Two Faces of Financial Systems: markets stimulate growth, banks smooth exogenous shocks

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Abstract

Banks and financial markets contribute to economic growth directly and indirectly. The direct channel works through assisting investment by facilitating access to funds, mitigating information frictions and providing other services to investors and borrowers. The indirect channel is through dampening the impact of exogenous shocks on growth. Do banks and markets perform equally well in both channels? On a panel of 39 developing and 24 developed countries over the period of 1988-2012 we obtain that financial structure matters for growth but there are qualitative differences between countries. The direct channel is found significant for advanced economies, while the indirect channel appears in developing countries only. The same dichotomy is observed between large and small financial systems. The results suggest high degree of substitution between services provided by banks and markets in financially less developed countries, and importance of intertemporal shock smoothing through banks in them. Better-developed and well-integrated financial markets stronger contribute to growth and enable cross-sectional (international) shock smoothing, potentially outbalancing intertemporal smoothing by banks in developed economies.

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1 Introduction

Economists usually agree that banks and markets matter for growth, however there is less agreement on their relative importance. 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. 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,"[1] 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."[2] With rare exceptions, the literature focuses on the direct link between the structure and the level of development of a financial system, on the one hand, and economic growth on the other. We take a broader perspective by also investigating the indirect link arising through the role of financial systems in smoothing exogenous shocks.

The direct effect of financial systems on growth has been rather extensively studied theoretically, yet conclusions on the primacy of either banks or markets highly depend on their specific functions under consideration. Banks stimulate growth because they 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). Financial markets have advantages of ensuring commitment to contract terms (Dewatripont and Maskin, 1995), facilitating good governance (Tadesse, 2004),

[1] 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

[2] "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).

as well as offering better hedging opportunities, among others. Empirically, a number of researchers suggested that financial structure does not matter for growth (La Porta et al., 2000; Levine, 2002). According to other findings, the answer seems to depend on the level of countries' economic and financial development (Boyd and Smith, 1998; Tadesse, 2002). We give a review of the relevant literature in the next section.

The indirect effect of financial systems on growth through a reduction of the impact of exogenous shocks is a relatively more recent line in the literature. Theoretically the ability of banks to smooth shocks was originally suggested by Allen and Gale (1997). Banks are able to do so because they spread the impact of shocks across generations (as in Allen and Gale, 1997; Gersbach and Wenzelburger, 2001; Vinogradov, 2011) and because they engage in relationship lending thus ensuring smooth funding to long-term customers (Bolton et al., 2013; Sette and Gobbi, 2015). It can be argued though that well-developed markets, especially in open economies, 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).

On the empirical side, Aghion et al. (2010) demonstrate that financial development, as measured by the size of the banking sector, dampens effects 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. (2006) find 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). However, their study does not investigate the

role of financial structure explicitly; controlling for the size of stock markets does not appear to affect the relationship.[3] In a more recent study, 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.[4] Their main result is 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. While these results suggest banking sectors may be capable of smoothing out business cycle fluctuations[5], it still remains to establish whether they smooth the impact of exogenous shocks on growth, and whether banks or markets perform better in this role.

[3] 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.

[4] 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.

[5] Reverse causality is also possible here if banks grow faster when there is more economic stability. This reverse causality would also explain why non-intermediation services are positively associated with economic volatility: in turbulent times more transactions take place, raising value-added of services associated with them.

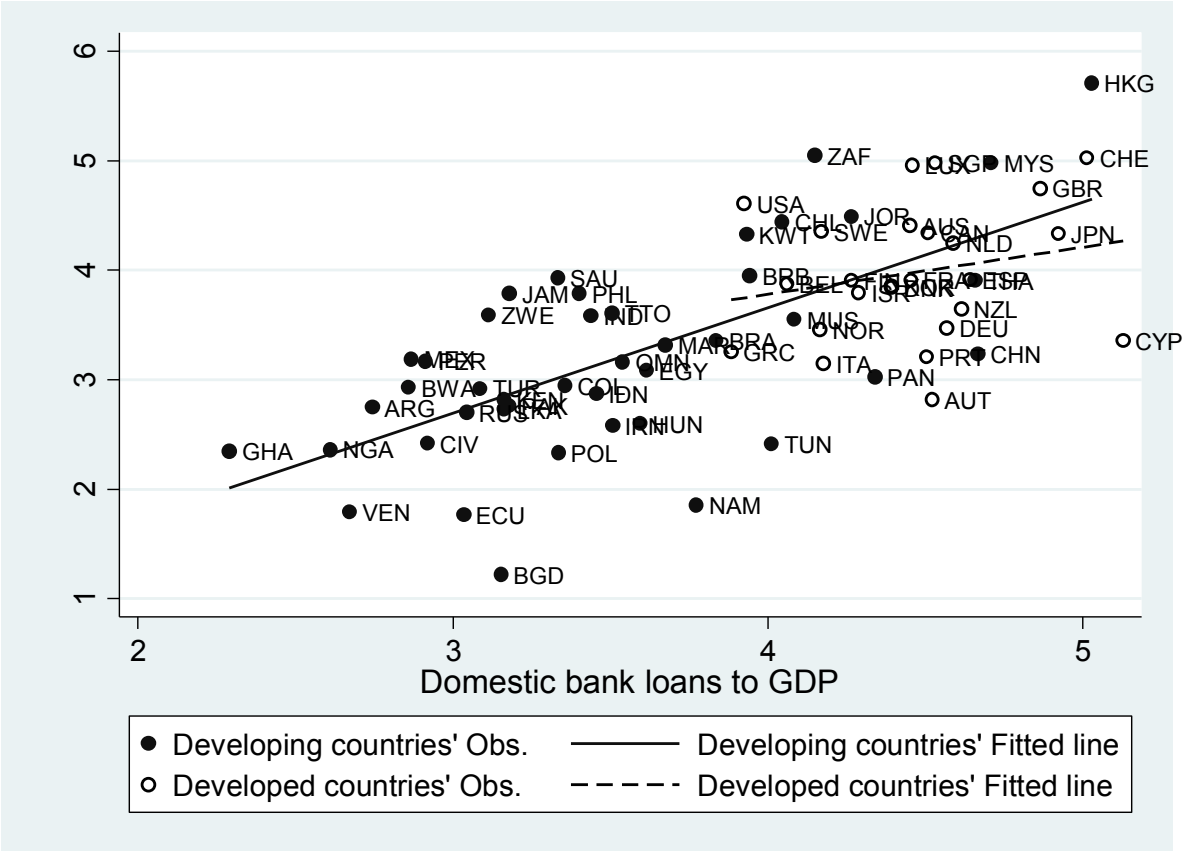

Figure 1. Financial structure (averages over 1988-2012, in log).

To explore, we study a panel of 63 countries over the period of 1988-2012. Splitting the whole period into five non-overlapping 5-year segments allows focusing on medium- and long-term effects, which is crucial in our setup as shock-smoothing may be undetectable in shorter periods.[6] All variables are defined as five-year averages; exogenous shocks are captured by the five-year volatility of the country's annual TOT over each five-year segment. This measure is convenient for our purposes because TOT volatility is exogenous to a country's GDP and its financial system, especially so for developing economies who are price-takers in the global market (Broda, 2004, Blattman et al., 2007). Financial structure is defined as the size of the stock

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

market relative to the outstanding credit by domestic banks, as in Levine (2002). Using traditional controls such as inflation rates, schooling levels, government expenditures and trade openness, we 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 TOT volatility and financial structure. We also analyse how financial and economic development affects these relationships.

Our main finding is that financial structure matters for growth both in terms of the direct impact and in terms of smoothing exogenous shocks. In our sample and period, market-based countries tend to grow faster. However, this positive impact of markets on growth depends on the development of the financial system: better-developed economies and financial systems benefit more from being market-based. In terms of shock smoothing, banking systems do provide a protection against exogenous shocks. This holds only for developing countries, which are also those suffering from high TOT volatility: developing countries in Figure 2 experience on average 2.5-times higher TOT volatility than developed economies. 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. Distinguishing between less and better *financially* developed countries yields the same results: benefits of markets for growth are only visible in large financial systems, whereas the shock-smoothing role of banks is only relevant for less financially developed countries.

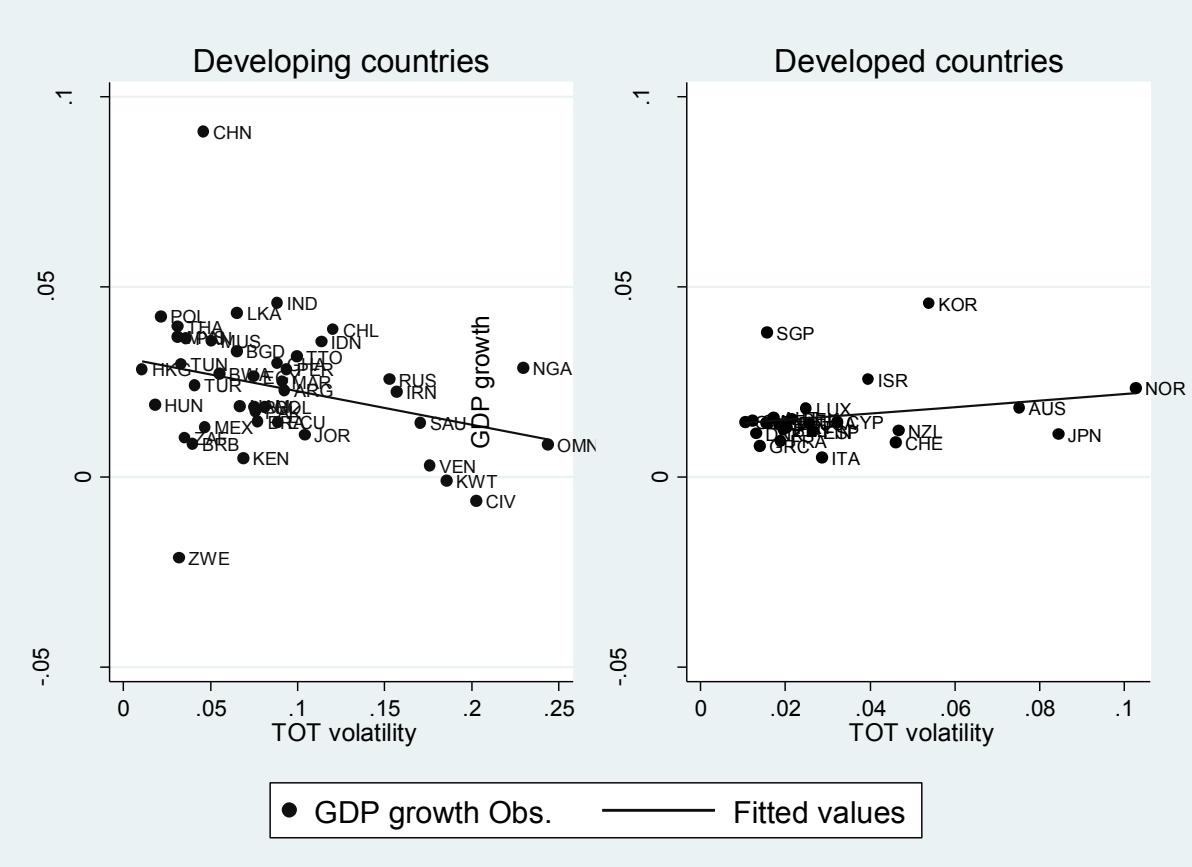

Figure 2. TOT volatility and growth in developing and developed countries (averages over 1988-2012, logs).

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, e.g., Cull, 1997). For developing countries, indeed, a well-functioning banking sector is detrimental 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 countries.[7]

The paper proceeds as follows. Next section reviews key predictions of the extant theoretical literature with regards to both channels through which financial systems can contribute to growth, paying particular attention to assumptions that may indicate relevance of each of these channels to economies with different levels of development; key empirical findings are also present there. This discussion informs our hypotheses and empirical models outlined in Section 3. Section 4 then presents the data and methods used to estimate our models, while main results and their discussion are in Section 5 (all robustness checks and auxiliary results are left for the Appendix). Finally, Section 6 concludes.

2 Theoretical Background

Banks offer investors services that are otherwise unavailable in financial markets. This includes liquidity provision (Diamond and Dybvig, 1983), information provision (Diamond, 1984), as well as reduction of transaction costs (Benston and Smith, 1976), and through that an improved allocation of resources, thus contributing to 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 and ensuring optimal allocation of resources (Boot and Thakor, 1997; Allen and Gale, 1999). Importantly, markets are free from inefficiencies inherent to banks. For instance,

[7] The main criteria used in the World Economic Outlook to classify countries as advanced economies, emerging markets, or developing economies are (1) per capita income level, (2) export diversification and (3) degree of integration into the global financial system (https://www.imf.org/external/pubs/ft/weo/faq.htm). For example, the export diversification criterion would prevent classifying oil exporters with high GDP per capita as advanced economies because around 70% of their export is oil.

profit maximising behaviour of banks under asymmetric information gives rise to credit rationing: some borrowers are unable to obtain funding although they are observationally undistinguishable from others who get funded (Stiglitz and Weiss, 1981). In a freely competitive market these borrowers would not be excluded but rather would be able to obtain funding at a higher interest rate and/or with a higher collateral requirement. In Di Patti and Gobbi (2007) mergers and acquisitions between banks disrupt relationship lending thus resulting in an adverse effect on credit.

In the above listed roles, banks and markets contribute to 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 (e.g. 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 inherent 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 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, and a high degree of integration can propagate financial crisis (Lehkonen, 2015). A different, though connected, mechanism of shock-smoothing is found in

relationship lending (Bolton et al., 2013; Sette and Gobbi, 2015; Beck et al., 2014b): during economic downturns banks keep (and prefer) lending to borrowers with who they have developed long-term relationships, which helps smooth business cycle fluctuations. If, however, 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).

If relative benefits from banking outbalance intermediation costs, financial systems should optimally be bank-based, as a better allocation of resources and more efficient shock smoothing would lead to higher growth. Otherwise, a market-based financial system is optimal. Yet in most countries both bank credit and capital markets would 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, e.g. 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 securitisation, 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. In Bencivenga and Smith (1991) the contribution of banks to growth is more pronounced when risk-aversion of population 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, little is known in this regard for the shock-smoothing role of financial systems. As

competition, both between banks and between banks and markets, reduces the shock-smoothing capacity of the banking sector (Allen and Gale, 1997; Vinogradov, 2011), we would expect that this role of banks may be more visible in the developing world due to less intense competition in the banking market. The relationship lending argument in favour of the 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, p. 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 favour 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.

Empirical studies mainly focus on the 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 6 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. A more recent study by Demirguc-Kunt et al. (2013) confirms that the higher economic development, the stronger the contribution of financial markets to growth, and the

weaker that of banks. We expect therefore different results for the relationship between financial development, financial structure, exogenous shocks and economic growth in developing and developed countries, as well as in countries with high and low financial development. The next section elaborates on our hypotheses and econometric models.

3 Models and Hypotheses

Theoretical arguments of the previous section indicate two scenarios in which financial structure would be irrelevant for growth: (1) services provided by banks and markets are perfect substitutes, and (2) 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. With this in mind, we expect a relationship between financial structure and growth (Model 1):

$$GDPGrowth_{is} = \alpha_1 + \beta_1 \, STRUCT_{is} + \varphi_1 \, X_{is} + \delta_s + \mu_i + \varepsilon_{is} \qquad (1)$$

Here $GDPGrowth_{is}$ is the GDP per capita growth in the *i*th country during period *s*, $STRUCT$ is the financial structure variable, measuring the activity of stock markets relative to that of banks, X is a set of typical controls that will be discussed in Section 4, δ_s and μ_i – time- and country-specific effects, respectively; ε_{is} is the error term. If financial structure matters for growth, β_1 should be significantly different from zero. Since we measure financial structure by a ratio of the size of capital market to bank credit, a positive value of β_1 would signify that capital markets support stronger economic growth than banking systems (vice versa if $\beta_1 < 0$).

If banks and markets substitute each other in services they provide, we expect a relationship between growth and the overall level of financial development as given by the size of financial systems (Model 2):

$$GDPGrowth_{is} = \alpha_2 + \beta_2 \ SIZE_{is} + \varphi_2 X_{is} + \delta_s + \mu_i + \varepsilon_{is} \quad (2)$$

where all variables are as in (1) and $SIZE_{is}$ stands for the sum of market capitalization and bank credit in country *i* during period *s*. A significantly different from zero and positive β_2 would support the hypothesis of the positive impact of financial development on growth.

Because the previous section suggests heterogeneity in the above two relationships, we will re-estimate (1) and (2) for the subsamples of developing and developed countries separately.

In order to test the shock-smoothing role of financial systems, we will employ Model 3:

$$GDPGrowth_{is} = \alpha_3 + \beta_3 \ STRUCT_{is} + \theta_3 (STRUCT \times TOTV)_{is} + \vartheta_3 TOTV_{is} + \varphi \ X_{is} + \delta_s + \mu_i + \varepsilon_{is} \ , \quad (3)$$

where, on top of the above-defined variables, $TOTV_{is}$ is the volatility of the country's *i* terms of trade in period *s*. We expect ϑ_3 to be either negative or insignificant as suggested by Figure 2 (see also Mendoza, 1997; Blattman *et al*., 2007, and references therein). The sign and significance of the interaction term, θ_3, show how financial structure affects this negative impact of TOT volatility on GDP growth. A positive θ_3 would imply that countries with a larger financial market better counteract the exogenous volatility effect. In contrast, if banks better perform the shock-smoothing role, θ_3 is expected to be negative. As in (1), coefficient β_3 here

stands for the direct effect of financial structure on growth, beyond dampening the impact of TOT volatility. We expect the overall effect of *STRUCT* to be consistent with regression (1).

As with models (1) and (3), we also estimate model (3) for the subsamples of developing and developed countries separately. There are two additional reasons for this, apart from those given in the previous section. First, as can be seen in Figure 2, TOT volatility in developed countries is on average lower than in developing economies, due to which the shock-smoothing role of financial systems may be undetectable even if present in the former. Second, the definition of advanced economies is based not only on the size of their GDP per capita but also on other criteria such as diversification of exports and global integration. This classification provides an additional dimension to the potential relationship between financial structure, shocks and growth.

To complete the analysis, we will test whether the shock-smoothing role of financial systems depends on the level of financial development. One way to do this would be through appropriately amending model (3) by including variable SIZE and the relevant interaction terms with it. The result would be difficult to interpret, in particular because of the triple interaction term $STRUCT \times TOTV \times SIZE$. Instead, we will use SIZE to classify economies into those with large and small financial sectors and re-estimate (3) for them separately. This is effectively our Model 4, testing the effect of financial development on the indirect impact of financial structure on growth.

4 Data and Methodology

We collect annual data from 1988 to 2012 for a panel of 63 countries, from which 39 are developing and 24 developed. 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. The source of all data is the World bank dataset.

Financial structure

The financial structure index reflects the activity of stock markets relative to that of banks. We represent it with the logarithm of the *market capitalization* to *bank 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. *Bank credit* is the ratio of domestic credit to private sector by banks to GDP. Larger values of the financial structure index indicate a more market-based (less bank-based) financial system.

Financial system size

Financial system size reflects the activity of the whole financial system, represented both by stock markets and by banks. It equals the logarithm of *market capitalization* plus *bank credit*. Larger values of this index signify a more active financial system.

Terms of trade (TOT) volatility

Terms of trade (TOT) is represented by the net barter terms of trade index. We measure the volatility of this index as the standard deviation of its growth in five year intervals to represent exogenous shocks in our model. Several studies suggest that the terms of trade is exogenous to developing countries because they are price takers in world markets (e.g. Broda, 2004; Blattman et al., 2007). Some developing countries in our sample could be main exporters or importers of some goods thus they can influence the price of these goods. Table A1 in the Appendix shows that only 6 out of 39 developing countries in our sample are the leaders of a

small share of the goods they trade; China is the only export/import leader in several products simultaneously. For this reason, assuming exogeneity of the terms of trade for developing countries in our sample does not introduce a significant bias. To robustify the results, we will re-run the relevant regressions, omitting these countries. Several developed economies, on the other hand, are leaders in export/import of some goods. The terms of trade of these countries, therefore, is endogenous but excluding these countries from the sample will lead to an insufficient number of observations. However, these countries have a well-diversified trade structure and specialize in low price volatility goods such as manufacturing products. For this reason, TOT volatility would have no significant impact on these countries' GDP, as confirmed in the literature (e.g. Blattman et al., 2007). 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 initial GDP per capita, education, trade openness, government expenditure and inflation. *Initial GDP per capita* is the value of GDP per capita of the beginning of each five-year period. Other controls are averages over 5-year periods. As a proxy of *education* we use total enrolment in primary education, regardless of age, expressed as a percentage of the population of official primary education age. This index can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition. This variable offers a larger number of observations than secondary school enrolment and net primary school enrolment. *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. Finally, we employ the lack of price stability[8] as a measure of *inflation*.

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 in developing countries. Both subsamples have on average larger banking sectors than stock markets (negative mean financial structure), with developed countries exhibiting an even stronger bias towards banking. Developed countries also have larger financial systems, are more open and have higher government expenditure than developing countries. Developing countries experience higher TOT volatility and higher inflation rates than developed countries. Finally, there is not much difference in primary school enrolments between the developed and developing countries in our sample.

[8] The "lack of price stability" variable equals log (100 + inflation), which for small inflation rates effectively is 4.6*(inflation rate).

Table 1: Summary statistics

	Developing			*Developed*		
Variable	Obs.	mean	S.D.	Obs.	mean	S.D.
GDP per capita	1038	5043.775	5901.366	625	33283.208	13369.735
Financial system structure (in log)	1006	-0.313	1.026	582	-0.467	0.781
Financial system size (in log)	1006	4.171	0.783	582	5.014	0.459
Terms of trade, %	956	107.482	30.023	361	100.500	17.186
Inflation, %	952	36.386	305.399	620	2.963	2.744
Schooling, %	889	102.417	11.681	566	102.206	5.254
Trade openness, %	1059	77.726	53.351	625	86.817	73.710
Gov. Expenditure	1059	14.729	5.896	625	18.797	4.272

To estimate regressions (1) – (3), we transform the annual series into non-overlapping five-year averages (with a maximum of five 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, and 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. Five-year averages are typically considered reasonable to smooth out business cycle fluctuations. Last but not the least, we use five-year observations to measure TOT volatility, a five-year standard deviation of TOT growth.

Some studies raise endogeneity concerns for the financial development-growth nexus, potentially resulting from the simultaneity bias. We do not expect this issue in our models, as our main focus is on financial structure, which depends on factors other than growth, such as legal

structure (Cecchetti, 1999) and information disclosure requirements (Thakor, 1996). Additionally, we test our model specification using specification error test suggested by Pregibon (1979), which captures any endogeneity bias caused by omitted variables.

In terms of econometric modelling, we use, based on the Hausman test results, the fixed effect model to estimate our regressions; standard errors are clustered by country to control for autocorrelation and heteroskedasticity. Differences in regression estimations for developing and developed countries will be established via Chow test.

5 Results

Model 1: Financial structure and economic growth.

Table 2 presents the results for Model 1. For the whole sample, we obtain a significant positive effect of financial structure on economic growth, supporting the growth-enhancing role of financial markets on average. Re-estimation of (1) for developing and developed countries reveals that this effect is observed only in developed countries while in developing economies financial structure has no significant effect on growth. This result rejects the irrelevance hypothesis for developed economies, yet does not reject it for lower levels of development. Given that services provided by banks and markets in developing economies are rather basic, they are likely to be substitutes, which explains the irrelevance. The substitution argument is further tested in Model 2. With better developed economies and financial systems, there is more differentiation between banking and market services. According to this 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". 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 development 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.

Table 2 Financial structure and growth

	(1) Whole	(1) Developed	(2) Developing
[1] Initial GDP pc	-4.456***	-6.673***	-4.916***
	(-4.12)	(-3.13)	(-3.81)
[2] Financial structure	1.310***	1.141**	0.708
	(3.78)	(2.44)	(1.52)
[3] Lack of price stability	-3.281***	-3.038	-3.155***
	(-5.25)	(-0.46)	(-4.44)
[4] Schooling (in log)	2.054	-11.38**	2.411
	(0.68)	(-2.16)	(0.84)
[5] Trade openness (in log)	-0.629	2.289*	-0.964
	(-0.56)	(1.84)	(-0.81)
[6] Gov. Expenditure (in log)	-2.596**	-4.798**	-2.045
	(-2.02)	(-2.23)	(-1.55)
Constant	57.55***	141.8***	53.30***
	(3.14)	(3.05)	(2.95)
Observations	283	118	165
Adjusted R^2	0.417	0.646	0.456

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is the 5-year average of GDP per capita growth. Financial structure is the logarithm of the market capitalization to bank credit ratio. Financial size is the logarithm of market capitalization plus bank credit. TOT volatility is the terms-of-trade volatility, 5-year standard deviation of TOT growth.

Model 2: Financial development and economic growth.

Estimates of Model 2 for the whole sample, as well as for the subsamples of developing and developed economies, are in Table 3. Our focus here is on the role of financial development (the size of the financial system), as shown by coefficients in line [2]. The estimates confirm a significant positive impact of financial development on growth, yet this result is due to the effect observed in developing economies. For developed countries, on the contrary, the effect is insignificant.

Again, if banking and market services in the developing countries are rather basic and close substitutes, financial development would be associated with a move from basic to more advanced services, thus manifesting in a positive impact on growth for developing countries. In the advanced economies, on the contrary, the range of services seems functional enough, so that variations in the size of the financial system in developed countries do not bring any new services essential for boosting the GDP growth. Combined with Model 1, this result implies that developing countries are on the extensive path of financial development (more services is better for growth), while developed countries are on the intensive path, where it matters how efficiently those services are provided.

Table 3 Financial development and growth

	(1) Whole	(2) Developed	(3) Developing
[1] Initial GDP pc	-4.729***	-8.139***	-5.411***
	(-4.19)	(-4.45)	(-4.41)
[2] Financial system size	2.180***	0.589	2.528***
	(4.09)	(0.93)	(3.70)
[3] Lack of price stability	-3.016***	-6.119	-2.238***
	(-3.42)	(-1.20)	(-3.28)
[4] Schooling (in log)	1.370	-11.19*	0.969
	(0.49)	(-1.81)	(0.38)
[5] Trade openness (in log)	-0.221	3.815***	-1.189
	(-0.18)	(2.98)	(-1.04)
[6] Gov. Expenditure (in log)	-4.272***	-6.067***	-2.955**
	(-3.12)	(-2.93)	(-2.22)
Constant	54.38***	163.9***	52.33***
	(3.06)	(3.46)	(3.14)
Observations	283	118	165
Adjusted R^2	0.383	0.604	0.505

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is the 5-year average of GDP per capita growth. Financial size is the logarithm of market capitalization plus bank credit.

Model 3: Financial structure, exogenous shocks and economic growth

Concluding from Table 2 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 exogenous shocks that may influence GDP growth. The estimates of Model 3, shown in Table 4, confirm that TOT volatility indeed negatively affects growth (consistent with other studies), and is amplified in more market-based financial systems (negative coefficient at the interaction term of TOT volatility with financial structure; see column 1 in Table 4). This provides an argument in favour of the shock-smoothing role of banking systems. At the same time, Table 4 confirms that the direct effect of financial structure (line [4]) goes in the opposite direction to the indirect effect (line [3]). Since the coefficients have opposite signs, one cannot judge on the overall impact of financial structure on growth from these estimates, although coefficients are jointly significant.

Re-estimating Model 3 for developing and developed countries separately allows testing whether the role of financial structure in dampening the growth impact of TOT volatility differs across countries with different levels of economic development (see columns 2 and 3 in Table 4). TOT volatility has no significant impact on growth in advanced economies, and financial structure demonstrates the same impact in Model 3 as in Model 1: markets bring more benefits than banks. In contrast, TOT 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.

Table 4 Financial structure, TOT volatility and growth

	(1) Whole	(2) Developed	(3) Developing
[1] Initial GDP pc	-3.028**	-0.163	-3.744***
	(-2.52)	(-0.11)	(-2.84)
[2] TOT Volatility	-8.175*	3.969	-7.602*
	(-1.86)	(0.58)	(-1.91)
[3] TOT Volatility × Financial system structure	-11.25**	-6.576	-9.599**
	(-2.37)	(-0.68)	(-2.24)
[4] Financial system structure	2.067***	2.130***	1.095
	(3.86)	(3.02)	(1.50)
[5] Lack of price stability	-3.309***	18.71	-3.094***
	(-6.03)	(1.60)	(-6.60)
[6] Schooling (in log)	2.688	3.987	2.720
	(0.87)	(0.85)	(0.90)
[7] Trade openness (in log)	-0.963	2.966**	-1.125
	(-0.71)	(2.33)	(-0.78)
[8] Gov. Expenditure (in log)	-3.070**	-8.473***	-2.443*
	(-2.39)	(-3.97)	(-1.84)
Constant	44.16**	-87.53	44.53**
	(2.38)	(-1.37)	(2.36)
Joint test			
[2] and [3]	0.056	0.123	0.056
[3] and [4]	0.001	0.004	0.089
[2], [3] and [4]	0.001	0.001	0.091
Observations	218	64	154
Adjusted R^2	0.461	0.883	0.429

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is the 5-year average of GDP per capita growth. Financial structure is the logarithm of the market capitalization to bank credit ratio. TOT volatility is the terms-of-trade volatility, 5-year standard deviation of TOT growth.

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 TOT volatility in developed countries in general. Moreover, one cannot rule out that TOT and its volatility in developed countries are endogenous to output. In this case a different source of truly exogenous shocks should be used to

test the shock-smoothing role of financial systems. For developing countries TOT volatility does represent exogenous shocks, and this is where we find significant evidence of the ability of banking sectors to smooth shocks (see also robustness checks in Table A3 in the Appendix).

Model 4: Financial development, structure, shocks and growth

We finally put all components together in Model 4, which aims to investigate the impact of financial development on the relationship detected in Model 3. Since the shock-smoothing role of financial systems is only visible in developing countries, we omit the developed subsample in this exercise and split the remaining observations into those with financial development (SIZE) above and below the mean. The results are in Table 5 and effectively replicate those for economic development: small financial systems exhibit significant shock-smoothing, while large financial systems show no shock smoothing but instead a significant direct effect on growth. Note that many developing countries that would be classified as large financial systems still experience high TOT volatility (Kuwait is the most prominent example of a large system with high TOT volatility, see "KWT" in Figures 1 and 2; the average standard deviations of TOT growth in small and large developing financial systems are almost equal at 0.046 and 0.043 respectively) therefore we cannot explain the insignificance of the shock-smoothing effect in large financial systems by the insignificance of shocks. Instead, it is likely that the shock-smoothing capacity of these financial systems is either equally driven by both markets and banks, or too heterogeneous (shocks are smoothed in some but amplified in other countries of the same financial structure).[9]

[9] Interestingly, although financial development and, potentially, integration enable the shock-smoothing capacity of markets, thus making them substitutes to banks in this role, the size of the financial system itself is irrelevant for the shock smoothing, as the interaction of the system size with TOT volatility has no significant impact on growth, see Table A2 in Appendix.

Table 5 Financial structure, TOT volatility and growth for developing subsample with small and large financial systems

	(1) Small system	(2) Large system
[1] Initial GDP pc	-2.611	-7.333***
	(-1.34)	(-3.27)
[2] TOT Volatility	-12.03**	-4.370
	(-2.31)	(-0.66)
[3] TOT Volatility × Financial system structure	-11.13***	-21.22
	(-3.62)	(-1.35)
[4] Financial structure	-0.209	2.765**
	(-0.45)	(2.15)
[5] Lack of price stability	-2.439***	-10.83
	(-9.52)	(-1.31)
[6] Schooling (in log)	1.500	-2.972
	(0.36)	(-0.54)
[7] Trade openness (in log)	-0.0539	-1.358
	(-0.03)	(-0.87)
[8] Gov. Expenditure (in log)	-1.434	-9.511***
	(-1.14)	(-3.86)
Constant	28.74	158.9***
	(1.10)	(2.94)
Joint test		
[2] and [3]	0.004	0.378
[3] and [4]	0.005	0.114
[2], [3] and [4]	0.012	0.074
Observations	78	76
Adjusted R^2	0.577	0.528

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is the 5-year average of GDP per capita growth. Financial structure is the logarithm of the market capitalization to bank credit ratio. TOT volatility is the terms-of-trade volatility, 5-year standard deviation of TOT growth. Small (large) system subsample includes the observations lower (larger) the average of financial size across developing countries.

Robustness check

We check the robustness of our results to the assumption of exogeneity of TOT for developing countries by excluding 6 developing countries, which are main exporters and/or importers of some goods, and re-estimating Models 3 and 4. TOT and its volatility could be endogenous for these countries as big exporters and importers may affect prices of these goods. Our main results are robust to this resampling: the shock-smoothing role of banks is confirmed

for developing countries, especially those with small financial systems, see Table A3 in the Appendix.

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 financial systems, and for two distinct channels through which financial structure may affect economies. The first channel refers to the direct impact of financial system 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 contribute to this. 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 on growth. We found no evidence that either bank-based or market-based systems better protect financially and economically developed economies against TOT volatility; this cannot be fully explained by smaller TOT fluctuations as some economies with rather large financial systems still experience high TOT volatility.

Our results confirm that developing countries with larger financial systems grow faster, yet for high levels of financial development it is the structure of the system that matters, as evidenced in our sample of developed economies and developing countries with large financial systems. 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 in our sample. 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 TOT volatility. Lack of financial integration in developing countries, especially those with smaller financial systems, disables the cross-sectional mechanism and uncovers the role of banks in shock smoothing, confirming significance of the intertemporal mechanism.

Although we find that more market-based developed economies grow faster, this does not imply banking sectors become unnecessary there. 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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Appendix

Table A1. Developing countries with export/import exceeds 15% of world export/import of specific product (2 digits level).[10]

Sources: ITC calculations based on UN COMTRADE statistics

Countries	Product label	Share of world export/import (%)
Argentina	Residues, wastes of food industry, animal fodder	15.6 (export)
Brazil	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	23.4 (export)
	Sugars and sugar confectionery	21.1 (export)
China	Umbrellas, walking-sticks, seat-sticks, whips, etc	80.5 (export)
	Bird skin, feathers, artificial flowers, human hair	76.1 (export)
	Manufactures of plaiting material, basketwork, etc.	68.3 (export)
	Silk	53.2 (export)
	Headgear and parts thereof	50.3 (export)
	Other made textile articles, sets, worn clothing etc	43.3 (export)
	Toys, games, sports requisites	42.2 (export)
	Knitted or crocheted fabric	41.8 (export)
	Articles of leather, animal gut, harness, travel goods	40.2 (export)
	Footwear, gaiters and the like, parts thereof	40.1 (export)
	Ceramic products	39.3 (export)
	Articles of apparel, accessories, knit or crochet	38.7 (export)
	Furniture, lighting, signs, prefabricated buildings	38.7 (export)
	Miscellaneous manufactured articles	38.3 (export)
	Special woven or tufted fabric, lace, tapestry etc	37.6 (export)
	Articles of apparel, accessories, not knit or crochet	35 (export)
	Manmade filaments	34.1 (export)
	Furskins and artificial fur, manufactures thereof	33.1 (export)

[10] The 15% threshold is as in Broda (2004).

	Manmade staple fibres	32.7 (export)
	Vegetable textile fibres nes, paper yarn, woven fabric	31.8 (export)
	Railway, tramway locomotives, rolling stock, equipment	29.5 (export)
	Impregnated, coated or laminated textile fabric	29.3 (export)
	Musical instruments, parts and accessories	26.7 (export)
	Miscellaneous articles of base metal	25.9 (export)
	Cotton	25.6 (export)
	Electrical, electronic equipment	24.4 (export)
	Tools, implements, cutlery, etc of base metal	22.2 (export)
	Glass and glassware	22 (export)
	Products of animal origin, nes	21.4 (export)
	Stone, plaster, cement, asbestos, mica, etc articles	21.4 (export)
	Other base metals, cermets, articles thereof	20.3 (export)
	Articles of iron or steel	19.3 (export)
	Machinery, nuclear reactors, boilers, etc	18.9 (export)
	Ships, boats and other floating structures	18.6 (export)
	Wadding, felt, nonwovens, yarns, twine, cordage, etc	18.2 (export)
	Meat, fish and seafood food preparations nes	17.9 (export)
	Wool, animal hair, horsehair yarn and fabric thereof	17.6 (export)
	Lac, gums, resins, vegetable saps and extracts nes	16.6 (export)
	Carpets and other textile floor coverings	16.2 (export)
	Explosives, pyrotechnics, matches, pyrophorics, etc	15.4 (export)
	Ores, slag and ash	52.5 (import)
	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	42.2 (import)
	Pulp of wood, fibrous cellulosic material, waste etc	34.4 (import)
	Copper and articles thereof	30 (import)
	Wool, animal hair, horsehair yarn and fabric thereof	24.8 (import)
	Raw hides and skins (other than furskins) and leather	23.2 (import)
	Vegetable textile fibres nes, paper yarn, woven fabric	22.7 (import)
	Cotton	22.3 (import)

	Optical, photo, technical, medical, etc apparatus Vegetable plaiting materials, vegetable products nes Electrical, electronic equipment Wood and articles of wood, wood charcoal	19 (import) 17.5 (import) 16.8 (import) 15.7 (import)
Hong Kong SAR, China	Clocks and watches and parts thereof Furskins and artificial fur, manufactures thereof Clocks and watches and parts thereof Pearls, precious stones, metals, coins, etc	18.3 (export) 23.2 (import) 20 (import) 16.6 (import)
India	Lac, gums, resins, vegetable saps and extracts nes	29.3 (export)
Saudi Arabia	Mineral fuels, oils, distillation products, etc (Crude petroleum oils)	18.5 (export)

Table A2: System Size, TOT volatility and growth

	(1) Whole FE	(2) Developed FE	(3) Developing FE
Initial GDP pc	-3.637***	-2.486	-4.261***
	(-2.66)	(-1.31)	(-2.84)
Financial system size	2.067***	0.986	2.220**
	(2.78)	(0.92)	(2.55)
TOT Volatility	-16.32	55.86	-5.259
	(-0.66)	(0.61)	(-0.20)
TOT Volatility × Financial system size	3.157	-7.041	0.345
	(0.56)	(-0.40)	(0.06)
Lack of price stability	-2.334***	36.27	-2.058***
	(-3.69)	(1.44)	(-3.25)
Schooling (in log)	2.369	6.739	1.715
	(0.84)	(1.20)	(0.62)
Trade openness (in log)	-0.845	6.496***	-1.245
	(-0.61)	(7.41)	(-0.94)
Gov. Expenditure (in log)	-4.010***	-11.38***	-2.752*
	(-2.72)	(-4.02)	(-2.00)
Constant	38.21**	-170.2	40.38**
	(2.14)	(-1.66)	(2.25)
Observations	218	64	154
Adjusted R^2	0.415	0.809	0.451

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is the 5-year average of GDP per capita growth. Financial size is the logarithm of market capitalization plus bank credit. TOT volatility is the terms-of-trade volatility, 5-year standard deviation of TOT growth.

Table A3: System structure, TOT volatility and growth: big exporters/importers excluded (fixed effects model)

	(1) Whole	(2) Developing	(3) Developing with small system	(4) Developing with large system
Initial GDP pc	-3.842**	-5.294***	-2.915	-8.844***
	(-2.53)	(-3.00)	(-1.32)	(-3.19)
TOT Volatility	-8.842*	-7.706*	-10.04*	-1.217
	(-1.99)	(-1.85)	(-1.77)	(-0.17)
TOT Volatility × Financial system structure	-13.87***	-11.96***	-9.621**	-20.88
	(-3.14)	(-2.91)	(-2.56)	(-1.43)
Financial system structure	2.373***	1.367	-0.333	3.326**
	(4.33)	(1.68)	(-0.77)	(2.49)
Lack of price stability	-3.336***	-3.112***	-2.587***	-22.59
	(-5.73)	(-6.37)	(-10.21)	(-1.33)
Schooling (in log)	0.937	0.813	1.190	-9.825
	(0.28)	(0.24)	(0.26)	(-1.65)
Trade openness (in log)	-2.258*	-2.649*	-0.396	-2.282
	(-1.70)	(-1.77)	(-0.19)	(-1.42)
Gov. Expenditure (in log)	-2.265*	-1.671	-1.419	-7.276***
	(-1.90)	(-1.30)	(-1.02)	(-2.99)
Constant	62.37**	69.20***	34.33	254.7***
	(2.66)	(2.79)	(1.13)	(3.95)
Observations	203	139	69	70
Adjusted R^2	0.498	0.468	0.566	0.623

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is the 5-year average of GDP per capita growth. Financial structure is the logarithm of the market capitalization to bank credit ratio. TOT volatility is the terms-of-trade volatility, 5-year standard deviation of TOT growth.