would expect a stronger shock-smoothing contribution of banks in these circumstances.

Although we find that more market-based developed economies grow faster, this does not imply banking sectors become redundant. Similarly, for the developing countries, our results should not be interpreted as indicating that financial systems there should only consist of banks, to achieve the highest possible protection from shocks. Recall from Figure 1 that there is a positive relationship between the development of financial markets and that of banking sectors. The variations from "more market based" to "more bank based" in our sample are within the limits observable in Figure 1, with no extreme "purely bank based" or "purely market based" cases. The relationship between financial structure and growth may appear non-monotonic, with potentially "too much market based" and "too much bank based" structures being disadvantageous. Investigating the optimal upper and lower bounds on the composition of financial systems may be a challenging direction for future research.

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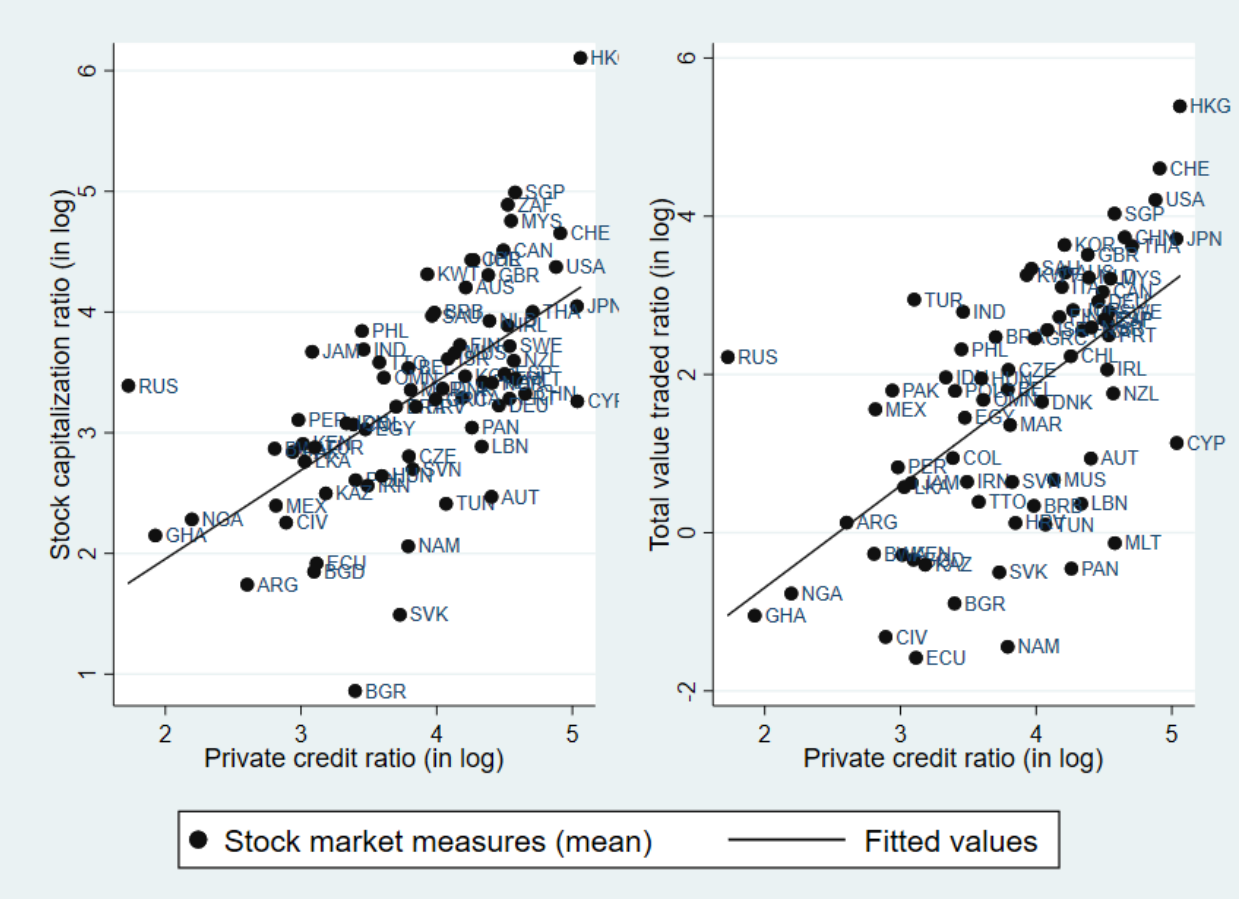

Figure 1. Bank credit versus market finance. *Notes*: "private credit ratio" is the ratio of total domestic private lending by depositary institutions to GDP, "stock capitalization ratio" is the ratio of the value of domestic shares listed on domestic exchanges to GDP, "total value traded ratio" is the ratio of the total value of all equities traded in domestic exchanges to GDP; end of year data; dots are country level period averages (1975-2017).

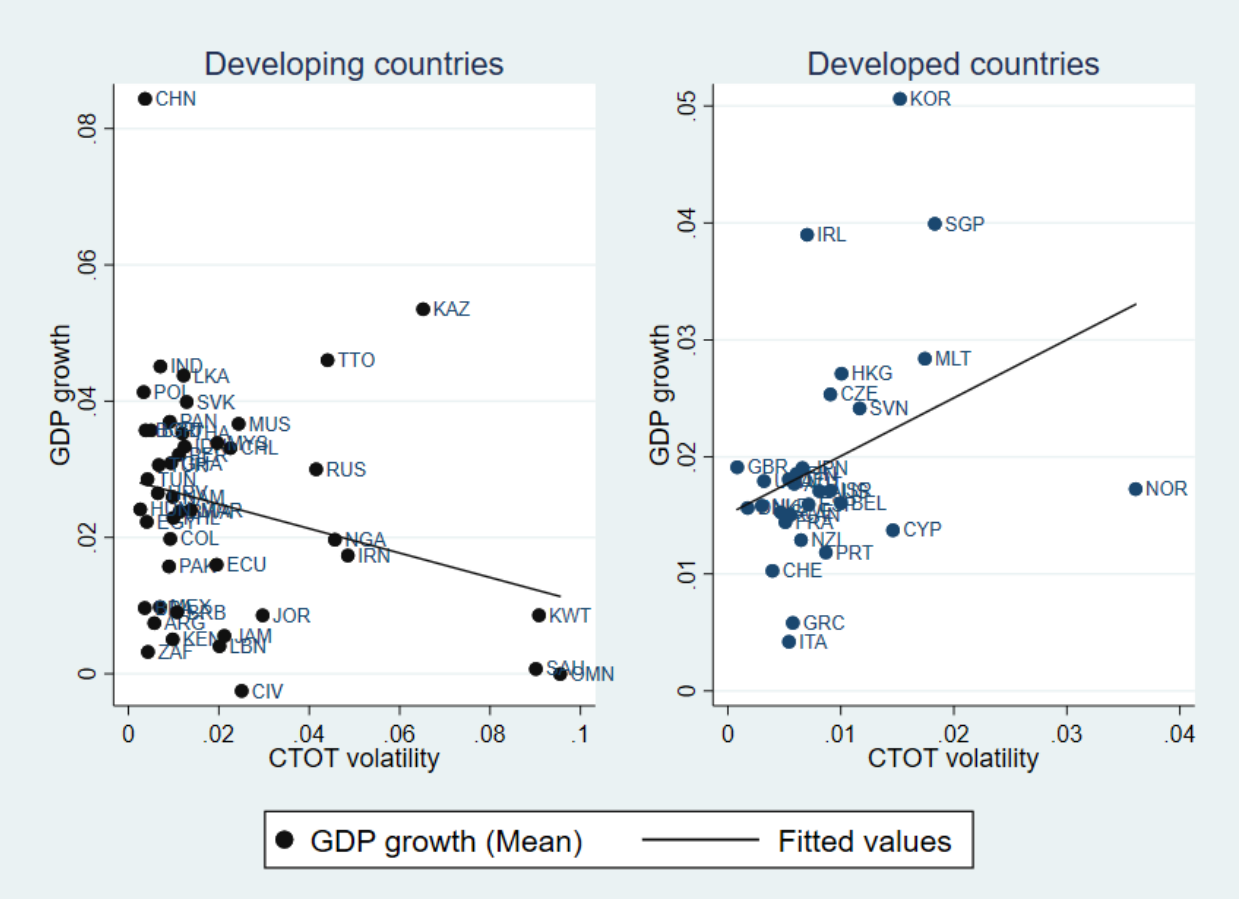

Figure 2. Commodity terms of trade volatility (CTOT volatility) and GDP growth. *Notes*: country level period averages (1975-2017).

Table 1: Summary statistics

	Developing			Developed		
	Obs.	Mean	S.D.	Obs.	Mean	S.D.
GDP per capita	1191	8.462	0.917	1020	10.395	0.442
Financial system structure	1191	0.126	1.175	1020	0.196	1.050
Financial system size	1191	-0.305	1.117	1020	0.930	0.946
CTOT	1185	4.579	0.122	994	4.622	0.042
Gov. Expenditure	1158	2.608	0.440	1015	2.897	0.273
Population	1191	3.156	1.744	1020	2.634	1.398
Trade openness	1166	4.141	0.548	1015	4.279	0.668

Note: All variables are in logs.

Table 2: Financial structure, CTOT volatility and growth (OLS)

	(1) All	(2) Developed countries	(3) Developing countries
CTOT Growth	0.107	-0.011	0.104
	(1.46)	(-0.08)	(1.29)
CTOT Volatility	-0.159**	0.158	-0.201***
	(-2.33)	(1.21)	(-2.68)
Financial system structure	0.001	0.006***	-0.000
	(1.33)	(4.53)	(-0.32)
Financial system size	-0.002**	-0.010***	0.000
	(-2.43)	(-4.76)	(0.16)
Population (in log)	0.004***	0.002*	0.005***
	(4.27)	(1.92)	(4.12)
Gov. Expenditure (in log)	-0.007**	-0.026***	-0.004
	(-1.99)	(-5.16)	(-0.99)
Trade openness (in log)	0.015***	0.006***	0.016***
	(6.75)	(2.64)	(4.39)
Constant	-0.025	0.077***	-0.062**
	(-1.42)	(3.81)	(-2.45)
Number of Observations	683	317	366
Number of Countries	73	29	44
Adjusted R2	0.180	0.458	0.193

t statistics in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Financial structure, CTOT volatility and growth

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.138*	0.054	-0.014
	(1.77)	(0.43)	(-0.07)
CTOT Growth	-0.101	-0.329	-0.076
	(-0.87)	(-1.00)	(-0.86)
CTOT Volatility	-0.325*	-0.023	-0.508***
	(-1.83)	(-0.07)	(-4.05)
Financial system structure	0.022***	0.019**	0.010
	(4.55)	(2.05)	(1.11)
Financial system size	-0.007	-0.012	0.003
	(-1.01)	(-0.84)	(0.44)
Population (in log)	0.004	0.011	0.001
	(0.46)	(1.47)	(0.08)
Gov. Expenditure (in log)	0.020	0.038	0.035**
	(1.43)	(0.61)	(2.44)
Trade openness (in log)	0.029*	0.048**	0.000
	(1.66)	(2.14)	(0.02)
Constant	-0.149	-0.298	0.025
	(-1.63)	(-1.20)	(0.09)
Number of Observations	625	297	328
Number of Countries	73	29	44
Arellano-Bond test for AR(2)	0.60	0.11	0.29
Sargan-Hansen test of the overidentifying restrictions:			
J-statistic	19.160	10.045	8.640
P-value	0.01	0.26	0.37

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Financial structure and CTOT volatility interaction and growth

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.107	-0.015	-0.017
	(1.18)	(-0.08)	(-0.10)
CTOT Growth	-0.262***	-0.230	-0.171
	(-2.63)	(-0.74)	(-1.43)
CTOT Volatility	-0.169	-0.019	-0.300**
	(-1.00)	(-0.04)	(-2.28)
CTOT Volatility × Financial system structure	-0.390**	-0.413	-0.261**
	(-2.40)	(-1.33)	(-2.09)
Financial system structure	0.024***	0.018**	0.015
	(4.92)	(2.15)	(1.54)
Financial system size	-0.007	-0.009	0.002
	(-1.17)	(-0.86)	(0.19)
Population (in log)	-0.001	0.007	0.001
	(-0.21)	(0.90)	(0.10)
Gov. Expenditure (in log)	0.004	0.028	0.028***
	(0.28)	(0.45)	(2.70)
Trade openness (in log)	0.031*	0.039	-0.001
	(1.85)	(1.60)	(-0.05)
Constant	-0.093	-0.222	-0.059
	(-1.47)	(-0.84)	(-0.31)
Number of Observations	625	297	328
Number of Countries	73	29	44
Arellano-Bond test for AR(2)	0.74	0.06	0.56
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	15.949	10.180	8.266
P-value	0.07	0.33	0.51

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Interaction of financial structure and CTOT volatility: additional controls, developing countries only.

	Exchange rate regime		Accountability		Financial openness	
	(1)	(2)	(3)	(4)	(5)	(6)
L.GDP pc Growth	0.098	0.083	0.024	-0.043	0.013	-0.006
	(0.84)	(0.84)	(0.18)	(-0.31)	(0.08)	(-0.03)
CTOT Growth	-0.039	-0.124	-0.056	-0.162	-0.056	-0.157
	(-0.53)	(-1.19)	(-0.76)	(-1.20)	(-0.72)	(-1.24)
CTOT Volatility	-0.405***	-0.183	-0.563***	-0.439**	-0.517***	-0.327*
	(-5.27)	(-1.51)	(-2.66)	(-1.97)	(-3.71)	(-1.80)
CTOT Volatility × Financial system structure		-0.243**		-0.252**		-0.234**
		(-2.04)		(-2.14)		(-2.17)
Financial system structure	0.008	0.014*	0.009	0.014*	0.007	0.014
	(0.95)	(1.89)	(1.18)	(1.72)	(0.88)	(1.51)
Financial system size	-0.001	-0.002	0.001	0.001	0.003	0.000
	(-0.13)	(-0.26)	(0.13)	(0.11)	(0.40)	(0.05)
Population (in log)	-0.001	0.002	0.002	0.002	-0.000	0.003
	(-0.09)	(0.28)	(0.44)	(0.34)	(-0.06)	(0.40)
Gov. Expenditure (in log)	0.031**	0.024**	0.039**	0.035**	0.038***	0.037***
	(2.26)	(2.07)	(2.33)	(2.44)	(3.33)	(3.27)
Trade openness (in log)	-0.007	-0.004	0.001	0.004	-0.004	0.007
	(-0.30)	(-0.18)	(0.06)	(0.17)	(-0.17)	(0.27)
Exchange rate regime	-0.008	-0.008				
	(-1.06)	(-1.38)				
Accountability Index (in log)			-0.074	-0.086		
			(-0.57)	(-0.65)		
Financial openness index					-0.012	-0.016
					(-0.51)	(-0.71)
Constant	-0.074	-0.161	0.105	0.127	-0.004	-0.069
	(-0.51)	(-1.23)	(0.45)	(0.54)	(-0.02)	(-0.37)
Number of Observations	321	321	328	328	322	322
Number of Countries	43	43	44	44	43	43

Arellano-Bond test for AR(2)	0.20	0.35	0.21	0.48	0.11	0.25
Sargan-Hansen test of overidentifying restrictions:						
J-statistic	10.617	10.124	8.460	8.378	8.333	8.669
P-value	0.30	0.42	0.49	0.59	0.50	0.56

Notes: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Financial structure components and CTOT volatility interaction and growth, developing countries

	Structure-Size		Structure-Activity	
	(1)	(2)	(3)	(4)
L.GDP pc Growth	-0.002	0.054	0.087	0.156
	(-0.01)	(0.29)	(0.49)	(1.30)
CTOT Growth	-0.067	-0.080	-0.078	-0.177*
	(-0.79)	(-0.75)	(-0.93)	(-1.66)
CTOT Volatility	-0.469***	-0.479***	-0.545***	-0.608***
	(-3.88)	(-3.38)	(-3.81)	(-5.41)
Structure-Size	0.006	0.007		
	(0.60)	(0.62)		
Structure-Activity			0.006	0.010**
			(1.27)	(1.96)
Financial system size	0.008	0.007	0.004	0.003
	(1.05)	(0.84)	(0.45)	(0.32)
Population (in log)	-0.001	-0.003	-0.002	0.001
	(-0.12)	(-0.40)	(-0.42)	(0.23)
Gov. Expenditure (in log)	0.035***	0.026**	0.032*	0.023
	(2.80)	(2.08)	(1.67)	(0.97)
Trade openness (in log)	-0.013	-0.014	0.020	0.013
	(-0.55)	(-0.63)	(0.78)	(0.42)
CTOT Volatility × Structure-Size		-0.317		
		(-1.42)		
CTOT Volatility × Structure-Activity		-0.317		-0.175***
		(-1.42)		(-2.69)
Constant	0.030	-0.014	0.096	-0.088
	(0.11)	(-0.06)	(0.45)	(-0.38)
Number of Observations	328	328	328	328
Number of Countries	44	44	44	44
Arellano-Bond test for AR(2)	0.14	0.13	0.35	0.59
Sargan-Hansen test of the overidentifying restrictions;				
J-statistic	8.907	9.773	5.900	4.934
P-value	0.35	0.37	0.66	0.84

t statistics in parentheses.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Structure-Activity = Ln (total value traded ratio/ private credit ratio). Structure-Size=Ln (market capitalization ratio/ private credit ratio).

Table 7: Financial structure components and rolling CTOT volatility interaction and growth, developing countries

	Structure-Size		Structure-Activity	
	(1)	(2)	(3)	(4)
L.GDP pc Growth	-0.011	0.066	0.020	0.076
	(-0.08)	(0.53)	(0.13)	(0.50)
CTOT Growth	-0.050	-0.001	-0.123	-0.115
	(-0.41)	(-0.01)	(-0.93)	(-0.76)
CTOT Volatility	-0.334***	-0.309***	-0.402***	-0.500***
	(-3.39)	(-3.08)	(-4.17)	(-3.43)
Structure-Size	0.007	0.006		
	(0.67)	(0.53)		
Structure-Activity			0.007*	0.010**
			(1.70)	(2.06)
Financial system size	0.014*	0.012	0.011	0.007
	(1.68)	(1.20)	(1.15)	(0.75)
Population (in log)	-0.002	-0.004	-0.002	0.001
	(-0.27)	(-0.54)	(-0.40)	(0.20)
Gov. Expenditure (in log)	0.027**	0.022*	0.024	0.021
	(2.11)	(1.68)	(1.62)	(1.55)
Trade openness (in log)	-0.018	-0.019	0.012	0.013
	(-0.95)	(-1.01)	(0.49)	(0.60)
CTOT Volatility × Structure-Size		-0.253		
		(-1.32)		
CTOT Volatility × Structure-Activity				-0.159**
				(-2.01)
Constant	0.028	-0.019	0.097	0.009
	(0.15)	(-0.12)	(0.59)	(0.07)
Number of Observations	328	328	328	328
Number of Countries	44	44	44	44
Arellano-Bond test for AR(2)	0.29	0.21	0.20	0.41
Sargan-Hansen test of the overidentifying restrictions;				
J-statistic	6.476	7.669	3.031	3.263
P-value	0.59	0.57	0.93	0.95

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The weights of rolling CTOT are lagged three-year rolling averages of trade values.
Structure-Activity = Ln (total value traded ratio/ private credit ratio). Structure-Size=Ln (market capitalization ratio/ private credit ratio).

Appendix

Table A: Country list

Developed	Developing	
Australia	Argentina	Oman
Austria	Bangladesh	Pakistan
Belgium	Barbados	Panama
Canada	Botswana	Peru
Cyprus	Brazil	Philippines
Czech Republic	Bulgaria	Poland
Denmark	Chile	Russian Federation
Finland	China	Saudi Arabia
France	Colombia	Slovak Republic
Germany	Cote d'Ivoire	South Africa
Greece	Croatia	Sri Lanka
Hong Kong SAR, China	Ecuador	Thailand
Ireland	Egypt, Arab Rep.	Tunisia
Israel	Ghana	Turkey
Italy	Hungary	
Japan	India	
Korea, Rep.	Indonesia	
Malta	Iran, Islamic Rep.	
Netherlands	Jamaica	
New Zealand	Jordan	
Norway	Kazakhstan	
Portugal	Kenya	
Singapore	Kuwait	
Slovenia	Lebanon	
Spain	Malaysia	
Sweden	Mauritius	
Switzerland	Mexico	
United Kingdom	Morocco	
United States	Namibia	
	Nigeria	

Table B: Correlation matrix between all explanatory variables

Variables	CTOT	STRUCT	SIZE	PPL	GOVT	OPEN	DEPTH	ACCESS	EFFIC
STRUCT	-0.05								
SIZE	0.13	0.50							
PPL	-0.04	0.27	0.01						
GOVT	0.03	-0.09	0.26	-0.31					
OPEN	0.08	0.06	0.26	-0.64	0.13				
DEPTH	0.20	0.39	0.89	-0.10	0.41	0.29			
ACCESS	0.05	0.21	0.58	-0.12	0.24	0.13	0.59		
EFFIC	0.10	0.42	0.67	0.27	0.22	0.02	0.59	0.48	
POLIT	0.07	-0.09	0.42	-0.53	0.47	0.43	0.55	0.49	0.27
REGQ	0.20	0.12	0.67	-0.39	0.45	0.40	0.76	0.59	0.45
LAW	0.16	0.09	0.68	-0.39	0.48	0.34	0.76	0.60	0.51
RIGHTS	0.27	-0.02	0.16	-0.18	0.17	0.08	0.23	0.51	0.20
R.END	0.01	-0.01	0.21	-0.24	0.20	0.08	0.22	0.36	0.01
REFORM	0.04	-0.02	0.02	-0.07	0.11	-0.04	0.06	0.02	0.00
JACC	0.12	0.16	0.47	-0.18	0.32	0.10	0.54	0.36	0.32
R.DUR	-0.03	0.21	0.52	-0.05	0.25	-0.03	0.55	0.40	0.32
Z-Score	0.06	0.06	0.20	-0.01	0.07	0.06	0.15	-0.05	0.05
VOLAT	-0.05	0.04	-0.19	0.21	-0.12	-0.20	-0.15	-0.09	0.03

Notes: abbreviated variable names STRUCT = Financial system structure, SIZE = Financial system size, PPL = population, GOVT = Government Expenditure, OPEN = Trade openness, DEPTH = Financial depth, ACCESS = Financial accessibility, EFFIC = Financial efficiency, POLIT = Political Stability, REGQ = Regulatory Quality, LAW = Rule of Law, RIGHTS = Property rights, R.END = Regime end type, REFORM = Judicial reform, JACC = Judicial accountability, R.DUR = Regime durability, Z-score = Bank z-score, VOLAT = Stock price volatility.

Table B (cont.): Correlation matrix between all explanatory variables

Variables	POLIT	REGQ	LAW	RIGHTS	R.END	REFORM	JACC	R.DUR	Z-score
STRUCT									
SIZE									
PPL									
GOVT									
OPEN									
DEPTH									
ACCESS									
EFFIC									
POLIT									
REGQ	0.77								
LAW	0.81	0.93							
RIGHTS	0.48	0.51	0.51						
R.END	0.30	0.26	0.29	0.32					
REFORM	0.07	0.06	0.07	0.27	0.22				
JACC	0.47	0.65	0.67	0.29	0.31	0.32			
R.DUR	0.47	0.59	0.64	0.08	0.25	-0.02	0.48		
Z-Score	-0.05	0.06	0.06	-0.14	0.12	0.08	0.14	0.10	
VOLAT	-0.10	-0.13	-0.15	-0.05	-0.26	-0.11	-0.16	-0.22	-0.30

Notes: abbreviated variable names STRUCT = Financial system structure, SIZE = Financial system size, PPL = population, GOVT = Government Expenditure, OPEN = Trade openness, DEPTH = Financial depth, ACCESS = Financial accessibility, EFFIC = Financial efficiency, POLIT = Political Stability, REGQ = Regulatory Quality, LAW = Rule of Law, RIGHTS = Property rights, R.END = Regime end type, REFORM = Judicial reform, JACC = Judicial accountability, R.DUR = Regime durability, Z-score = Bank z-score, VOLAT = Stock price volatility.

Table C1: Financial structure, CTOT volatility and growth: non-linearity of the size effect (OLS)

	(1) All	(2) Developed countries	(3) Developing countries
CTOT Growth	0.111	-0.010	0.110
	(1.50)	(-0.07)	(1.36)
CTOT Volatility	-0.173**	0.128	-0.191***
	(-2.57)	(0.96)	(-2.65)
Financial system structure	0.002	0.006***	-0.001
	(1.44)	(4.67)	(-0.45)
Financial system size	-0.001	-0.008***	-0.001
	(-1.21)	(-3.92)	(-0.29)
Financial system size SQUARED	-0.003***	-0.001*	-0.002**
	(-4.80)	(-1.69)	(-2.06)
Population (in log)	0.004***	0.002*	0.006***
	(4.42)	(1.84)	(4.39)
Gov. Expenditure (in log)	-0.011***	-0.027***	-0.006
	(-3.28)	(-5.19)	(-1.33)
Trade openness (in log)	0.015***	0.007***	0.017***
	(7.14)	(2.71)	(4.71)
Constant	-0.012	0.083***	-0.059**
	(-0.67)	(3.95)	(-2.16)
Number of Observations	683	317	366
Number of Countries	73	29	44
Adjusted R2	0.208	0.460	0.199

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C2: Financial structure and CTOT volatility interaction and growth with financial depth

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.137	0.067	0.058
	(1.35)	(0.48)	(0.34)
CTOT Growth	-0.199*	-0.115	-0.125
	(-1.66)	(-0.36)	(-1.17)
CTOT Volatility	-0.046	0.115	-0.133
	(-0.24)	(0.21)	(-0.52)
CTOT Volatility × Financial system structure	-0.458**	-0.428	-0.334*
	(-2.47)	(-1.45)	(-1.65)
Financial system structure	0.023***	0.018**	0.015
	(4.12)	(2.28)	(1.51)
Financial depth	0.001	-0.006	0.033
	(0.15)	(-0.29)	(1.13)
Population (in log)	-0.003	-0.001	0.005
	(-0.31)	(-0.10)	(0.79)
Gov. Expenditure (in log)	0.005	0.063	0.027*
	(0.27)	(1.41)	(1.75)
Trade openness (in log)	0.019	0.030*	-0.010
	(1.27)	(1.68)	(-0.51)
Constant	-0.042	-0.271	0.006
	(-0.45)	(-1.60)	(0.02)
Number of observations	625	297	328
Number of countries	73	29	44
Arellano-Bond test for AR(2) [a]	0.673	0.038	0.746
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	23.684	10.421	6.363
P-value	0.005	0.317	0.703

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. [a] The third lag of the dependent variable is used if we cannot reject second order autocorrelation. Financial depth is the log of financial institutions depth and market depth.

Table C3: Financial structure and CTOT volatility interaction and growth with financial accessibility

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.166	0.022	0.140
	(1.56)	(0.15)	(1.11)
CTOT Growth	-0.172	-0.178	-0.102
	(-1.01)	(-0.61)	(-0.98)
CTOT Volatility	-0.041	-0.004	-0.192
	(-0.19)	(-0.01)	(-0.99)
CTOT Volatility × Financial system structure	-0.368*	-0.407	-0.274**
	(-1.71)	(-1.27)	(-2.09)
Financial system structure	0.020***	0.015*	0.011
	(3.08)	(1.75)	(1.12)
Financial accessibility	0.011	-0.015	0.013
	(0.86)	(-0.64)	(1.14)
Population (in log)	0.007	-0.003	0.004
	(0.73)	(-0.34)	(0.59)
Gov. Expenditure (in log)	-0.018	0.002	0.023
	(-0.45)	(0.03)	(1.25)
Trade openness (in log)	0.022	0.015	0.010
	(1.17)	(0.71)	(0.34)
Constant	-0.015	-0.035	-0.181
	(-0.09)	(-0.14)	(-0.88)
Number of observations	625	297	328
Number of countries	73	29	44
Arellano-Bond test for AR(2)[a]	0.404	0.008	0.399
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	35.036	11.482	14.056
P-value	0.000	0.244	0.120

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. [a] The third lag of the dependent variable is used if we cannot reject second order autocorrelation. Financial accessibility is the log of financial institutions accessibility and financial markets accessibility.

Table C4: Financial structure and CTOT volatility interaction and growth with financial efficiency

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.200**	0.012	-0.017
	(2.49)	(0.05)	(-0.09)
CTOT Growth	-0.274**	-0.210	-0.220
	(-2.18)	(-0.49)	(-1.64)
CTOT Volatility	-0.039	-0.151	-0.309
	(-0.24)	(-0.24)	(-1.50)
CTOT Volatility × Financial system structure	-0.490**	-0.518*	-0.294**
	(-2.53)	(-1.87)	(-2.15)
Financial system structure	0.019***	0.015*	0.015*
	(3.69)	(1.65)	(1.83)
Financial efficiency	0.038*	-0.004	0.035*
	(1.72)	(-0.21)	(1.73)
Population (in log)	-0.006	0.003	-0.003
	(-0.70)	(0.37)	(-0.38)
Gov. Expenditure (in log)	-0.014	0.043	0.022
	(-0.56)	(1.01)	(1.16)
Trade openness (in log)	0.030	0.036	-0.008
	(1.62)	(1.43)	(-0.44)
Constant	-0.022	-0.240	0.074
	(-0.20)	(-1.15)	(0.32)
Number of observations	625	297	328
Number of countries	73	29	44
Arellano-Bond test for AR(2) [a]	0.483	0.063	0.666
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	16.559	9.590	4.805
P-value	0.056	0.385	0.851

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. [a] The third lag of the dependent variable is used if we cannot reject second order autocorrelation. Financial efficiency is the log of financial institutions efficiency and financial markets efficiency.

Table D1: Financial structure and CTOT volatility interaction and growth: additional controls, developing countries only.

	(1) Political Stability	(2) Regulatory Quality	(3) Rule of Law
L.GDP pc Growth	0.144	0.126	0.148
	(1.53)	(1.17)	(1.49)
CTOT Growth	-0.109	0.002	-0.128
	(-0.96)	(0.02)	(-1.25)
CTOT Volatility	-0.258	-0.027	-0.226
	(-1.42)	(-0.12)	(-1.15)
CTOT Volatility × Financial system structure	-0.144	-0.197**	-0.183*
	(-1.56)	(-2.03)	(-1.76)
Financial system structure	0.015**	0.018**	0.016**
	(2.44)	(2.09)	(2.30)
Financial system size	-0.007	-0.012	-0.012
	(-0.98)	(-1.07)	(-1.45)
Population (in log)	-0.001	-0.007	-0.003
	(-0.15)	(-0.85)	(-0.41)
Gov. Expenditure (in log)	0.006	-0.009	0.009
	(0.48)	(-0.61)	(0.43)
Trade openness (in log)	-0.005	-0.013	0.010
	(-0.28)	(-0.43)	(0.55)
Political Stability	0.012*		
	(1.96)		
Regulatory Quality		0.040**	
		(2.11)	
Rule of Law			0.008
			(0.38)
Constant	0.031	0.106	-0.041
	(0.40)	(0.70)	(-0.45)
Number of observations	288	288	288
Number of countries	44	44	44
Arellano-Bond test for AR(2)	0.051	0.173	0.084
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	8.391	13.577	9.521
P-value	0.59	0.19	0.48

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Financial system structure is the first principal component of Structure-Activity and Structure-Size. Structure-Activity = Ln (total value traded ratio/ private credit ratio). Structure-Size=Ln (market capitalization ratio/ private credit ratio). Financial system size is the first principal component of Finance-Activity and Finance-Size. Finance-Activity=Ln(total value traded ratio × private credit ratio). Finance-Size-Ln(market capitalization ratio + private credit ratio).

Table D2: Financial structure and CTOT volatility interaction and growth

	(1) Property rights	(2) Regime end type	(3) Judicial reform	(4) Judicial accountability	(5) Regime durability
L.GDP pc Growth	0.128	-0.023	0.002	0.033	0.131
	(1.09)	(-0.13)	(0.01)	(0.29)	(1.08)
CTOT Growth	-0.094	-0.172	-0.120	-0.048	-0.092
	(-0.79)	(-1.21)	(-1.03)	(-0.29)	(-0.80)
CTOT Volatility	-0.160	-0.290*	-0.249*	-0.280	-0.307
	(-0.89)	(-1.67)	(-1.92)	(-1.10)	(-1.53)
CTOT Volatility × Financial system structure	-0.223*	-0.271*	-0.257**	-0.237**	-0.163*
	(-1.91)	(-1.91)	(-2.04)	(-2.42)	(-1.77)
Financial system structure	0.014*	0.016**	0.014	0.015**	0.010**
	(1.85)	(1.96)	(1.44)	(2.18)	(2.01)
Financial system size	-0.005	0.000	0.001	0.003	-0.005
	(-0.63)	(0.06)	(0.14)	(0.32)	(-0.72)
Population (in log)	0.002	0.001	0.000	0.007	0.005
	(0.39)	(0.11)	(0.02)	(0.65)	(0.80)
Gov. Expenditure (in log)	0.020	0.036***	0.035***	0.029	0.055***
	(1.62)	(2.66)	(3.23)	(1.06)	(2.95)
Trade openness (in log)	0.012	0.004	-0.004	0.010	0.012
	(0.62)	(0.18)	(-0.18)	(0.33)	(0.68)
Property rights	0.020				
	(0.68)				
Regime end type		-0.002			
		(-0.38)			
Judicial reform			-0.081		
			(-1.43)		
Judicial accountability				-0.290*	
				(-1.69)	
Regime durability					-0.000
					(-0.54)
Constant	-0.082	-0.035	0.079	0.462	-0.175*
	(-0.55)	(-0.22)	(0.33)	(1.04)	(-1.82)
Number of observations	328	328	328	328	320
Number of	44	44	44	44	43

countries					
Arellano-Bond test for AR(2)	0.632	0.396	0.570	0.813	0.708
Sargan-Hansen test of the overidentifying restrictions;					
J-statistic	11.936	7.914	7.960	7.872	36.051
P-value	0.289	0.637	0.633	0.641	0.054

Note: t statistics in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Financial system structure is the first principal component of Structure-Activity and Structure-Size. Structure-Activity = Ln (total value traded ratio/ private credit ratio). Structure-Size=Ln (market capitalization ratio/ private credit ratio). Financial system size is the first principal component of Finance-Activity and Finance-Size. Finance-Activity=Ln(total value traded ratio × private credit ratio). Finance-Size-Ln(market capitalization ratio + private credit ratio).

Table E1: Financial structure and CTOT volatility interaction and growth with Bank z-score

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.067	-0.038	0.139
	(0.93)	(-0.22)	(1.34)
CTOT Growth	-0.309**	-0.126	-0.243*
	(-2.55)	(-0.54)	(-1.94)
CTOT Volatility	-0.198	0.106	-0.339*
	(-1.26)	(0.41)	(-1.74)
CTOT Volatility × Financial system structure	-0.419**	-0.523*	-0.257*
	(-2.45)	(-1.82)	(-1.76)
Financial system structure	0.023***	0.022*	0.011
	(3.80)	(1.74)	(1.23)
Financial system size	-0.006	-0.028*	-0.006
	(-0.66)	(-1.95)	(-0.43)
Population (in log)	-0.003	-0.002	-0.002
	(-0.52)	(-0.14)	(-0.25)
Gov. Expenditure (in log)	0.022	-0.007	0.028
	(0.97)	(-0.28)	(1.00)
Trade openness (in log)	0.019	0.011	0.034
	(0.90)	(0.62)	(1.58)
Bank z-score (in log)	0.020**	0.011	0.019
	(2.08)	(1.60)	(1.13)
Constant	-0.156	-0.007	-0.230
	(-1.60)	(-0.04)	(-1.51)
Number of observations	471	190	281
Number of countries	73	29	44
Arellano-Bond test for AR(2)	0.228	0.117	0.137
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	10.547	11.757	7.670
P-value	0.394	0.302	0.661

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Financial system structure is the first principal component of Structure-Activity and Structure-Size. Structure-Activity = Ln (total value traded ratio/ private credit ratio). Structure-Size=Ln (market capitalization ratio/ private credit ratio). Financial system size is the first principal component of Finance-Activity and Finance-Size. Finance-Activity=Ln(total value traded ratio × private credit ratio). Finance-Size-Ln(market capitalization ratio + private credit ratio).

Table E2: Financial structure and CTOT volatility interaction and growth with stock price volatility

	(1) All	(2) Developed countries	(3) Developing countries
L.GDP pc Growth	0.201**	-0.162	0.176**
	(2.25)	(-1.06)	(2.58)
CTOT Growth	0.085	0.030	0.278**
	(0.48)	(0.15)	(2.16)
CTOT Volatility	-0.076	-0.685	-0.010
	(-0.28)	(-0.21)	(-0.05)
CTOT Volatility × Financial system structure	-0.267***	-0.542	-0.145*
	(-4.02)	(-0.93)	(-1.81)
Financial system structure	0.023***	0.028***	0.005
	(4.27)	(3.18)	(0.69)
Financial system size	-0.010*	-0.029**	-0.003
	(-1.84)	(-2.38)	(-0.64)
Population (in log)	0.006	-0.003	0.007
	(0.82)	(-0.36)	(0.91)
Gov. Expenditure (in log)	0.014	-0.062	0.028
	(0.82)	(-0.77)	(1.40)
Trade openness (in log)	0.029	-0.011	0.008
	(1.48)	(-0.63)	(0.48)
Stock price volatility	0.001	-0.000	0.002***
	(1.42)	(-1.34)	(3.20)
Constant	-0.130	0.299	-0.112
	(-1.05)	(0.96)	(-0.93)
Number of observations	497	248	249
Number of countries	69	29	40
Arellano-Bond test for AR(2)	0.600	0.010	0.806
Sargan-Hansen test of the overidentifying restrictions;			
J-statistic	14.127	10.819	3.823
P-value	0.167	0.372	0.955

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Financial system structure is the first principal component of Structure-Activity and Structure-Size. Structure-Activity = Ln (total value traded ratio/ private credit ratio). Structure-Size=Ln (market capitalization ratio/ private credit ratio). Financial system size is the first principal component of Finance-Activity and Finance-Size. Finance-Activity=Ln(total value traded ratio × private credit ratio). Finance-Size-Ln(market capitalization ratio + private credit ratio).