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Banking sector resilience to financial spillovers

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By using a large sample of bank-level data, we analyse whether the spillover effects of U.S. financial shocks differ with the fundamental characteristics of the banking sectors in the affected countries. We find that a banking sector characterized by a higher degree of competition and larger margin of safety is less affected by financial spillovers. The results are robust to the inclusion of bank-level control variables that capture individual banks' lending capacity.

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I. Introduction

With the deepening of financial integration across national borders, few countries with international economic linkages can escape the spillover of financial shocks originating abroad. A series of recent major events in international financial markets, notably the global financial crisis, European debt crisis, and taper tantrum of 2013,[1] have demonstrated that major financial shocks can quickly transmit internationally and cause serious impacts on global economic activity. Indeed, a large body of empirical research quantifies the impact of financial spillovers on financial markets and real economic activities (e.g. Balakrishnan *et al*., 2011; Dovern and van Roye, 2014).

However, the impact of financial spillovers is not uniform across counties and depends on their underlying vulnerabilities. Frankel and Saravelos (2012), for example, find that foreign reserves and real exchange rates were the most useful predictors of the impact of the global financial crisis. Berkmen *et al*. (2012) find that a small set of macroeconomic variables that measure financial vulnerabilities explained cross-country variation in the growth impact of the global financial crisis. Similarly, Shaghil *et al*. (2015) show that a composite index of six macroeconomic variables can explain the heterogeneous response of financial markets in emerging market economies during major financial spillovers, particularly the taper tantrum. By

[1] 'Taper tantrum' refers to the sharp negative impact of the U.S. central bank's indication of the possible tapering of quantitative easing on financial markets in emerging market economies.

contrast, Eichengreen and Gupta (2014) find that better macroeconomic fundamentals failed to insulate emerging market economies against the impact of the taper tantrum.

By drawing on the existing literature, this study re-examines the driving forces behind the cross-country heterogeneity in the impact of financial spillovers. More specifically, we analyse whether the spillover effect of financial shocks differs with the fundamental characteristics of the banking sectors in the affected countries. Our main contribution is twofold. First, we use a large sample of bank-level data to analyse the impact of U.S. financial shocks on the banking sectors in other countries in order to better control for individual banks' lending capacity, using balance sheet data. Second, to complement the existing literature that emphasizes the importance of macroeconomic fundamentals as a determinant of cross-country heterogeneity, we shed light on the fundamentals of banking sectors. In particular, we analyse whether a banking sector characterized by a higher degree of competition and larger margin of safety (buffer in terms of capitalization and return) is more resilient to financial spillovers. In particular, we use the Boone indicator and Z-score to measure a banking sector's degree of competition and margin of safety, respectively. The resilience of a banking sector can rise by promoting competition because this helps develop a deeper and more efficient sector (Bertrand *et al*., 2007; Dick and Lehnert, 2010). Likewise, the presence of a larger margin of safety increases the banking sector's resilience by lowering a bank's probability of default and raising

profitability during crises (Berger and Bouwman, 2013). Our analysis finds significant evidence that a banking sector characterized by a higher degree of competition and larger margin of safety is less affected by the spillover effects of U.S. financial shocks.

II. Methodology and Data

We estimate a dynamic panel regression in which the dependent variable is the growth in real bank loans and explanatory variables include a U.S. financial shock, its interaction term, and other control variables. Most importantly, we include the interaction terms of the U.S. financial shock with the Boone indicator and Z-score. By doing so, we examine whether the spillover effect of the U.S. financial shock differs with the banking sector's degree of competition and margin of safety in the affected countries. The dynamic panel regression is specified as follows:

$$\begin{aligned} L_{i,j,t} = {} & \beta_0 + \beta_1 L_{i,j,t-1} + \beta_2 FS_t + \beta_3 FS_t \times D_j + \beta_4 FS_t \times BI_{j,t} + \beta_5 FS_t \times ZS_{j,t} \\ & + \gamma' X_{i,j,t} + \delta' Y_{j,t} + \eta_i + \theta_t + \varepsilon_{i,j,t} \end{aligned} \quad (1)$$

where $L_{i,j,t}$ denotes the growth in real loans provided by bank i in country j in year t, FS_t denotes the U.S. financial shock, D_j denotes a dummy variable that is coded 1 for developing countries and 0 for high-income countries, $BI_{j,t}$ denotes the banking sector's Boone indicator, $ZS_{j,t}$ denotes the banking sector's Z-score, $X_{i,j,t}$ denotes a set of bank-level control variables,

$Y_{j,t}$ denotes a set of macroeconomic-level control variables, and η_i, θ_t, and $\varepsilon_{i,j,t}$ denote an unobserved bank-specific effect, a common time-specific effect, and an error term, respectively.

We measure the growth in real bank loans by using the data on net bank loans deflated by the GDP deflator. Net loans are denominated in local currencies. The U.S. financial shock is measured by the Kansas City Financial Stress Index (KCFSI) provided by the Federal Reserve Bank of Kansas City. The KCFSI is a composite monthly index designed to measure the level of stress in the U.S. financial market.[2] Financial stress is a sudden disruption in the proper functioning of financial markets, which is often associated with greater asset price volatility, higher funding costs, and the reduced availability of bank credit (Hakkio and Keeton, 2009). The Boone indicator is calculated as the elasticity of profits to marginal costs. The more positive the Boone indicator is, the lower is the degree of competition in the banking sector. The Z-score is calculated as the sum of equity and return on assets (ROA) over the standard deviation of ROA. The more positive the Z-score is, the larger is the margin of safety and thus the lower is the bank's probability of default. To control for individual banks' lending capacity, we include the following bank-level control variables: the cost-to-income ratio (a measure of efficiency), equity over total assets (a measure of capital adequacy), return on average equity (a measure of profitability), and liquid assets over deposits and short-term funding (a measure of

[2] The KCFSI consists of 11 financial variables such as TED spread, treasury and corporate bond spreads, and the volatility of stock prices. The annual data are constructed by averaging monthly data for each year.

the liquidity buffer). We use a lag of these variables to avoid endogeneity problems. As for the macroeconomic-level control variables, we include GDP per capita and the inflation rate as a proxy for the quality of regulatory framework and degree of macroeconomic instability in a country, respectively.

To estimate Eq. (1), we use the system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). The sample data consist of observations for 92 non-U.S. countries (comprising 29 high-income countries and 63 developing countries), including 756 commercial banks, over the period 2000–2013.[3] Table A1 lists the countries and number of banks in the samples. The data on individual banks are obtained from Bureau van Dijk's Bankscope and the other data are obtained from the World Bank's Global Financial Development Data and World Development Indicators. Table 1 reports the summary statistics of the variables.

[Table 1]

III. Results

[3] As for the data on commercial banks, we consider the financial statements at the highest level of consolidation within a country to avoid any duplication of the data. Note that commercial banks do not include other types of banks, such as saving banks and cooperatives. In addition, banks with many missing values and outliers in the data are excluded from the sample. Future work might thus aim to expand the coverage of the sample to check the robustness of the presented findings.

Table 2 shows the estimation results of the six alternative models. The results of both the Sargan test of overidentifying restrictions and the Arellano–Bond test of serial correlations support the appropriateness of the estimations. In all models, the coefficient on the U.S. financial shock is negative and highly statistically significant, indicating that increased U.S. financial stress has an adverse spillover effect on the growth in real bank loans in other countries. The negative sign of the interaction term between the U.S. financial shock and dummy variable for developing countries indicates that the adverse impact of the financial shock is greater in developing countries. Most importantly, the coefficient on the interaction term between the financial shock and Boone indicator is negative and statistically significant, which implies that a lower degree of banking competition amplifies the adverse impact of financial shocks on bank loans. In addition, the coefficient on the interaction term between the financial shock and Z-score is positive and highly significant, which implies that a larger margin of safety mitigates the adverse impact of the financial shock on bank loans. These results indicate that a banking sector characterized by a higher degree of competition and larger margin of safety is less affected by the spillover of financial shocks. We note that these results are robust to the inclusion of control variables, particularly individual banks' equity ratios and liquidity asset ratios, which have statistically significant coefficients with the correct signs.

[Table 2]

IV. Conclusions

By using a large sample of bank-level data, we analysed whether the spillover effects of U.S. financial shocks differ with the fundamental characteristics of the banking sectors in the affected countries. We find that a banking sector characterized by a higher degree of competition and larger margin of safety is less affected by U.S. financial spillovers. The results are robust to the inclusion of bank-level control variables that capture individual banks' lending capacity. Our findings provide useful insights for countries seeking to reduce their vulnerabilities to financial spillovers without resorting to the introduction of stringent capital controls.

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Table 1. Summary statistics

Variables	Obs	Mean	Std.dev.	Min	Max
Real bank loan growth	6,323	-4.2419	5.2036	-62.0255	27.6254
Financial shock (KCFSI)	10,584	0.2741	0.9726	-0.7092	2.6083
Boone indicator	10,380	-0.0464	0.1729	-2.0817	5.9683
Z-score	10,526	17.345	11.7288	-11.2398	74.1295
Cost to income ratio	7,051	61.0389	29.6337	2.941	748.223
Equity over total assets	7,129	9.9078	6.9749	-70.536	100
Return on average equity	7,091	1.009	1.8496	-29.281	17.285
Liquid assets over deposits and short-term funding	7,124	31.0635	31.2843	-6.584	797.079
GDP per capita	10,569	9.0671	1.3914	4.9039	11.1432
Inflation rate	10,565	5.234	7.4527	-27.6318	103.823

Notes: The pair-wise correlations between the key variables are as follows: Real bank loan growth is correlated negatively with KCFSI, positively with the Z-score, and positively with the Boone indicator, respectively. KCFSI is correlated negatively with the Z-score and positively with the Boone indicator, respectively. The Z-score is positively correlated with the Boone indicator.

Table 2. Estimation results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Lagged dependent variable	-0.0061***	-0.0038***	-0.0063***	-0.0040***	-0.0064***	-0.0041***
	(0.0011)	(0.0011)	(0.0012)	(0.0011)	(0.0011)	(0.0011)
Financial shock	-0.0413***	-0.0415***	-0.0498***	-0.0494***	-0.0543***	-0.0537***
	(0.0127)	(0.0122)	(0.0132)	(0.0125)	(0.0132)	(0.0126)
Financial shock*Developing countries	-0.0167***	-0.0144**	-0.0122**	-0.0104*	-0.0168***	-0.0143**
	(0.0063)	(0.0060)	(0.0062)	(0.0061)	(0.0062)	(0.0060)
Financial shock*Boone indicator	-0.1378***	-0.1123***			-0.1504***	-0.1246***
	(0.0412)	(0.0424)			(0.0419)	(0.0432)
Financial shock*Z-score			0.0006***	0.0005***	0.0007***	0.0006***
			(0.0002)	(0.0002)	(0.0002)	(0.0002)
Lagged cost to income ratio		0.0002		0.0002		0.0002
		(0.0003)		(0.0003)		(0.0003)
Lagged equity over total assets		0.0110***		0.0113***		0.0112***
		(0.0029)		(0.0029)		(0.0029)
Lagged return on average equity		0.0064		0.0066		0.0062
		(0.0043)		(0.0043)		(0.0043)
Lagged liquid assets over deposits & short term funding		0.0023***		0.0021**		0.0020**
		(0.0009)		(0.0009)		(0.0008)
GDP per capita	0.0026	0.0066	0.0036	0.0077	0.0045	0.0087
	(0.0093)	(0.0103)	(0.0099)	(0.0105)	(0.0094)	(0.0106)
Inflation rate	-0.9951***	-0.9964***	-0.9952***	-0.9962***	-0.9952***	-0.9964***
	(0.0009)	(0.0008)	(0.0009)	(0.0008)	(0.0009)	(0.0008)
Constant	26.6609***	24.0378***	26.8518***	24.7887***	26.7038***	24.9417***
	(3.6958)	(4.3891)	(3.6881)	(4.4164)	(3.6703)	(4.3532)
Sargan test	0.1564	0.5722	0.1780	0.5286	0.2166	0.5635
AR(1)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AR(2)	0.2834	0.9406	0.3572	0.7961	0.2796	0.9269
Observations	5,493	5,463	5,512	5,482	5,493	5,463
Number of banks	756	756	756	756	756	756

Notes: The results of the system GMM using the one-step estimator are reported. The figures in parentheses are standard errors adjusted for clustering on banks. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Time-specific dummies are included in all models. Allowing for MA(1) errors, GMM-type instruments are constructed with lags of three and morer for the difference equation and with only the second lag for the level equation. For the latter, no more than two lags are used because they are redundant (Blundell and Bond, 1998). Similar results are obtained when the two-step estimator is used and when alternative instruments (e.g., lags of four and more for the difference equation and the third lag for the level equation) are used. The Hausman tests indicate that random-effects models are inappropriate and that fixed-effects models show broadly the same results.

Table A1. Countries and number of banks

Country name	Income group	Number of banks	Country name	Income group	Number of banks	Country name	Income group	Number of banks
ANTIGUA AND BARBUDA	Developing	1	GERMANY	High income	16	NORWAY	High income	5
ARGENTINA	Developing	8	GHANA	Developing	7	PAKISTAN	Developing	1
AUSTRALIA	High income	8	GREECE	High income	7	PANAMA	Developing	18
AUSTRIA	High income	12	GUATEMALA	Developing	3	PERU	Developing	2
AZERBAIJAN	Developing	5	HAITI	Developing	1	PHILIPPINES	Developing	7
BAHRAIN	Developing	2	HONDURAS	Developing	1	POLAND	Developing	15
BANGLADESH	Developing	5	HONG KONG	High income	21	PORTUGAL	High income	7
BARBADOS	Developing	1	HUNGARY	Developing	10	QATAR	High income	1
BELGIUM	High income	6	ICELAND	High income	1	REPUBLIC OF KOREA	Developing	11
BOTSWANA	Developing	3	INDIA	Developing	19	REPUBLIC OF MOLDOVA	Developing	3
BRAZIL	Developing	16	INDONESIA	Developing	16	ROMANIA	Developing	2
BULGARIA	Developing	4	IRELAND	High income	6	RUSSIAN FEDERATION	Developing	36
CAMBODIA	Developing	4	ISRAEL	High income	9	SINGAPORE	High income	5
CANADA	High income	18	ITALY	High income	19	SLOVENIA	High income	4
CHILE	Developing	18	JAPAN	High income	32	SOUTH AFRICA	Developing	6
CHINA	Developing	37	JORDAN	Developing	9	SPAIN	High income	15
COLOMBIA	Developing	7	KAZAKHSTAN	Developing	3	SRI LANKA	Developing	2
COSTA RICA	Developing	4	KENYA	Developing	7	SWEDEN	High income	6
CROATIA	Developing	7	KUWAIT	High income	1	SWITZERLAND	High income	8
CYPRUS	High income	7	LATVIA	Developing	4	THAILAND	Developing	14
CZECH REPUBLIC	Developing	6	LEBANON	Developing	9	TRINIDAD AND TOBAGO	Developing	1
DENMARK	High income	12	LITHUANIA	Developing	3	TUNISIA	Developing	9
DOMINICAN REPUBLIC	Developing	3	MALAWI	Developing	2	TURKEY	Developing	15
ECUADOR	Developing	4	MAURITIUS	Developing	1	UKRAINE	Developing	3
EGYPT	Developing	2	MEXICO	Developing	14	UNITED ARAB EMIRATES	High income	4
EL SALVADOR	Developing	6	MOROCCO	Developing	6	UNITED KINGDOM	High income	30
ESTONIA	Developing	1	NAMIBIA	Developing	3	UZBEKISTAN	Developing	2
ETHIOPIA	Developing	1	NETHERLANDS	High income	14	VENEZUELA	Developing	2
FINLAND	High income	6	NEW ZEALAND	High income	7	VIETNAM	Developing	12
FRANCE	High income	29	NICARAGUA	Developing	1	ZAMBIA	Developing	2
GEORGIA	Developing	7	NIGERIA	Developing	6			