In Lands of Foreign Currency Credit, Bank Lending Channels Run Through?

The Effects of Monetary Policy on the Currency Denomination of the Supply of Credit

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Workshop on Foreign Currency Lending since the Financial Crisis
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Outline

Motivation

- Foreign currency lending to local businesses and households has been widely observed in many countries
  - South-America, East Asia, and more recently Eastern Europe
    ▸ Europe
- Yet, still...
  - No empirical work identifying the impact of **domestic monetary conditions** on the local supply of credit in **domestic versus foreign currency**
  - No empirical work identifying the impact of monetary policy set by the relevant **central bank abroad** (that issues the foreign currency) on the local supply of credit (in the **different currencies**)

What Is Already Investigated

- Impact of monetary policy on the **aggregate volume** of credit in the economy
  - Bernanke and Blinder (AER 1992), Kashyap and Stein (AER 2000), Jimenez, Ongena, Peydro and Saurina (AER 2012)
- Changes in the **composition of credit** in response to changes in the quality of the pool of non-financial borrowers - along **balance-sheet strength** and **credit risk**
  - Gertler and Gilchrist (QJE 1994), Jimenez, Ongena, Peydro and Saurina (ECMA 2014)

This Study

- Impact of domestic and foreign monetary policies on the **currency composition of the supply of credit**
- Hypotheses
  - Monetary expansion by domestic central bank decreases local banks' cost of funding in the domestic currency but not in the foreign currency, generating a differential impact on loan supply decisions in the domestic and foreign currencies.
  - Monetary expansion by foreign central bank lowers domestic banks' cost of funding in foreign currency but not in domestic currency, generating, again, differential supply effects.

Hungary

- High foreign currency loan ratio ▸ Loans
- Unique database
  - disaggregated (loan level) data, covers entire corporate sector
  - contains currency denomination of loans

Main Findings: Currency Compositional Effects

- A lower domestic interest rate expands the supply of credit in the domestic but not in the foreign currency.
- A lower foreign interest rate on the other hand expands lending by lowly versus highly capitalized banks relatively more in the foreign than in the domestic currency.

Outline

Datasets

- Hungarian Central Credit Information System (KHR)
  - All outstanding loans extended by all credit institutions in Hungary
  - Loans in Hungarian Forint and in foreign currencies
- National Tax and Customs Office Database (APEH)
  - Balance-sheet and income statement information for *all firms* with double-entry book-keeping
- Complex firm register
  - Firms' bank account numbers
- Banks' supervisory reports
  - Banks' balance-sheet, income statement, and ownership data

Sample

- Panel of *all firms* in Hungary with double-entry book-keeping
- Loans extended by commercial banks and branch offices of foreign banks
- Monthly observations, 2005-2011
- 3 observations for each firm-month
  - Hungarian Forint loans + Euro loans + Swiss Franc loans
- Total of 36,661,233 firm-month-currency observations
  - 318,411 firms
  - 39 banks
- Bank-firm relationship identified for firms with one bank
  - 74% of sample firms are 'single-bank firms'

Outline

Credit Channels of Monetary Transmission

- Expansionary monetary policy increases credit because...
  - Balance-sheet channel (credit demand)
    - firm fundamentals increase
    - i.e. higher net worth, more valuable collateral and investment opportunities (Bernanke and Gertler, JEP 1995)
  - Bank-lending channel (credit supply)
    - banks' funding cost decreases
    - effect is more pronounced for banks with low capitalization (Kashyap and Stein, AER 2000)

Decisive Identification Challenge

- To disentangle the impact of changes in monetary conditions at home and abroad on the currency composition of the supply of credit
  - from changes in the volume of supply
  - from changes in the quality and volume of demand
  - while accounting for impacts of other aggregate variables
- Firm-bank-time-currency level data needed for identification
  - Available from credit registry of Hungary
  - Allows for comparison of lending by one or more banks (different in their capitalization ratios) in *same month* to *same firm* in *different currencies*

Identification Strategy

- Firm-time fixed effects
  - Account for all time-varying, observed and unobserved, heterogeneity in firm credit demand (i.e. interest rate and firm balance-sheet channels)
- *Changes in interest rate*bank capital ratio*currency denomination*
  - Capital ratio is proxy for bank moral hazard and bank financing (Holmström and Tirole QJE 1997)
- Horserace changes in domestic interest rate with:
  - *Changes in other aggregate variables * bank capital ratio * currency denomination*
    - Hungarian aggregate output and inflation
    - Foreign exchange rate
    - Interest rates set abroad (EU, Switzerland)

Dependent Variables

- $Credit_{ikt}$: New Granting of Credit
  - =1 if firm i receives credit in currency k in month t, conditional on having received no credit in currency k in month t-1,
  - =0 otherwise
- Advantage of using binary dependent variable
  - No need to account for foreign exchange rate
- Employ linear probability models
  - Coefficients of interaction terms easier to interpret than in binary dependent variable models
  - Comprehensive sets of fixed effects
    - Binary dependent variable models may discard many observations and may be cumbersome to estimate

Main Independent Variables

- Main Independent Macro Variables
  - Δ*Interest Rate*$_t$: Annual change of Hungarian 3-month government bond rate
  - Δ*Interest Rate in Euro Area*$_t$: Annual change of Euro area 3-month generic government bond rate
  - Δ*Interest Rate in Switzerland*$_t$: Annual change of Swiss 3-month LIBOR interest rate
- Main Independent Bank Variable
  - *Bank Capital Ratio*$_{bt-1}$: Ratio of bank equity to total assets
- Independent Currency Denomination Dummies
  - *Credit Is Granted In Foreign Currency*$_{ikt}$
  - *Credit Is Granted In Euro*$_{ikt}$ and *Credit Is Granted In Swiss Franc*$_{ikt}$

Control Variables

- Additional Independent Key Macro Variables
  - GDP, CPI
- Macro, Bank and Firm Controls
  - Exchange rate, CDS spread, FDI, Yield curve
  - Bank Assets, Liquidity Ratio, ROA, Doubtful Loan Ratio, Foreign Ownership Dummy
  - Firm Assets, Capital Ratio, Liquidity Ratio, ROA, Export Sales Ratio

Outline

Domestic Monetary Conditions
Granting of Credit in Forint vs FX

- Expected Signs
  - ΔIR < 0
  - ΔIR * Bank Capital Ratio > 0
  - ΔIR * Credit is Granted in FX > 0
  - ΔIR * Bank Capital Ratio * Credit is Granted in FX < 0

Domestic Monetary Conditions, Granting of Credit

THE GRANTING OF CREDIT IN DOMESTIC OR FX TO BORROWERS CURRENTLY WITHOUT CREDIT IN DOMESTIC OR FX (EXTENSIVE MARGIN)

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR	-0.0101***	-0.0343***	-0.0134***	-0.0506***			
	(-3.37)	(-6.64)	(-3.62)	(-6.43)			
Δ IR * Bank Capital Ratio		0.2554***		0.3914***	0.4411***		
		(6.13)		(5.58)	(6.25)		
Δ IR * Credit Is Granted in FX			0.0067**	0.0327***	0.0327***	0.0284***	0.0135**
			(2.36)	(4.24)	(4.24)	(4.36)	(2.14)
Δ IR * Bank Capital Ratio * Credit Is Granted in FX				-0.2721***	-0.2721***	-0.2361***	-0.1370**
				(-3.80)	(-3.80)	(-3.95)	(-2.37)
Δ GDP	0.0021	0.0095**	0.0130***	0.0249***			
	(0.53)	(2.05)	(3.07)	(4.41)			
Δ GDP * Bank Capital Ratio		-0.0817***		-0.1291***	-0.0791*		
		(-3.19)		(-3.11)	(-1.91)		
Δ GDP * Credit Granted inFX			-0.0216***	-0.0308***	-0.0308***	-0.0264***	-0.0197***
			(-13.07)	(-7.02)	(-7.02)	(-7.04)	(-5.73)
Δ GDP * Bank Capital Ratio * Credit Is Granted in FX				0.0948**	0.0948**	0.0767**	0.0650*
				(2.19)	(2.19)	(2.08)	(1.95)
Δ CPI	0.0031	-0.0075*	0.0024	-0.0203***			
	(1.26)	(-1.74)	(0.76)	(-2.99)			
Δ CPI * Bank Capital Ratio		0.1136***		0.2421***	0.2414***		
		(3.23)		(3.85)	(3.81)		
Δ CPI * Credit Is Granted in FX			0.0015	0.0255***	0.0255***	0.0192***	0.0058
			(0.56)	(3.64)	(3.64)	(3.65)	(1.24)
Δ CPI * Bank Capital Ratio * Credit Is Granted in FX				-0.2569***	-0.2569***	-0.1855***	-0.0650
				(-3.80)	(-3.80)	(-3.85)	(-1.63)
Macroeconomic Control Variables	Yes	Yes	Yes	Yes	No	No	No
Firm Level Control Variables	Yes	Yes	Yes	Yes	Yes	No	No
Bank Level Control Variables	Yes	Yes	Yes	Yes	Yes	No	No
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	--	--
Time Fixed Effects	No	No	No	No	Yes	--	--
Firm - Time Fixed Effects	No	No	No	No	No	Yes	Yes
Number of Observations	2,075,500	2,075,500	2,075,500	2,075,500	2,075,500	2,385,314	1,762,190

Domestic Monetary Conditions, Granting of Credit

THE GRANTING OF CREDIT IN DOMESTIC OR FX TO BORROWERS CURRENTLY WITHOUT CREDIT IN DOMESTIC OR FX (EXTENSIVE MARGIN)

Model	(1)	(2)	(3)	(4)
Sample	*All Firms*	*All Firms*	*All Firms*	*All Firms*
Δ IR	-0.0101***	-0.0343***	-0.0134***	-0.0506***
	(-3.37)	(-6.64)	(-3.62)	(-6.43)
Δ IR * Bank Capital Ratio		0.2554***		0.3914***
		(6.13)		(5.58)
Δ IR * Credit Is Granted in FX			0.0067**	0.0327***
			(2.36)	(4.24)
Δ IR * Bank Capital Ratio * Credit Is Granted in FX				-0.2721***
				(-3.80)
Δ GDP and its interaction terms	Yes	Yes	Yes	Yes
Δ CPI and its interaction terms	Yes	Yes	Yes	Yes
Macroeconomic Control Variables	Yes	Yes	Yes	Yes
Firm Level Control Variables	Yes	Yes	Yes	Yes
Bank Level Control Variables	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No
Firm - Time Fixed Effects	No	No	No	No
Number of Observations	2,075,500	2,075,500	2,075,500	2,075,500

Domestic Monetary Conditions, Granting of Credit

THE GRANTING OF CREDIT IN DOMESTIC OR FX TO BORROWERS CURRENTLY WITHOUT CREDIT IN DOMESTIC OR FX (EXTENSIVE MARGIN)

Model	(4)	(5)	(6)	(7)
Sample	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR	-0.0506***			
	(-6.43)			
Δ IR * Bank Capital Ratio	0.3914***	0.4411***		
	(5.58)	(6.25)		
Δ IR * Credit Is Granted in FX	0.0327***	0.0327***	0.0284***	0.0135**
	(4.24)	(4.24)	(4.36)	(2.14)
Δ IR * Bank Capital Ratio * Credit Is Granted in FX	-0.2721***	-0.2721***	-0.2361***	-0.1370**
	(-3.80)	(-3.80)	(-3.95)	(-2.37)
Δ GDP and its interaction terms	Yes	Yes	Yes	Yes
Δ CPI and its interaction terms	Yes	Yes	Yes	Yes
Macroeconomic Control Variables	Yes	No	No	No
Firm Level Control Variables	Yes	Yes	No	No
Bank Level Control Variables	Yes	Yes	No	No
Firm Fixed Effects	Yes	Yes	--	--
Time Fixed Effects	No	Yes	--	--
Firm - Time Fixed Effects	No	No	Yes	Yes
Number of Observations	2,075,500	2,075,500	2,385,314	1,762,190

Economic Relevancy

THE GRANTING OF CREDIT IN DOMESTIC OR FOREIGN CURRENCY TO BORROWERS CURRENTLY WITHOUT CREDIT IN DOMESTIC OR FOREIGN CURRENCY (EXTENSIVE MARGIN)

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	--	--
Time Fixed Effects	No	No	No	No	Yes	--	--
Firm - Time Fixed Effects	No	No	No	No	No	Yes	Yes
Percentage Point Difference in Impact of a Decrease in Interest Rate by 25 bps on the Likelihood of Granting of First-Time Credit by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations)							
in Hungarian Forint or in Foreign Currency	-	*0.0189*	-	-	-	-	-
in Hungarian Forint	-	-	-	*0.0290*	*0.0326*	-	-
in Foreign Currency	-	-	-	*0.0088*	*0.0125*	-	-
Difference in Impact Between Foreign Currency and Hungarian Forint	-	-	-	*-0.0201*	*-0.0201*	*-0.0175*	*-0.0101*
Difference in Impact of a Decrease in Interest Rate by 25 bps on the Likelihood of Granting of First-Time Credit by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting First-Time Credit in Sample (= 0.23%)							
in Hungarian Forint or in Foreign Currency	-	*8%*	-	-	-	-	-
in Hungarian Forint	-	-	-	*13%*	*14%*	-	-
in Foreign Currency	-	-	-	*4%*	*5%*	-	-
Difference in Impact Between Foreign Currency and Hungarian Forint	-	-	-	*-9%*	*-9%*	*-8%*	*-4%*

Domestic Monetary Conditions
Granting of Credit in Forint vs FX

- **Presence of bank-lending channel**
  - Interest rate changes affect first-time credit granting, especially by low capitalization banks
    - Low capitalization bank is 0.019 pp more likely to grant credit than high cap bank following a 25 bp decrease in interest rate (8% of unconditional prob. of granting credit)

Domestic Monetary Conditions
Granting of Credit in Forint vs FX

- **Presence of bank-lending channel**
  - Interest rate changes affect first-time credit granting, especially by low capitalization banks
    - Low capitalization bank is 0.019 pp more likely to grant credit than high cap bank following a 25 bp decrease in interest rate (8% of unconditional prob. of granting credit)

- **Currency compositional effect**
  - Monetary expansion increases likelihood of granting credit in the domestic currency but not in foreign currency
    - When credit is granted in domestic (foreign) currency: low cap bank is 0.033 pp (0.12) more likely to grant credit than high cap bank, following a 25 bp decrease in interest rate (14% (5%) of unconditional prob. of granting credit)

Domestic Monetary Conditions
Granting of Credit in Forint vs Euro and Swiss Franc

- We split up foreign currency to Euro and Swiss Franc...

Domestic Monetary Conditions, Granting of Credit

THE GRANTING OF CREDIT IN HUNGARIAN FORINT, EURO, OR SWISS FRANC TO BORROWERS CURRENTLY WITHOUT CREDIT IN THOSE CURRENCIES (EXTENSIVE MARGIN)

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR	-0.0059***	-0.0216***	-0.0104***	-0.0461***			
	(-2.92)	(-6.19)	(-3.27)	(-6.15)			
Δ IR * Bank Capital Ratio		0.1657***		0.3752***	0.4099***		
		(5.90)		(5.45)	(5.94)		
Δ IR * Credit Is Granted in EUR			0.0066**	0.0369***	0.0369***	0.0322***	0.0153**
			(2.40)	(4.92)	(4.92)	(5.08)	(2.45)
Δ IR * Bank Capital Ratio * Credit Is Granted in EUR				-0.3176***	-0.3176***	-0.2763***	-0.1614***
				(-4.53)	(-4.53)	(-4.74)	(-2.81)
Δ IR * Credit Is Granted in CHF			0.0068**	0.0365***	0.0365***	0.0321***	0.0180***
			(2.50)	(4.92)	(4.92)	(5.11)	(2.95)
Δ IR * Bank Capital Ratio * Credit Is Granted in CHF				-0.3108***	-0.3108***	-0.2734***	-0.1814***
				(-4.47)	(-4.47)	(-4.72)	(-3.21)
Δ GDP and its interaction terms	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ CPI and its interaction terms	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic variables	Yes	Yes	Yes	Yes	No	No	No
Bank Characteristics	Yes	Yes	Yes	Yes	Yes	No	No
Firm Characteristics	Yes	Yes	Yes	Yes	Yes	No	No
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	--	--
Time Fixed Effects	No	No	No	No	Yes	--	--
Firm - Time Fixed Effects	No	No	No	No	No	Yes	Yes
Number of Observations	3,113,250	3,113,250	3,113,250	3,113,250	3,113,250	3,577,971	2,643,285

Domestic Monetary Conditions
Granting of Credit in Forint vs Euro and Swiss Franc

- We obtain same results...
- Presence of bank-lending channel
- Currency compositional effect
  - Domestic monetary expansion increases the likelihood of credit granting in Forint but has no impact on the likelihood of credit granting in Euro or Swiss Franc

Robustness: Other Margins of Lending

- **Ending Credit** (negative extensive margin)
  - Domestic monetary expansion decreases likelihood of banks' ending credit in domestic currency but has little impact on banks' ending credit in Euro or Swiss Franc
- **Increasing the Amount of Credit** (intensive margin)
  - Domestic monetary expansion increases the amount of credit in domestic currency but has little impact on amount of credit in Euro or Swiss Franc

▸ Robustness

Robustness 2
Other Bank and Macroeconomic Characteristics

- Bank Characteristics
  - **Bank regulatory capital** ratio: regulatory capital over risk-weighted assets
  - **Bank size**: natural logarithm of bank assets (Kashyap and Stein, CR 1995)
  - **Bank liquidity**: ratio of liquid to total bank assets (Kashyap and Stein, AER 2000)
  - **Bank foreign ownership** =1 if bank is at least 50% foreign owned, =0 otherwise
- Horse racing with other aggregate variables?
  - Change in **exchange rate**
  - Change in **foreign direct investment**
  - Change in **CDS swap spread**

▸ Robustness

Robustness 3: Subsamples

- **Foreign owned banks**
  - We obtain same results
- **Pre-crisis and crisis** periods
  - In period before 2008:09, the difference in potency between lending channels in domestic and foreign currency is larger than for entire period.
- **50% largest firms** by total assets
  - Difference in potency between the two channels also pertains to large firms

▸ Robustness

Outline

Monetary Conditions Abroad
Granting of Credit

- Do monetary conditions abroad matter for domestic supply of bank loans in the domestic and foreign currencies?
- Another horserace
  - Δ *Interest Rate*$_t$
  - Δ *Interest Rate in Euro Area*$_t$
  - Δ *Interest Rate in Switzerland*$_t$

THE GRANTING OF CREDIT IN HUNGARIAN FORINT, EURO, AND SWISS FRANC TO BORROWERS CURRENTLY WITHOUT CREDIT IN THOSE CURRENCIES (EXTENSIVE MARGIN), EFFECTS OF EURO AND SWISS FRANC INTEREST RATES

Model	(1)	(2)	(3)	(4)
Sample	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR	-0.0545***			
	(-6.43)			
Δ IR * Bank Capital Ratio	0.4385***	0.4661***		
	(5.96)	(6.30)		
Δ IR * Credit Is Granted in EUR	0.0457***	0.0457***	0.0383***	0.0213***
	(5.62)	(5.62)	(5.68)	(3.24)
Δ IR * Bank Capital Ratio * Credit Is Granted in EUR	-0.3831***	-0.3831***	-0.3161***	-0.1936***
	(-5.07)	(-5.07)	(-5.15)	(-3.29)
Δ IR * Credit Is Granted in CHF	0.0422***	0.0422***	0.0354***	0.0217***
	(5.25)	(5.25)	(5.30)	(3.37)
Δ IR * Bank Capital Ratio * Credit Is Granted in CHF	-0.3601***	-0.3601***	-0.3000***	-0.2010***
	(-4.81)	(-4.81)	(-4.92)	(-3.47)
Δ IR in Euro Area	-0.0695			
	(-1.60)			
Δ IR in Euro Area * Bank Capital Ratio	0.3985	0.4517		
	(1.08)	(1.23)		
Δ IR in Euro Area * Credit Is Granted in EUR	0.1094**	0.1094**	0.1148***	0.0873***
	(2.52)	(2.52)	(3.23)	(2.64)
Δ IR in Euro Area * Bank Capital Ratio * Credit Is Granted in EUR	-0.3633	-0.3633	-0.4330	-0.4464
	(-0.93)	(-0.93)	(-1.38)	(-1.53)
Δ IR in Euro Area * Credit Is Granted in CHF	0.1018**	0.1018**	0.1131***	0.0925***
	(2.43)	(2.43)	(3.29)	(2.87)
Δ IR in Euro Area * Bank Capital Ratio * Credit Is Granted in CHF	-0.4129	-0.4129	-0.5158*	-0.5481*
	(-1.09)	(-1.09)	(-1.70)	(-1.94)
Δ IR in Switzerland	0.5153***			
	(11.03)			
Δ IR in Switzerland * Bank Capital Ratio	-2.9439***	-2.9235***		
	(-7.17)	(-7.10)		
Δ IR in Switzerland * Credit Is Granted in EUR	-0.5037***	-0.5037***	-0.4256***	-0.3834***
	(-10.46)	(-10.46)	(-10.88)	(-9.82)
Δ IR in Switzerland * Bank Capital Ratio * Credit Is Granted in EUR	2.6950***	2.6950***	2.0223***	1.9931***
	(6.31)	(6.31)	(6.00)	(5.87)
Δ IR in Switzerland * Credit Is Granted in CHF	-0.3908***	-0.3908***	-0.3328***	-0.3199***
	(-8.20)	(-8.20)	(-8.63)	(-8.14)
Δ IR in Switzerland * Bank Capital Ratio * Credit Is Granted in CHF	2.3287***	2.3287***	1.7968***	1.8049***
	(5.55)	(5.55)	(5.46)	(5.35)
Δ GDP and its relevants interactions	Yes	Yes	Yes	Yes
Δ CPI and its relevants interactions	Yes	Yes	Yes	Yes
Macroeconomic variables	Yes	No	No	No
Bank Characteristics	Yes	Yes	No	No
Firm Characteristics	Yes	Yes	No	No
Firm Fixed Effects	Yes	Yes	--	--
Time Fixed Effects	No	Yes	--	--
Firm - Time Fixed Effects	No	No	Yes	Yes
Number of Observations	3,113,250	3,113,250	3,577,971	2,643,285

Δ IR in Hungary

Δ IR in Euro Area

Δ IR in Switzerland

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	Model	(1)	(2)	(3)	(4)
	Sample	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR		-0.0545***			
		(-6.43)			
Δ IR * Bank Capital Ratio		0.4385***	0.4661***		
		(5.96)	(6.30)		
Δ IR * Credit Is Granted in EUR		0.0457***	0.0457***	0.0383***	0.0213***
		(5.62)	(5.62)	(5.68)	(3.24)
Δ IR * Bank Capital Ratio * Credit Is Granted in EUR		-0.3831***	-0.3831***	-0.3161***	-0.1936***
		(-5.07)	(-5.07)	(-5.15)	(-3.29)
Δ IR * Credit Is Granted in CHF		0.0422***	0.0422***	0.0354***	0.0217***
		(5.25)	(5.25)	(5.30)	(3.37)
Δ IR * Bank Capital Ratio * Credit Is Granted in CHF		-0.3601***	-0.3601***	-0.3000***	-0.2010***
		(-4.81)	(-4.81)	(-4.92)	(-3.47)
Δ IR in Euro Area and its relevants interactions		Yes	Yes	Yes	Yes
Δ IR in Switzerland and its relevants interactions		Yes	Yes	Yes	Yes
Δ GDP and its relevants interactions		Yes	Yes	Yes	Yes
Δ CPI and its relevants interactions		Yes	Yes	Yes	Yes
Macroeconomic variables		Yes	No	No	No
Bank Characteristics		Yes	Yes	No	No
Firm Characteristics		Yes	Yes	No	No
Firm Fixed Effects		Yes	Yes	--	--
Time Fixed Effects		No	Yes	--	--
Firm - Time Fixed Effects		No	No	Yes	Yes
Number of Observations		3,113,250	3,113,250	3,577,971	2,643,285

THE GRANTING OF CREDIT IN HUNGARIAN FORINT, EURO, AND SWISS FRANC TO BORROWERS CURRENTLY WITHOUT CREDIT IN THOSE CURRENCIES (EXTENSIVE MARGIN), EFFECTS OF EURO AND SWISS FRANC INTEREST RATES

Model	(1)	(2)	(3)	(4)
Sample	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR in Euro Area	-0.0695			
	(-1.60)			
Δ IR in Euro Area * Bank Capital Ratio	0.3985	0.4517		
	(1.08)	(1.23)		
Δ IR in Euro Area * Credit Is Granted in EUR	0.1094**	0.1094**	0.1148***	0.0873***
	(2.52)	(2.52)	(3.23)	(2.64)
Δ IR in Euro Area * Bank Capital Ratio * Credit Is Granted in EUR	-0.3633	-0.3633	-0.4330	-0.4464
	(-0.93)	(-0.93)	(-1.38)	(-1.53)
Δ IR in Euro Area * Credit Is Granted in CHF	0.1018**	0.1018**	0.1131***	0.0925***
	(2.43)	(2.43)	(3.29)	(2.87)
Δ IR in Euro Area * Bank Capital Ratio * Credit Is Granted in CHF	-0.4129	-0.4129	-0.5158*	-0.5481*
	(-1.09)	(-1.09)	(-1.70)	(-1.94)
Δ IR and its relevants interactions	Yes	Yes	Yes	Yes
Δ IR in Switzerland and its relevants interactions	Yes	Yes	Yes	Yes
Δ GDP and its relevants interactions	Yes	Yes	Yes	Yes
Δ CPI and its relevants interactions	Yes	Yes	Yes	Yes
Macroeconomic variables	Yes	No	No	No
Bank Characteristics	Yes	Yes	No	No
Firm Characteristics	Yes	Yes	No	No
Firm Fixed Effects	Yes	Yes	--	--
Time Fixed Effects	No	Yes	--	--
Firm - Time Fixed Effects	No	No	Yes	Yes
Number of Observations	3,113,250	3,113,250	3,577,971	2,643,285

THE GRANTING OF CREDIT IN HUNGARIAN FORINT, EURO, AND SWISS FRANC TO BORROWERS CURRENTLY WITHOUT CREDIT IN THOSE CURRENCIES (EXTENSIVE MARGIN), EFFECTS OF EURO AND SWISS FRANC INTEREST RATES

	Model	(1)	(2)	(3)	(4)
	Sample	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR in Switzerland		0.5153***			
		(11.03)			
Δ IR in Switzerland * Bank Capital Ratio		-2.9439***	-2.9235***		
		(-7.17)	(-7.10)		
Δ IR in Switzerland * Credit Is Granted in EUR		-0.5037***	-0.5037***	-0.4256***	-0.3834***
		(-10.46)	(-10.46)	(-10.88)	(-9.82)
Δ IR in Switzerland * Bank Capital Ratio * Credit Is Granted in EUR		2.6950***	2.6950***	2.0223***	1.9931***
		(6.31)	(6.31)	(6.00)	(5.87)
Δ IR in Switzerland * Credit Is Granted in CHF		-0.3908***	-0.3908***	-0.3328***	-0.3199***
		(-8.20)	(-8.20)	(-8.63)	(-8.14)
Δ IR in Switzerland * Bank Capital Ratio * Credit Is Granted in CHF		2.3287***	2.3287***	1.7968***	1.8049***
		(5.55)	(5.55)	(5.46)	(5.35)
Δ IR and its relevants interactions		Yes	Yes	Yes	Yes
Δ IR in Euro Area and its relevants interactions		Yes	Yes	Yes	Yes
Δ GDP and its relevants interactions		Yes	Yes	Yes	Yes
Δ CPI and its relevants interactions		Yes	Yes	Yes	Yes
Macroeconomic variables		Yes	No	No	No
Bank Characteristics		Yes	Yes	No	No
Firm Characteristics		Yes	Yes	No	No
Firm Fixed Effects		Yes	Yes	--	--
Time Fixed Effects		No	Yes	--	--
Firm - Time Fixed Effects		No	No	Yes	Yes
Number of Observations		3,113,250	3,113,250	3,577,971	2,643,285

Monetary Conditions Abroad
Granting of Credit

- Triple interactions with change in interest rate in Switzerland are statistically significant!
  - Monetary conditions set by Swiss National Bank seem to affect the supply of bank loans in Swiss Franc in Hungary
  - Monetary expansion in Switzerland causes a relative contraction in credit supply in Forint and a relative expansion in the supply of Euro and Swiss Franc credit

Economic Relevancy

THE GRANTING OF CREDIT IN HUNGARIAN FORINT, EURO, AND SWISS FRANC TO BORROWERS CURRENTLY WITHOUT CREDIT IN THOSE CURRENCIES (EXTENSIVE MARGIN), EFFECTS OF EURO AND SWISS FRANC INTEREST RATES

	Model	(1)	(2)	(3)	(4)
	Sample	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Firm Fixed Effects		Yes	Yes	--	--
Time Fixed Effects		No	Yes	--	--
Firm - Time Fixed Effects		No	No	Yes	Yes
Percentage Point Difference in Impact of a Decrease in Forint Interest Rate by 25 bps on the Likelihood of Granting of First-Time Credit by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting First-Time Credit in Sample (= 0.16%)					
in Hungarian Forint		*20%*	*22%*	-	-
in Euro		*3%*	*4%*	-	-
in Swiss Franc		*4%*	*5%*	-	-
Difference in Impact Between Euro and Hungarian Forint		*-18%*	*-18%*	*-15%*	*-9%*
Difference in Impact Between Swiss Franc and Hungarian Forint		*-17%*	*-17%*	*-14%*	*-9%*
*Difference in Impact of a Decrease in **Swiss Franc Interest Rate** by 25 bps on the Likelihood of Granting of First-Time Credit by Lower versus Higher Capitalized Banks (Δ=2 Standard Deviations) as Percent of Unconditional Probability of Granting First-Time Credit in Sample (= 0.16%)*					
in Hungarian Forint		*-137%*	*-136%*	-	-
in Euro		*-12%*	*-11%*	-	-
in Swiss Franc		*-29%*	*-28%*	-	-
Difference in Impact Between Euro and Hungarian Forint		*125%*	*125%*	*94%*	*93%*
Difference in Impact Between Swiss Franc and Hungarian Forint		*108%*	*108%*	*84%*	*84%*
Difference in Impact Between Hungarian Forint and Swiss Franc		*-108%*	*-108%*	*-84%*	*-84%*
Difference in Impact Between Euro and Swiss Franc		*-17%*	*-17%*	*-10%*	*-9%*

Monetary Conditions Abroad
Granting of Credit

- Triple interactions with change in interest rate in Euro Area are NOT statistically significant!
  - Though economically sizeable
  - May be a consequence of the impact of change in interest rate through the foreign exchange rate on the banks' balance sheets
    - Lower interest rate on Euro, stronger Forint, higher bank capital ratios if part of the bank balance sheet is in Euro - may offset negative effect of higher bank capital ratios

Outline

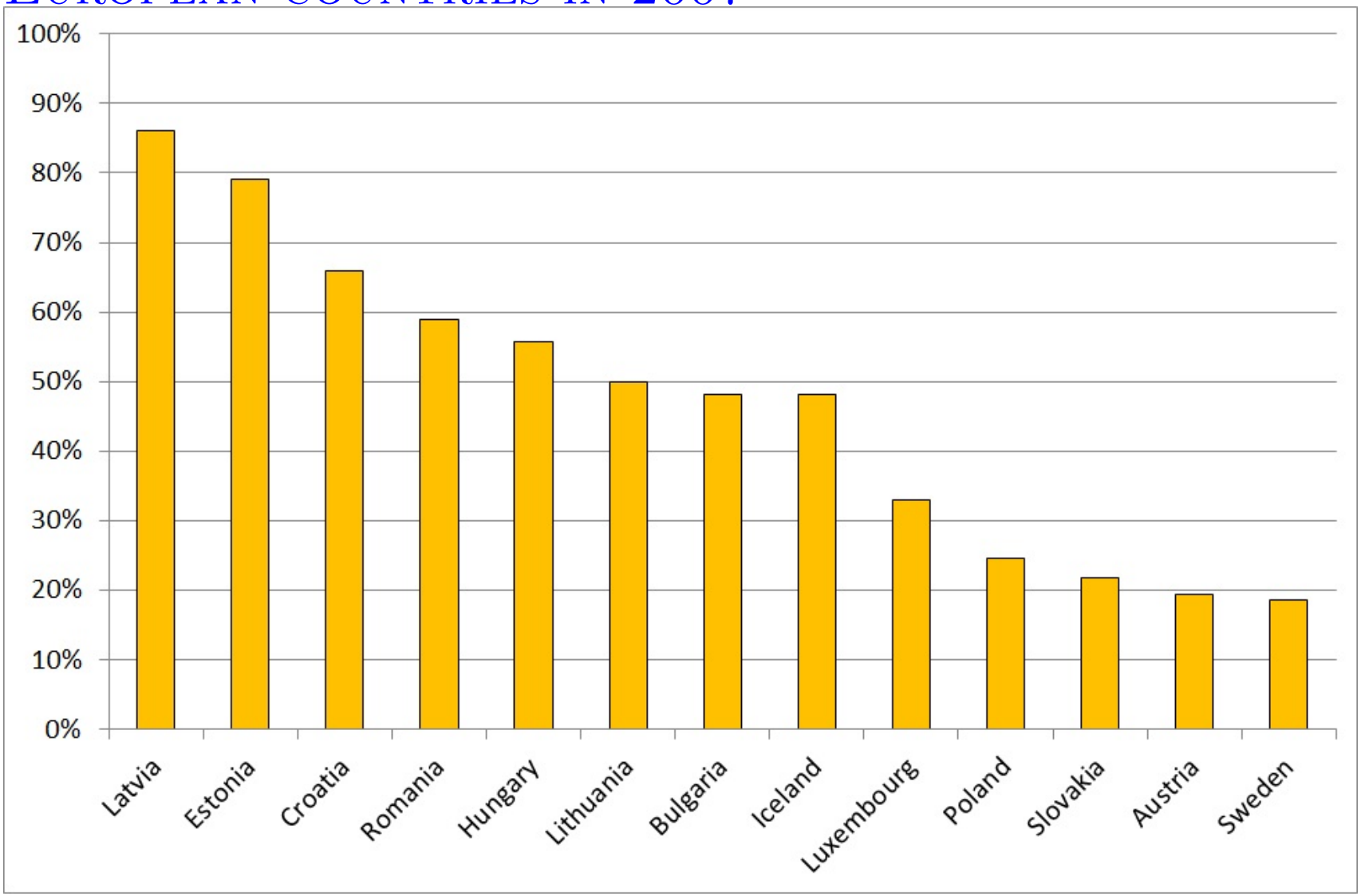
Local bank lending in a foreign currency

- Limits the bank lending channel as a transmission mechanism of domestic monetary policy to bank lending in the domestic currency
- Introduces a bank lending channel in the foreign currency which transmits the monetary policy of the central bank that issues the foreign currency

Outline

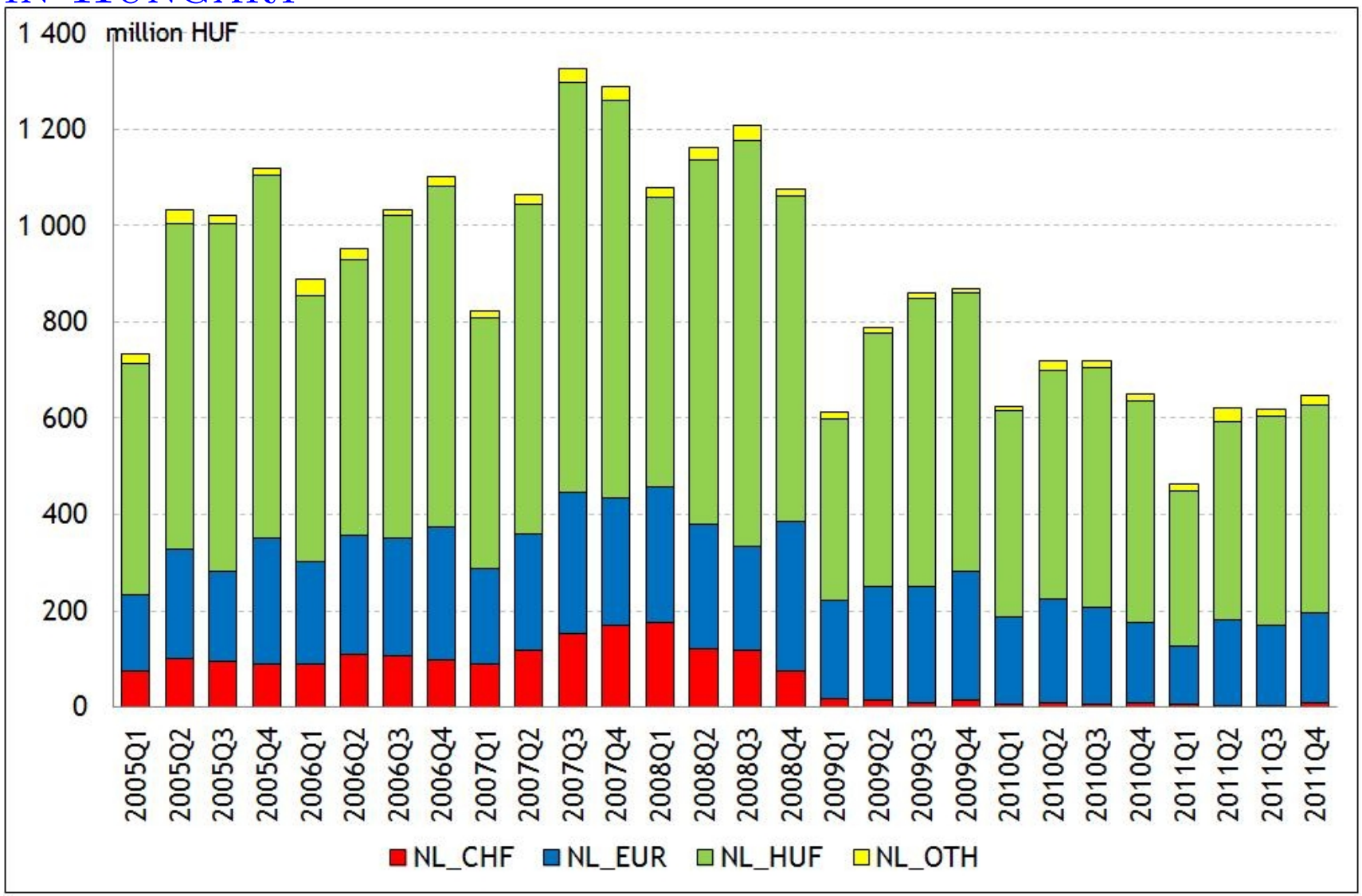
Backup Slides

Share of foreign currency loans in some European countries in 2007



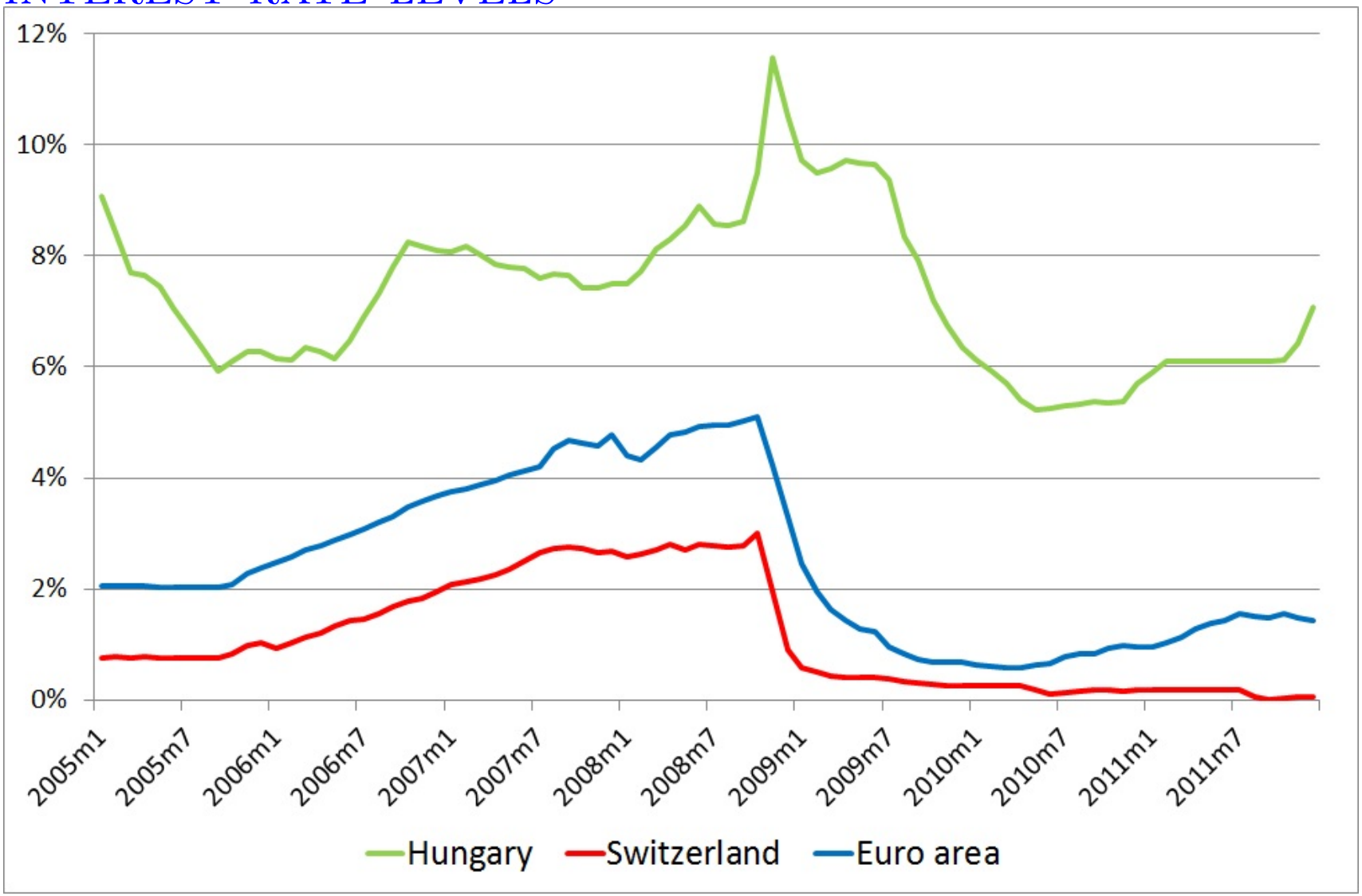
Back

Currency decomposition of new corporate loans in Hungary



Back

3-month money market HUF, CHF and EUR interest rate levels



Back

THE REPAYMENT OF CREDIT BY BORROWERS WITH CREDIT IN HUNGARIAN FORINT, EURO, AND SWISS FRANC (NEGATIVE EXTENSIVE MARGIN) AND THE INCREASE IN THE AMOUNT OF CREDIT BORROWERS HOLD IN HUNGARIAN FORINT, EURO, OR SWISS FRANC (INTENSIVE MARGIN)

Dependent Variable	ENDING CREDIT (NEGATIVE EXTENSIVE MARGIN)				INCREASING THE AMOUNT OF CREDIT (INTENSIVE MARGIN)			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	*All firms with debt*	*All firms with debt*	*All firms with debt*	*Single-Bank firms w. debt*	*All Firms*	*All Firms*	*All Firms*	*Single-Bank Firms*
Δ IR	0.0409**				-0.0667***			
	(2.03)				(-5.50)			
Δ IR * Bank Capital Ratio	-0.3213	-0.3179			0.5384***	0.5995***		
	(-1.62)	(-1.61)			(4.96)	(5.51)		
Δ IR * Credit Is Granted in EUR	-0.0456**	-0.0456**	-0.0454**	-0.0663**	0.0441***	0.0441***	0.0352***	0.0166*
	(-2.17)	(-2.17)	(-2.21)	(-2.57)	(3.58)	(3.58)	(3.39)	(1.78)
Δ IR * Bank Capital Ratio * Credit Is Granted in EUR	0.4262**	0.4262**	0.4192**	0.5779**	-0.4528***	-0.4528***	-0.3576***	-0.2202**
	(2.00)	(2.00)	(2.01)	(2.32)	(-3.99)	(-3.99)	(-3.79)	(-2.56)
Δ IR * Credit Is Granted in CHF	-0.0318	-0.0318	-0.0311	-0.0346	0.0570***	0.0570***	0.0479***	0.0261***
	(-1.49)	(-1.49)	(-1.49)	(-1.31)	(4.64)	(4.64)	(4.64)	(2.83)
Δ IR * Bank Capital Ratio * Credit Is Granted in CHF	0.2994	0.2994	0.2953	0.2792	-0.5242***	-0.5242***	-0.4300***	-0.2936***
	(1.39)	(1.39)	(1.41)	(1.11)	(-4.61)	(-4.61)	(-4.56)	(-3.45)
Δ GDP and its interaction terms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ CPI and its interaction terms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic variables	Yes	No	No	No	Yes	No	No	No
Bank Characteristics	Yes	Yes	No	No	Yes	Yes	No	No
Firm Characteristics	Yes	Yes	No	No	Yes	Yes	No	No
Firm Fixed Effects	Yes	Yes	--	--	Yes	Yes	--	--
Time Fixed Effects	No	Yes	--	--	No	Yes	--	--
Firm - Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Number of Observations	1,117,353	1,117,353	1,160,565	617,775	3,113,250	3,113,250	3,577,971	2,643,285

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THE GRANTING OF CREDIT IN DOMESTIC OR FOREIGN CURRENCY TO BORROWERS CURRENTLY WITHOUT CREDIT IN DOMESTIC OR FOREIGN CURRENCY (EXTENSIVE MARGIN), BY SAMPLE

Model	(1)	(2)	(3)	(4)	(5)	(6)
	Overall Sample	*Only Foreign Owned Banks*		*2005:01-2008:09*	*Only Firms > Median in Total Assets*	
Sample	*All Firms*	*Single-Bank Firms*	*All Firms*	*Single-Bank Firms*	*All Firms*	*Single-Bank Firms*
Δ IR * Credit Is Granted in FX	0.0276***	0.0231***	0.1029***	0.0763***	0.0368***	0.0182*
	(3.87)	(3.30)	(6.10)	(4.52)	(3.69)	(1.72)
Δ IR * Bank Capital Ratio * Credit Is Granted in FX	-0.2194***	-0.2091***	-0.7400***	-0.6309***	-0.2932***	-0.1827*
	(-3.50)	(-3.38)	(-4.94)	(-4.21)	(-3.17)	(-1.90)
Δ GDP * Credit Is Granted in FX	-0.0258***	-0.0182***	0.0124	0.0221	-0.0340***	-0.0279***
	(-6.46)	(-4.81)	(0.81)	(1.55)	(-5.76)	(-4.75)
Δ GDP * Bank Capital Ratio * Credit Is Granted in FX	0.1126***	0.0708**	-0.1921	-0.1110	0.0667	0.0557
	(3.05)	(2.00)	(-1.39)	(-0.94)	(1.14)	(0.98)
Δ CPI * Credit Is Granted in FX	0.0215***	0.0136**	-0.0057	-0.0122	0.0192**	0.0048
	(4.05)	(2.55)	(-0.57)	(-1.29)	(2.55)	(0.65)
Δ CPI * Bank Capital Ratio * Credit Is Granted in FX	-0.1617***	-0.1192***	-0.0421	0.1102	-0.1984***	-0.0647
	(-3.69)	(-2.64)	(-0.48)	(1.36)	(-2.94)	(-1.08)
Credit Is Granted in FX	-0.0026***	-0.0019***	-0.0041***	-0.0035***	-0.0039***	-0.0032***
	(-17.75)	(-13.01)	(-9.93)	(-8.29)	(-18.39)	(-14.67)
Bank Bank Capital Ratio * Credit Is Granted in FX	0.0054***	0.0026**	0.0116***	0.0082**	0.0062***	0.0047**
	(4.34)	(2.09)	(3.58)	(2.42)	(3.29)	(2.48)
Constant	0.0029***	0.0022***	0.0051***	0.0035***	0.0053***	0.0039***
	(89.35)	(69.22)	(98.76)	(69.90)	(110.75)	(77.14)
Firm - Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1,615,640	1,336,152	1,160,416	845,040	1,408,422	919,230

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Domestic Monetary Conditions, Other margins

THE GRANTING OF CREDIT IN DOMESTIC OR FOREIGN CURRENCY TO BORROWERS CURRENTLY WITHOUT CREDIT IN DOMESTIC OR FOREIGN CURRENCY (EXTENSIVE MARGIN), INTERACTIONS WITH MACROECONOMIC VARIABLES, BANK REGULATORY CAPITAL, SIZE AND LIQUIDITY, AND FOREIGN OWNERSHIP

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
In Models (3) to (10): *Other Bank Characteristic*	Additional Macroeconomic Variables in Interactions		*Bank Regulatory Capital Ratio*		*Bank Total Assets*		*Bank Liquidity Ratio*		*Foreign Owned Bank*	
Sample	*All Firms*	*Firms*	*All Firms*	*Firms*	*All Firms*	*Firms*	*All Firms*	*Firms*	*All Firms*	*Firms*
Δ IR * Credit Is Granted in FX	0.0500***	0.0258**	0.0300***	0.0153***	0.0120	-0.0348	0.0578***	0.0252***	0.0482***	0.0068
	(4.00)	(2.26)	(4.94)	(2.85)	(0.36)	(-1.17)	(6.03)	(2.72)	(2.83)	(0.43)
Δ IR * Bank Capital Ratio * Credit Is Granted in FX	-0.4010***	-0.1675			-0.2408***	-0.1435**	-0.3125***	-0.1858***	-0.2291***	-0.1439**
	(-3.40)	(-1.62)			(-4.02)	(-2.49)	(-4.94)	(-3.01)	(-3.83)	(-2.47)
Δ IR * Bank Characteristic * Credit Is Granted in FX			-0.0164***	-0.0099***	0.0011	0.0034*	-0.1236***	-0.0301	-0.0210	0.0075
			(-4.88)	(-3.49)	(0.50)	(1.73)	(-3.72)	(-0.95)	(-1.27)	(0.48)
Δ GDP * Credit Is Granted in FX	-0.0372***	-0.0288***	-0.0210***	-0.0143***	-0.0704***	-0.0301*	-0.0299***	-0.0222***	-0.0269***	-0.0193**
	(-5.29)	(-4.48)	(-7.35)	(-5.94)	(-3.90)	(-1.91)	(-5.54)	(-4.56)	(-2.86)	(-2.13)
Δ GDP * Bank Capital Ratio * Credit Is Granted in FX	0.1138*	0.1452**			0.0751**	0.0616*	0.0595	0.0526	0.0765**	0.0633*
	(1.68)	(2.44)			(2.04)	(1.86)	(1.57)	(1.55)	(2.07)	(1.88)
Δ GDP * *Bank Characteristic* * Credit Is Granted in FX			0.0024*	0.0013	0.0031***	0.0008	0.0546***	0.0373**	0.0004	-0.0003
			(1.66)	(1.15)	(2.60)	(0.73)	(3.31)	(2.42)	(0.04)	(-0.03)
Δ CPI * Credit Is Granted in FX	-0.0033	-0.0097	0.0039	-0.0019	0.0244	0.0211	0.0139*	0.0001	0.0658***	0.0205
	(-0.39)	(-1.31)	(0.87)	(-0.52)	(0.89)	(0.89)	(1.94)	(0.02)	(4.45)	(1.36)
Δ CPI * Bank Capital Ratio * Credit Is Granted in FX	-0.0787	0.0218			-0.1794***	-0.0614	-0.1802***	-0.0821*	-0.1627***	-0.0558
	(-1.08)	(0.35)			(-3.71)	(-1.53)	(-3.67)	(-1.95)	(-3.37)	(-1.40)
Δ CPI * Bank Characteristic * Credit Is Granted in FX			-0.0024	0.0001	-0.0004	-0.0011	0.0123	0.0398	-0.0503***	-0.0160
			(-0.95)	(0.06)	(-0.22)	(-0.67)	(0.36)	(1.28)	(-3.39)	(-1.06)
Δ Exchange Rate * Credit Is Granted in FX	0.0102**	0.0111***								
	(2.50)	(3.02)								
Δ Exchange Rate * Bank Capital Ratio * Credit Is Granted in FX	-0.0675*	-0.1081***								
	(-1.74)	(-3.15)								
Δ FDI * Credit Is Granted in FX	-0.0028*	-0.0029**								
	(-1.74)	(-2.02)								
Δ FDI * Bank Capital Ratio * Credit Is Granted in FX	0.0081	0.0293**								
	(0.53)	(2.20)								
Δ CDS * Credit Is Granted in FX	-0.0009***	-0.0007***								
	(-3.90)	(-3.45)								
Δ CDS * Bank Capital Ratio * Credit Is Granted in FX	0.0053**	0.0051***								
	(2.47)	(2.62)								
Credit Is Granted in FX	-0.0017***	-0.0011***	-0.0029***	-0.0021***	-0.0064***	-0.0034***	-0.0038***	-0.0029***	-0.0015***	-0.0007**
	(-4.74)	(-3.10)	(-24.82)	(-20.31)	(-7.52)	(-4.12)	(-20.11)	(-16.20)	(-4.44)	(-2.01)
Bank Bank Capital Ratio * Credit Is Granted in FX	-0.0007	-0.0055*			0.0040***	0.0021*	0.0047***	0.0030**	0.0045***	0.0027**
	(-0.21)	(-1.76)			(3.11)	(1.78)	(3.66)	(2.45)	(3.57)	(2.37)
Bank Characteristic * Credit Is Granted in FX			0.0003***	0.0002***	0.0003***	0.0001*	0.0059***	0.0051***	-0.0013***	-0.0014***
			(5.30)	(4.83)	(4.45)	(1.77)	(8.66)	(8.33)	(-3.91)	(-4.21)
Firm - Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2,385,314	1,762,190	2,303,752	1,697,084	2,385,314	1,762,190	2,385,314	1,762,190	2,385,314	1,762,190

Literature: The Bank-Lending Channel in the US

- Bernanke and Blinder (AER 1992)
  - Monetary contraction is followed by a decline in *aggregate* bank lending
- Kashyap and Stein (AER 2000)
  - Examine lending behavior at the individual *bank level*
  - Effect of tight monetary policy is more pronounced for banks with low capitalization and low asset liquidity
- Jimenez, Ongena, Peydro, and Saurina (AER 2012)
  - Examine banks' lending behavior using *loan applications*
  - Tight monetary conditions reduce loan granting, especially for banks with low capitalization and low asset liquidity
- Jimenez, Ongena, Peydro, and Saurina (ECMA 2014)
  - Examine banks' credit risk-taking using *loan* data
  - Expansive monetary policy increases credit risk-taking, especially by small banks