



US monetary policy, bank capital, and the origination of international leveraged loans

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The views expressed in this presentation are those of the presenter and not necessarily those of the Bank for International Settlements

Outline

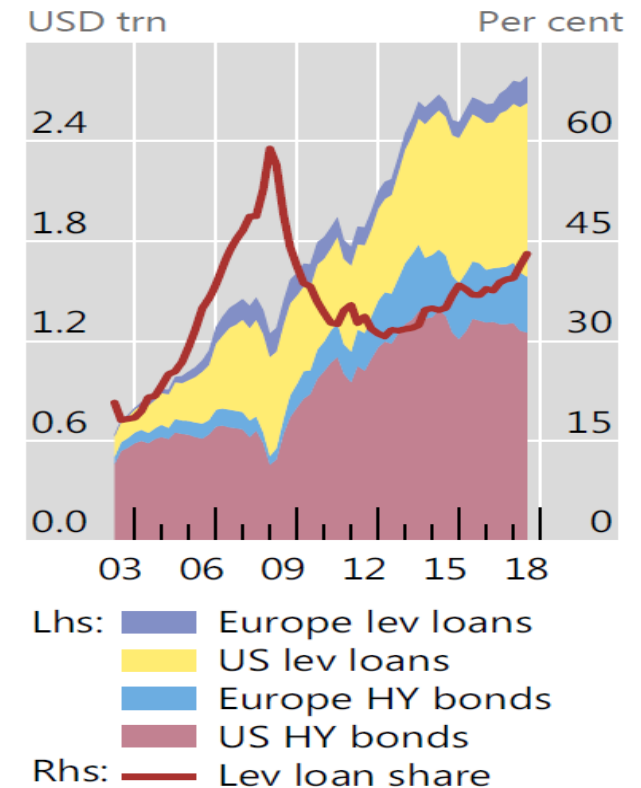
1. Introduction
2. Data
3. Empirical framework
4. Results
5. Conclusions



Motivation

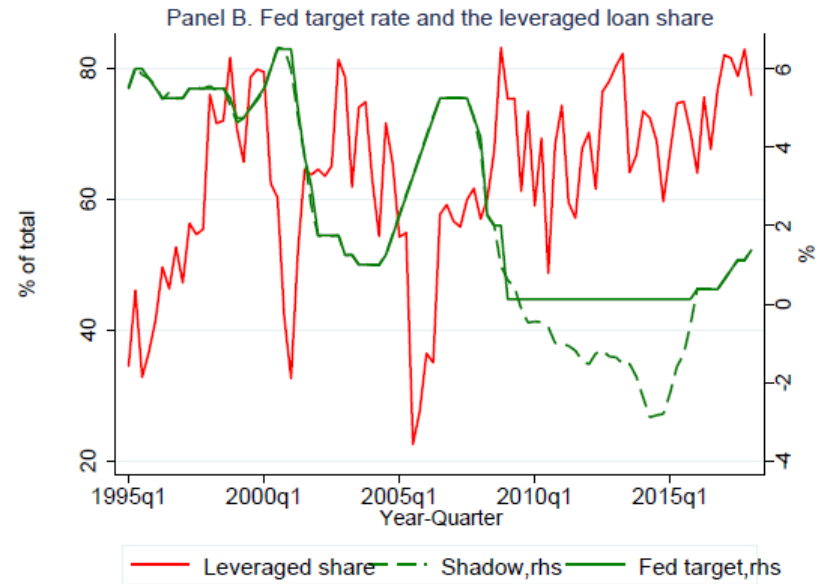
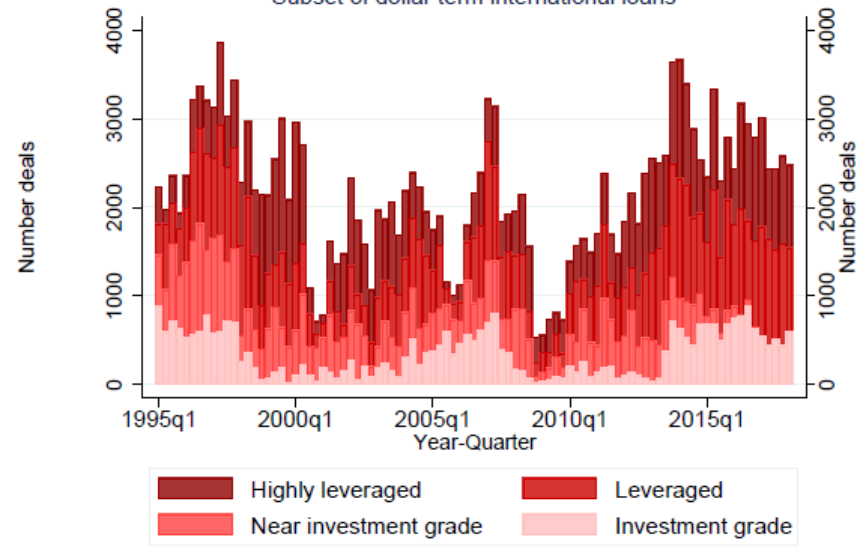
- The origination of leveraged loans by banks has surged recently against the backdrop of very accommodative monetary policy in the US.
- A large fraction of these loans are:
 - extended in US dollars,
 - international (lenders and borrowers from different countries).
- The vast majority of loans are arranged by banks, which operate in an unusual environment characterised by:
 - high regulatory capital,
 - low market valuations.
- Do low US interest rates incentivise banks to originate international leveraged loans?
 - If so, what are the main mechanisms at play?

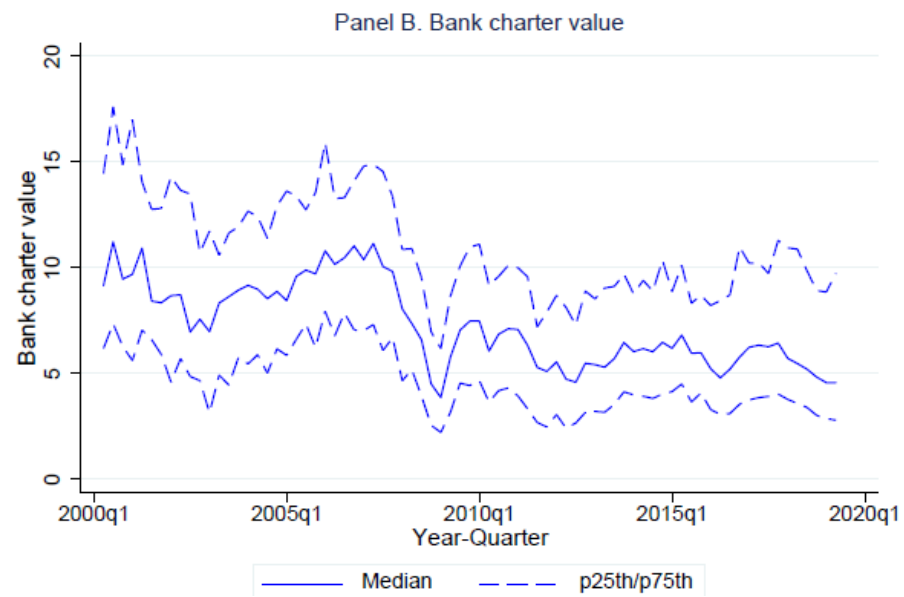
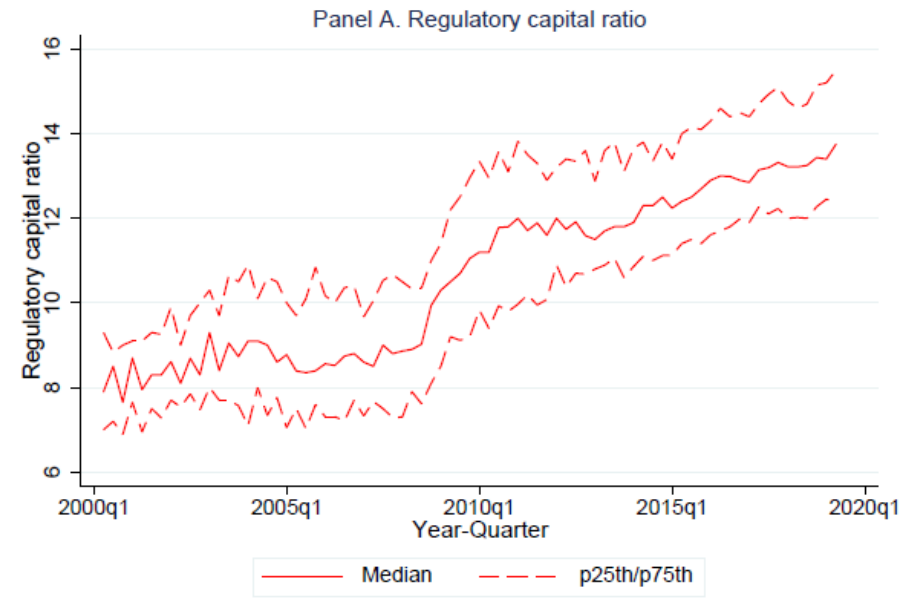
Loans gain share as leveraged finance grows¹



Source: *BIS Quarterly Review*, September 2018.

Panel A. Loan risk classification
Subset of dollar term international loans





Hypotheses

- US monetary policy and risk-taking
 - **H1:** *Banks increase the origination of international US dollar-denominated leveraged loans when US monetary policy is loose.*
- The bank capital channel
 - **H2a:** *Banks with higher regulatory capital originate more leveraged loans.*
 - **H2b:** *The impact of US interest rates on the origination of leveraged loans is stronger for banks with higher regulatory capital.*
- The risk-shifting channel
 - **H3a:** *Banks with higher charter value originate fewer leveraged loans.*
 - **H3b:** *The impact of US interest rates on the origination of leveraged loans is weaker for banks with higher charter value.*

Preview of Key Results

- Loose US MP spurs the origination of risky USD international leveraged loans.
- Two distinct risk-taking mechanisms are at work simultaneously.
 - The bank capital channel: banks with higher levels of regulatory capital tend to originate more leveraged loans and are more sensitive to interest rates.
 - The risk-shifting channel: banks with low market valuations tend to engage in more risk-taking, especially when interest rates are low.
- Banks that are most likely to extend risky international leveraged loans are those that have a combination of
 - high regulatory capital
 - low charter values.
- Low interest rates depress bank charter values, which in turn leads to more risk taking by banks.

Existing Literature (Strand 1): International Spillovers of US MP

MP Impact on	Domestic Loans	International Loans
Credit Quantity	<i>Kashyap and Stein (2000), and Kishan and Opiela (2000), Jiménez et al. (2012), Borio and Gambacorta (2016) Ippolito et al (2018).</i>	Large Literature See <i>Koepke (2016)</i> and <i>BIS AR Chapter VI (2017)</i> for a literature review.
Credit Quality	Domestic credit registry <i>Jimenez et al (2014); Dell'Arricia et al. (2017); Morais et al. (2018); Baskaya et al. (2018)</i>	Fed SNC <i>Liu, Stebunovs and Lee (2017)</i> Commercial data <i>Brauning and Ivashina (2018)</i> This paper

This paper: cross-country & loan-level: global syndicated loans, matched with lenders' and borrowers' information (entity-parent links).



Existing Literature (Strand 2): The bank capital and the risk-shifting channels

- **The bank capital channel**

- *Gambacorta and Mistrulli (2004);*
- *Van den Heuvel (2005);*
- *Borio and Zhu, (2012);*
- *Gambacorta and Shin (2017);*
- *Dell’Ariccia et al (2017).*

- **The risk-shifting channel**

- *Keeley (1990);*
- *Acharya (1996);*
- *Demsetz et al. (1996);*
- *Jimenez et al. (2014).*

- **Our contribution:**

- We show that **both of the above channels are simultaneously at work:**
 - the bank capital channel goes through banks’ regulatory capital,
 - the risk-shifting channel operates through banks’ charter values.
- We demonstrate that **risk-shifting also operates in an international context.**



Data: Overview

- Syndicated loan data from Refinitiv SDC
 - Similar coverage to Dealscan.
- Match loan data to borrower and lender characteristics.
- Main observational unit: *"Bank lender – NFC borrower – Loan"* triplet.
- Focus on:
 - Term loans
 - Loans denominated in USD
 - International loans
 - ultimate parent country of (NFC) borrower differs from ultimate parent country of lending bank.
 - Lead arranger loans
- Resulting sample = over 114,000 (triplet) observations.
- Loans classification (assigned by market participants):
 1. investment grade loans (safest);
 2. near investment grade;
 3. leveraged;
 4. highly leveraged (riskiest).



Data: Example

- Petrobras loan is mapped into 10 international USD-denominated bank loans (we focus on the three lead arranger loans).

Petrobras Oil & Gas BV Prices US\$1,800M Revolving Credit Facility		Lender	Role	Location	Ultimate parent lender location
Loan Type	Revolving Credit Facility	Credit Agricole CIB	Arranger	FR	FR
Loan Syndicate Type	Syndicated	Natixis-Natixis Partners SA	Arranger	FR	FR
High Yield (Y/N)	N	Societe Generale	Arranger	FR	FR
Loan Yield Description	Investment Grade	Standard Bank of S. Africa	Arranger	ZA	UK
Tranche Amount (MM)	1800	Standard Chartered Bank PLC	Arranger	UK	UK
Host Currency	(US)	BankAmerica Corp	Arranger	US	US
Loan Target Market	Europe Western Europe	First Rand Bank Limited	Arranger	ZA	ZA
Issue Date	04.12.2018	Nedbank Ltd	Arranger	ZA	ZA
Closing Date	06.12.2018	ABSA Bank Ltd	Lead	ZA	ZA
		Barclays PLC	Lead	UK	UK
		Sumitomo Mitsui Banking Corp	Lead	JP	JP
Borrower	Petrobras Oil & Gas BV				
Country	NL				
Sector	Finance and Insurance				
Industry	Other Financial Investment Activities				
Borrower Ultimate Parent	Petroleo Brasileiro SA				
Country	BR				
Sector	Energy				
Industry	Oil & Gas				



Table 1. Characteristics of market participants' risk ratings: this table depicts the characteristics of the risk ratings developed by market participants. At origination, loans are classified into four groups. From riskiest to safest: highly leveraged, leveraged, near investment grade, and investment grade loans. To characterise the classification, we run an ordered logit model in which the dependent variable is the rating scale (4 for highly leveraged loans). Loan characteristics are: the spread, the amount, the original maturity. As borrower characteristics we include the Altman score - a composite indicator introduced in Altman (1966) - (higher values mean less risk); and the borrower 5-year EDF (higher values reflect more risk).

	I	II	III	IV	V
Loan: Spread	0.803*** (0.01)	0.800*** (0.01)	0.819*** (0.02)	5.529*** (0.10)	5.483*** (0.11)
Loan: Amount	-0.173*** (0.01)	-0.148*** (0.01)	-0.316*** (0.01)	-0.150*** (0.02)	-0.150*** (0.02)
Loan: Original maturity	0.014* (0.01)	0.052*** (0.01)	0.089*** (0.01)	0.100*** (0.02)	0.091*** (0.02)
Borrower: Altman score				-0.122*** (0.02)	-0.165*** (0.02)
Borrower: EDF (5-Year)					0.102*** (0.02)
Observations	114183	112409	68369	19897	15739
Adjusted R-squared					
Bank FE		X	X	X	X
Year FE		X	X	X	X

Table 2. Leveraged Loans Share and the Fed target rate: this table shows the results of a generalised least square model (GLM) with a logistic link function, in which the dependent variable is a measure of the share of leveraged loans to total loans, at the year-country level. Push factors are the short term rate, 10 year government bond, real GDP growth, the current account to GDP, the Chin-Ito index, and the sovereign rating. As pull factors we include the Merrill-Lynch spread, US inflation expectations, and global GDP growth. In column I (i), the dependent variable is the amount (number) of leveraged and highly leveraged loans to total amount (number) of loans. In the regressions we focus on the subset of 42 countries which account for 97.5% of total syndicated loans, aggregating loans at the borrower-year level.

	I	II
Fed target rate	-0.133*** (0.05)	-0.145*** (0.05)
Observations	394	395
Adjusted R-squared		
Country FE		
Pull factors	X	X
Push factors	X	X

Benchmark Empirical Framework

- Unit of observation is the firm-bank-loan triplet.
- Baseline empirical model:

$$Loan_{l,c,j,t}^{risk} = \alpha + \beta_{ct} + \gamma_t + f(x_{ct}) + g(y_{jt}) + h(z_t) + ff_t + bc_{jt} + ff_t * bc_{jt} + \varepsilon_{l,c,j,t}$$

- $Loan_{l,c,j,t}^{risk}$: categorical variable with the loan classification attached to loans by market participants:
 1. investment grade loans (safest);
 2. near investment grade,
 3. leveraged,
 4. highly leveraged (riskiest).
- Key explanatory variables of interest
 - ff_t = federal funds rate;
 - bc_{jt} = bank capital
- Control for pull factors, push factors, and bank characteristics.



Two measures of bank capital

- **The bank's regulatory capital ratio:**

$$bc_{jt} \equiv rc_{jt} = Tier1_{jt}/RWA_{jt}$$

- *Used to examine the bank capital channel.*

- **The bank's charter value:**

$$bc_{jt} \equiv bc_{jt} = MC_{jt}/(MC_{jt} + BL_{jt})$$

- *Used to examine the risk-shifting channel.*



Table 3. Monetary policy, risk-taking, and regulatory capital: this table shows reports ordinal logit (columns I-III) and OLS (columns IV-VI) regressions estimates of market participants' risk-ratings. The dependent variable is the ordinal scale taking value 4 for highly leveraged (riskiest) loans, and 1 for investment grade (safest) loans. To control for demand factors we include standard country-specific controls (short term rate, 10 year government bond, real GDP growth, the current account to GDP, the Chin-Ito index, and the sovereign rating). To control for supply factors we include the Merrill-Lynch spread, global GDP growth, global inflation expectations, and the market-wide 5 year EDF (which controls for potential changes in the composition of the pool of borrowers). At the bank-level we control for factors which can explain the origination of risky loans: liquid assets ratio, deposits ratio, size (log of total assets), and profitability (net income ratio). To test the existence of the risk-taking bank capital channel, we include the Fed target rate, the Tier 1 to RWA ratio, and an interaction between both terms. In columns II and V we include country FE, and in columns III and VI, also year fixed effects. Robust standard errors in parentheses. Significance stars: * 0.10 ** 0.05 *** 0.01

	I	II	III	IV	V	VI
Bank: Tier 1 capital to RWA	0.400*** (0.02)	0.336*** (0.02)	0.391*** (0.03)	0.194*** (0.01)	0.143*** (0.01)	0.171*** (0.01)
Fed target rate	-0.007 (0.01)	-0.074*** (0.02)	0.000 (.)	0.006 (0.01)	-0.032*** (0.01)	0.012 (0.01)
Bank: Tier 1 capital to RWA*Fed target rate	-0.093*** (0.01)	-0.087*** (0.01)	-0.073*** (0.01)	-0.036*** (0.00)	-0.031*** (0.00)	-0.025*** (0.01)
Observations	19593	19593	19593	19593	19593	19593
Adjusted R-squared				0.236	0.338	0.349
Country FE		X	X		X	X
Bank FE						
Model			X			X
Year FE	O logit	O logit	O logit	OLS	OLS	OLS

Table 5. Two channels simultaneously at work: we explore if monetary policy fosters risk-taking simultaneously through the bank capital channel and the risk-shifting channel. The table reports ordinal logit estimates of market participants' risk-ratings. The dependent variable is the ordinal scale taking value 4 for highly leveraged (riskiest) loans, and 1 for investment grade (safest) loans. To test the existence of the risk-shifting transmission mechanisms, we include the Fed target rate, the bank charter value, and an interaction between both terms. Following Schwert (2018) we assess bank charter value with the ratio of market capitalisation to quasi-market assets. To test the existence of the risk-taking bank capital channel, we include the Fed target rate, the Tier 1 to RWA ratio, and an interaction between both terms. We include, but do not report, the country-specific, supply, and bank-specific variables listed in Tables 3 and 4. In columns II we include country FE, and in columns III also year fixed effects. Robust standard errors in parentheses. Significance stars: * 0.10 ** 0.05 *** 0.01

	I	II	III
Bank: Charter value	-0.239*** (0.04)	-0.138*** (0.04)	-0.114*** (0.04)
Fed target rate	0.007 (0.02)	-0.075*** (0.02)	
Bank: Charter value*Fed target rate	0.022** (0.01)	0.039*** (0.01)	0.036*** (0.01)
Bank: Tier 1 capital to RWA	0.439*** (0.02)	0.375*** (0.02)	0.460*** (0.03)
Bank: Tier 1 capital to RWA*Fed target rate	-0.100*** (0.01)	-0.102*** (0.01)	-0.099*** (0.01)
Observations	19049	19049	19049
Adjusted R-squared			
Country FE		X	X
Year FE			X

Table 6. Interplay between regulatory capital and bank charter value: to further explore if monetary policy fosters risk-taking simultaneously through the bank capital channel and the risk-shifting channel, we expand the baseline model (which includes the set of country-specific, global, and bank-specific variables, not reported) with a set of categorical variables classifying banks into four groups, depending on whether they have high (low) regulatory capital and high (low) charter values. Further we interact the categorical variables with the Fed target rate. As in previous exercises, the dependent variable is the ordinal scale taking value 4 for highly leveraged (riskiest) loans, and 1 for investment grade (safest) loans. In columns I we report ordinal logit regressions, and column 2 reports panel regressions. To ease the interpretation we drop the Fed target rate. We do not report the coefficient of the categorical variables. Risk-taking for the group of banks with high regulatory capital, and low charter value, is twice as strong as for the group of banks with high capital, and high charter value. Robust standard errors in parentheses. Significance stars: * 0.10 ** 0.05 *** 0.01

	I	II
High capital - Low charter value*Fed target rate	-0.155*** (0.02)	-0.049*** (0.01)
Low capital - Low charter value*Fed target rate	-0.010 (0.02)	-0.007 (0.01)
High capital - High charter value*Fed target rate	-0.088*** (0.02)	-0.033*** (0.01)
Low capital - High charter value*Fed target rate	0.028 (0.02)	0.014 (0.01)
Observations	19049	19049
Adjusted R-squared	0.229	0.232

Table 7. Monetary policy regulatory capital and charter value: the table reports regression results on the determinants of lead arrangers' bank charter value. In columns I and II we measure it with market capital; in columns III and IV, with price-to-book ratios. Following Claessens et al. (2018) we include bank-specific determinants: deposit ratio, size (log of total assets), liquid assets ratio, net income ratio, and leverage. To explore if better regulatory compliance impacts on charter value we add the Tier 1 capital to RWA ratio. To gauge the impact of monetary policy, in columns II and IV we add the Fed target rate. The number of observations is higher than in previous exercises, since we include domestic and international loans alike, as long as they are denominated in dollars.

Dependent variable is:	Market capital ratio		Price-to-Book	
	I	II	III	IV
Bank: Deposits ratio	0.085*** (0.00)	0.085*** (0.00)	0.010*** (0.00)	0.010*** (0.00)
Bank: Size (log assets)	-0.273*** (0.01)	-0.273*** (0.01)	-0.043*** (0.00)	-0.043*** (0.00)
Bank: Liquid assets ratio	-0.019*** (0.00)	-0.019*** (0.00)	-0.001** (0.00)	-0.001** (0.00)
Bank: Net income	1.226*** (0.01)	1.226*** (0.01)	0.171*** (0.00)	0.171*** (0.00)
Bank: Leverage	-6.490*** (0.06)	-6.490*** (0.06)	-0.694*** (0.01)	-0.694*** (0.01)
Bank: Tier 1 capital to RWA	0.295*** (0.01)	0.295*** (0.01)	0.044*** (0.00)	0.044*** (0.00)
Fed target rate		1.007*** (0.03)		0.135*** (0.00)
Observations	19701	19701	19701	19701
Adjusted R-squared	0.671	0.671	0.634	0.634
Year FE	X	X	X	X

Table 8. Robustness test. Alternative measures of bank charter value: we explore if monetary policy fosters risk-taking simultaneously through the bank capital channel and the risk-shifting channel. The table reports ordinal logit estimates of market participants' risk-ratings. The dependent variable is the ordinal scale taking value 4 for highly leveraged (riskiest) loans, and 1 for investment grade (safest) loans. To test the existence of the risk-taking bank capital channel, we include the Fed target rate, the Tier 1 to RWA ratio, and an interaction between both terms. We use alternative measures of charter value. In columns I-III we use the price-to-book ratio; in columns IV-VI the book capital ratio. Besides we include, but do not report, the country-specific, supply, and bank-specific variables listed in Tables 3 and 4. In columns II we include country FE, and in columns III also year fixed effects. Robust standard errors in parentheses. Significance stars: * 0.10 ** 0.05 *** 0.01

Charter value measured with:	Price-to-Book			Book capital ratio		
	I	II	III	IV	V	VI
Bank: Charter value	-0.239*** (0.04)	-0.143*** (0.04)	-0.122*** (0.04)	-0.461*** (0.03)	-0.283*** (0.04)	-0.226*** (0.04)
Fed target rate	0.007 (0.02)	-0.074*** (0.02)	0.000	0.013 (0.02)	-0.045** (0.02)	0.000
Bank: Charter value*Fed target rate	0.019* (0.01)	0.037*** (0.01)	0.033** (0.01)	0.071*** (0.01)	0.091*** (0.02)	0.084*** (0.02)
Bank: Tier 1 capital to RWA	0.437*** (0.02)	0.374*** (0.02)	0.460*** (0.03)	0.460*** (0.02)	0.375*** (0.02)	0.419*** (0.03)
Bank: Tier 1 capital to RWA*Fed target rate	-0.100*** (0.01)	-0.101*** (0.01)	-0.098*** (0.01)	-0.099*** (0.01)	-0.094*** (0.01)	-0.082*** (0.01)
Observations	19049	19049	19049	19465	19465	19465
Adjusted R-squared						
Country FE		X	X		X	X
Year FE			X			X

Table 9. Robustness test. Alternative measures of US monetary policy: we use the US shadow rate to measure US monetary policy, and test the robustness of the bank capital and risk-shifting channels. The table reports ordinal logit estimates of market participants' risk-ratings. The dependent variable is the ordinal scale taking value 4 for highly leveraged (riskiest) loans, and 1 for investment grade (safest) loans. To test the existence of the risk-shifting transmission mechanisms, we include the US shadow rate, the bank charter value, and an interaction between both terms. Following Schwert (2018) we assess bank charter value with the ratio of market capitalisation to quasi-market assets. To test the existence of the risk-taking bank capital channel, we include the US shadow rate, the Tier 1 to RWA ratio, and an interaction between both terms. We include, but do not report, the country-specific, supply, and bank-specific variables listed in Tables 3 and 4. In columns II we include country FE, and in columns III also year fixed effects. Robust standard errors in parentheses. Significance stars: * 0.10 ** 0.05 *** 0.01

	I	II	III
Bank: Charter value	-0.234*** (0.03)	-0.116*** (0.03)	-0.101*** (0.03)
US shadow rate	-0.016 (0.01)	-0.080*** (0.01)	-0.269*** (0.03)
Bank: Charter value*US shadow rate	0.018** (0.01)	0.031*** (0.01)	0.023*** (0.01)
Bank: Tier 1 capital to RWA	0.449*** (0.02)	0.357*** (0.02)	0.468*** (0.03)
Bank: Tier 1 capital to RWA*US shadow rate	-0.098*** (0.01)	-0.094*** (0.01)	-0.085*** (0.01)
Observations	19701	19701	19701
Adjusted R-squared			
Country FE		X	X
Year FE			X

Table 10. Robustness test. Orthogonalised bank charter value: to further explore if monetary policy fosters risk-taking simultaneously through the bank capital channel and the risk-shifting channel, we orthogonalise bank charter value and regulatory capital. In columns I-III we fit the same model as in Table 5, but replacing the market capital ratio (as measure of charter value) with an orthogonalised measure. We construct it regressing the market capital ratio on the regulatory capital ratio (Tier 1 to RWA). To assess the existence of the risk-shifting transmission mechanism, we interact it with the Fed target rate. To control for the existence of the risk-taking bank capital channel, we include the Fed target rate, the Tier 1 to RWA ratio, and an interaction between both terms. Models are estimated using an ordinal logit, since the dependent variable is the ordinal scale taking value 4 for highly leveraged (riskiest) loans, and 1 for investment grade (safest) loans. All models include the standard country-specific, supply, and bank-specific variables listed in Tables 3 and 4. In columns II we include country FE, and in columns III also year fixed effects. In columns IV-VI replicate the regressions, we use an orthogonalised measure of price-to-book ratio. Robust standard errors in parentheses. Significance stars: * 0.10 ** 0.05 *** 0.01

Charter value measured with:	Market capital ratio			Price-to-Book		
	I	II	III	IV	V	VI
Bank: Charter value	-0.199*** (0.03)	-0.113*** (0.03)	-0.093*** (0.03)	-0.239*** (0.04)	-0.143*** (0.04)	-0.122*** (0.04)
Fed target rate	0.005 (0.02)	-0.078*** (0.02)	0.000 (.)	0.007 (0.02)	-0.074*** (0.02)	0.000 (.)
Bank: Charter value*Fed target rate	0.020** (0.01)	0.037*** (0.01)	0.034*** (0.01)	0.019* (0.01)	0.037*** (0.01)	0.033** (0.01)
Bank: Tier 1 capital to RWA	0.400*** (0.02)	0.353*** (0.03)	0.441*** (0.03)	0.437*** (0.02)	0.374*** (0.02)	0.460*** (0.03)
Bank: Tier 1 capital to RWA*Fed target rate	-0.097*** (0.01)	-0.095*** (0.01)	-0.093*** (0.01)	-0.100*** (0.01)	-0.101*** (0.01)	-0.098*** (0.01)
Observations	19049	19049	19049	19049	19049	19049
Adjusted R-squared						
Country FE		X	X		X	X
Year FE			X			X

Conclusions

- We investigate the links among:
 - US monetary policy,
 - bank capital,
 - the origination of international leveraged loans.
- Loose US MP spurs the origination of risky USD international leveraged loans.
- Two distinct risk-taking mechanisms are at work simultaneously.
 - The bank capital channel: banks with higher levels of regulatory capital tend to originate more leveraged loans and are more sensitive to interest rates.
 - The risk-shifting channel, which works through banks' charter values: banks with low market valuations tend to engage in more risk-taking, especially when interest rates are low.
- Low interest rates depress bank charter values, which in turn leads to more risk taking by banks.
- Low market valuations of banks appear to be an important, but often neglected, channel through which monetary policy impacts risk taking in international loan markets.