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Risk-Based Capital Requirements & International Trade: Evidence from Basel II Implementation in Turkey

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Basel II and the real economy

- During the Great Recession, international trade decreased approx. 30%.

- Some, such as Robert Zoellick, the World Bank president, suggested that 10% to 15% of the observed decrease may be due to Basel II (FT, March 31, 2009).

- "the feedback … on Basel II … [suggests] that most banks are facing tougher capital requirements for their trade assets" (ICC Report, March 31, 2009, p.40).

- Surveys indicate that (i) Basel II negatively affected banks' provision of trade finance and that (ii) for a non-negligible proportion banks the increase in the cost of trade finance products (such as commercial letters of credit or trade-related lending) is linked with higher capital requirements (Asmundson et al., 2011).

- We examine if exports (an important component of GDP) may have been affected by Basel II for a given country (Turkey) for which we have clear identification schemes as of July 1, 2012.

- To the best of our knowledge ours is the only paper on Basel Accord's effect on trade flows.

International trade payment methods

- International Trade Payment terms can be regrouped under three general categories (and form the basis of our data):
  - ***Open Account (OA):*** the exporter bears the risk of the transaction
  - ***Cash In Advance (CIA):*** the importer bears the risk of the transaction
  - ***Commercial Letter of Credit (CLC):*** the importer in the destination country asks its bank a CLC, which it sends to the exporter in Turkey, which in turn presents it to its Turkish bank. If the Turkish bank accepts the CLC, it holds the document until its remaining maturity as an off-B/S item (no secondary market for CLCs in Turkey).

- Our focus: CLCs that finance approx. 6%-17% of Turkey's international trade
  - Under Basel rules, CLCs held by exporters' banks requires setting aside capital based on the risk of the counterparty bank that issued the letter.
  - The data at our disposal are disaggregated by CIA, CLC and OA categories, but provide no further detail: such aggregation makes it harder for us to find any effect.

Preview of our results

- We find that Turkey's CLC-based exports were affected by risk-weight changes that affect the capital charges for these instruments.

- Exports to OECD countries (whose banks were rated A1 to Baa3 (A+ to BBB-) on average in our sample period) drop as the corresponding risk-weight increases.

- Exports to non-OECD countries whose banks were rated Aaa to Aa3 on average go up as the related risk-weights decrease.

- We find no such effects for OA- or CIA-based exports.

- The risk-weight elasticity of CLC-based exports ranges from -0.5 to -1.0 depending on counterparty rating and the remaining CLC-maturity assumed.

- The overall impact on total exports is small for Turkey (RW-change elasticity of total exports between roughly -0.032 to -0.125) but could be larger for other countries that use CLCs in higher proportions.

Turkey's implementation of Basel I, II, and III

- Basel I was implemented in Turkey in 1993.
- Basel II on July 1, 2012
- Basel III's gradual implementation started on January 1, 2014

- In general, Basel II's treatment of CLCs depends on the approach adopted by the bank:
  - **The Standardized Approach (SA):** mostly similar to Basel I, but typically with different CCFs and/or risk-weights (RWs).
  - **Internal Ratings Based Approach (IRB) or Advanced-IRB (AIRB):** counterparty risk is evaluated based on internal (non-public, proprietary) risk-assessment models.

Brief literature review

- Capital requirements & banks' lending:
  - Peek and Rosengren (1995a and 1995b)
  - Berger and Udell (1994)
  - Berger (2006)
  - Liebig et al. (2007)
  - Brun, Fraisse and Thesmar (2013)
- Methods of payment and int'l trade:
  - Antras and Foley (2013)
  - Schmidt-Eisenlohr (2013)
  - Glady and Potin (2011)
  - Ahn (2013)
- Financial intermediation and trade:
  - Michalski and Örs (2012, 2013)
  - Hale et al. (2013)
  - Amiti and Weinstein (2011)
  - Peek (2013)
  - Paravisini et al. (2013)
  - Minetti and Zhu (2011)
  - Berman and Héricourt (2010)
  - Chor and Manova (2009)
  - Levchenko et al. (2010)
  - Eaton et al. (2011)

Why examine Turkey's adoption of Basel II?

- In Turkey Basel II was implemented uniformly as of July 1, 2012
  - All the banks had to use only the SA whose components are publicly known.

- Manufactured goods, which we focus on, form 94% of Turkish exports in 2012.

- Turkey (a member of OECD, WTO and G-20) is the world's:
  - 17th largest economy,
  - 22nd largest exporter by value,
  - 15th largest exporter in manufactured goods that we examine.

- Since 1996 Turkey is in a customs union with the EU for manufactured goods:
  - It is the 5th largest exporter to the EU (6th largest exporter in manufactured goods),
  - It is the 7th largest importer from the EU

- We have quarterly country-industry data covering all Turkish exports:
  - 2011Q3 – 2013Q2 data are used to create annual data prior to and after July 1, 2012

Identification

- CLC (issued or held) capital charge = CLC-Notional Amount × CCF × **RW**
- In Turkey the same CCFs applied between 2006 and 2013.
- On July 1, 2012, the CLC-related RWs changed as follows (Table 1):

Basel I		Basel II			
Risk-Weights		Risk-Weights		Agency Rating Categories	
A	B	C	D	E	F
OECD	Non-OECD	CLC maturity < 3 months	CLC maturity > 3 months	Moody's	S&P or Fitch's
0.20	1.00	0.20	0.20	Aaa to Aa3	AAA to AA-
			0.50	A1 to Baa3	A+ to BBB-
		0.50	1.00	Ba1 to B3	BB+ to B-
		1.50	1.50	Caa1 and below	CCC+ and below
		0.20	0.50	Non-rated (NR)	Non-rated (NR)

- In fact, we have 3 identification schemes, depending on the assumption made regarding the remaining maturity of the CLCs on average.

Identification scheme 1

- **<u>Counterparty banks domiciled in OECD countries:</u>** assuming that CLCs have *remaining maturities longer than 3 months* on average, for A1 to Baa3 (A+ to BBB-) rated counterparties the RW **increases** from **0.20** to **0.50**

Basel I		Basel II			
Risk-Weights		Risk-Weights		Agency Rating Categories	
A	B	C	D	E	F
OECD	Non-OECD	CLC maturity < 3 months	CLC maturity > 3 months	Moody's	S&P or Fitch's
0.20	1.00	0.20	0.20	Aaa to Aa3	AAA to AA-
			0.50	A1 to Baa3	A+ to BBB-
		0.50	1.00	Ba1 to B3	BB+ to B-
		1.50	1.50	Caa1 and below	CCC+ and below
		0.20	0.50	Non-rated (NR)	Non-rated (NR)

- We have no OECD country whose banks' TA-weighted average rating stayed in the Ba1-to-B3 or Caa1-and-below range during July 1, 2011 and June 30, 2013.

- No OECD country without any rated banks.

Identification scheme 2a

- **<u>Counterparty banks domiciled in non-OECD countries:</u>** assuming that CLCs have *remaining maturities longer than 3 months* on average, for Aaa to Aa3 (AAA to AA-) rated counterparties the RW **decreases** from **1.00** to **0.20**, and for A1 to Baa3 (A+ to BBB-) rated or non-rated (NR) counterparties, the RW **decreases** from **1.00** to **0.50**:

Basel I		Basel II			
Risk-Weights		Risk-Weights		Agency Rating Categories	
A	B	C	D	E	F
OECD	Non-OECD	CLC maturity < 3 months	CLC maturity > 3 months	Moody's	S&P or Fitch's
0.20	1.00	0.20	0.20	Aaa to Aa3	AAA to AA-
			0.50	A1 to Baa3	A+ to BBB-
		0.50	1.00	Ba1 to B3	BB+ to B-
		1.50	1.50	Caa1 and below	CCC+ and below
		0.20	0.50	Non-rated (NR)	Non-rated (NR)

Identification scheme 2b

- **<u>Counterparty banks domiciled in non-OECD countries:</u>** assuming that CLCs have *remaining maturities shorter than 3 months* on average, for Aaa to Baa3 (AAA to BBB-) rated or non-rated counterparties, the RWs **decrease** from **1.00** to **0.20**

Basel I		Basel II			
Risk-Weights		Risk-Weights		Agency Rating Categories	
A	B	C	D	E	F
OECD	Non-OECD	CLC maturity < 3 months	CLC maturity > 3 months	Moody's	S&P or Fitch's
0.20	1.00	0.20	0.20	Aaa to Aa3	AAA to AA-
			0.50	A1 to Baa3	A+ to BBB-
		0.50	1.00	Ba1 to B3	BB+ to B-
		1.50	1.50	Caa1 and below	CCC+ and below
		0.20	0.50	Non-rated (NR)	Non-rated (NR)

A simple example

Consider a steel export transaction with a value of $ 1 million (≅ 1.8 million TL as of July 2, 2012) paid through a CLC issued by a non-OECD country-domiciled bank and with a remaining maturity > 3 months:

- Prior to July 1, 2012, under Basel I, holding this foreign bank issued CLC would cost the Turkish bank a capital charge of $ 24,000 (= $ 1,000,000 × 0.20 × **1.00** × 0.12)

- After July 1, 2012, under Basel II, holding the same CLC would require that the Turkish bank set aside an amount that depends the counterparty bank's FX-denominated L/T debt rating:

Moody's	S&P or Fitch	Turkish bank's capital charge for CLC	% change
Aaa to Aa3 80%	AAA to AA-	$ 4,800 = $1,000,000 × 0.20 × **0.20** × 0.12	–
A1 to Baa3 50%	A+ to BBB-	$ 12,000 = $1,000,000 × 0.20 × **0.50** × 0.12	–
Non-Rated	Non-Rated		
Ba1 to B3 0%	BB+ to B-	$ 24,000 = $1,000,000 × 0.20 × **1.00** × 0.12	

Empirical challenges

We have inherently weak empirical tests:

-We have exports data disaggregated by country, 2-digit ISIC industry, payment type (rather than transactions-level data)

-We use TA-weighted average foreign counterparty-bank ratings by country:

- CLC-issuing counterparty bank information is simply not collected
- As a robustness check, we also use median of bank ratings, equally-weighted average bank ratings, as well as L/T sovereign-debt ratings as a proxy

-We do not have data on remaining CLC maturity:

- We repeat the tests assuming that the remaining maturities are longer or shorter than 3 months for the non-OECD counterparty sample

-It may well be that the Turkish banks do not reflect the changes in CLC clearing costs (i.e., the associated capital charges) to their customers:

- Turkish banks' average Tier 1+Tier 2 capital ratio was 16.47% as of July 1, 2012, i.e., more than twice 8% required under Basel II and higher than the 12% required by Turkish regulators.

Empirical specifications

To explain our specification, let us start with a log-linear "pseudo" gravity equation for Turkey's exports to countries (c) in 2-digit ISIC industry segment (i) in period (t):

$$ln(EXPORTS_{c,i,t}) = \alpha_0 + \alpha_1\, ln(IMPORTS_EX_TUR_{c,t}) + \alpha_2\, ln(DISTANCE_c) + \alpha_3\, D_ADJACENT_c + \delta_i + \varepsilon_{c,i,t}$$

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Into which we insert a difference-in-differences model (here for the OECD sample:
H_0: $\beta_3 < 0$ since RW for A1 to Baa3 increased from 0.20 to **0.50**)

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$$+ \beta_1\, D_A1\text{-}Baa3_c + \beta_2\, D_BASELII_t + \beta_3\, D_A1\text{-}Baa3_c \times D_BASELII_t + \delta_i + \varepsilon_{c,i,t}$$

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$$+ \beta_1\, D_A1\text{-}Baa3_c + \beta_2\, D_BASELII_t + \beta_3\, D_A1\text{-}Baa3_c \times D_BASELII_t + \delta_i + \varepsilon_{c,i,t}$$

But we have three payment terms:

$$ln(EXPORTS_{c,i,t}) = \alpha_0 + \alpha_1\, ln(IMPORTS_EX_TUR_{c,t}) + \alpha_2\, ln(DISTANCE_c) + \alpha_3\, D_ADJACENT_c$$
$$+ \gamma_1\, D_A1\text{-}Baa3_c + \gamma_2\, D_BASELII_t + \gamma_3\, D_A1\text{-}Baa3_c \times D_BASELII_t$$
$$+ [\beta_1\, D_A1\text{-}Baa3_c + \beta_2\, D_BASELII_t + \beta_3\, D_A1\text{-}Baa3_c \times D_BASELII_t] \times D_CLC_{c,i,t}$$
$$+ [\lambda_1\, D_A1\text{-}Baa3_c + \lambda_2\, D_BASELII_t + \lambda_3\, D_A1\text{-}Baa3_c \times D_BASELII_t] \times D_CIA_{c,i,t} + \delta_i + \varepsilon_{c,i,t}$$

Empirical specifications

- To understand the impact of RW-changes in % change, we need to calculate incidence ratios for the change in CLC-based exports:

$$e^{\beta} - 1$$

- Based on which we can also calculate an elasticity:

$$\varepsilon = (e^{\beta} - 1) \;/\; (RW_{BASEL\ II} / RW_{BASEL\ I} - 1)$$

- Finally, Santos-Silva and Tenreyro (2006, 2011) show that log-linear gravity models, which are estimated with heteroskedastic trade data and by construction *exclude* zero trade flows, yield biased and potentially inconsistent estimates.

- We use the Poisson Pseudo Maximum Likelihood (PPML) estimator as they suggest:

$$\begin{aligned} EXPORTS_{c,i,t} = exp\,\{ & \alpha_0 + \alpha_1 \ln(IMPORTS_EX_TUR_{c,t}) + \alpha_2 \ln(DISTANCE_c) + \alpha_3 D_ADJACENT_c \\ & + \gamma_1 D_A1\text{-}Baa3_c + \gamma_2 D_BASELII_t + \gamma_3 D_A1\text{-}Baa3_c \times D_BASELII_t \\ & + [\beta_1 D_A1\text{-}Baa3_c + \beta_2 D_BASELII_t + \beta_3 D_A1\text{-}Baa3_c \times D_BASELII_t] \times D_CLC_{c,i,t} \\ & + [\lambda_1 D_A1\text{-}Baa3_c + \lambda_2 D_BASELII_t + \lambda_3 D_A1\text{-}Baa3_c \times D_BASELII_t] \times D_CIA_{c,i,t} \} + \delta_i + \varepsilon_{c,i,t} \end{aligned}$$

Data

- 2011Q3 - 2013Q2 exports data from the Turkish Statistics Institute:
  - Customs data aggregated by the country of destination, industry, and quarter
  - Data available for 174 countries, 22 industries at the 2-digit ISIC level

- Moody, S&P and Fitch's all available bank ratings from BankScope database:
  - We eliminate financial institutions that are unlikely to issue CLCs,
  - TA-weighted ratings averages per country,
  - If a bank's rating changes, we weight by the # of days in a given year a rating is valid,
  - For each bank if multiple ratings: (i) worst of 2 ratings, or (ii) second best of 3 ratings (as stipulated by the BDDK, the Turkish banking regulator).

- Quarterly for each country shipper-country-level imports data from IMF DOTS database:
  - limiting the dataset to 160 countries
  - we drop few countries: Cuba, Iran, Syria, UAE
  - Others are dropped because they change between the larger rating categories (for ex., Greece)

- Distance between Ankara and destination country's principle city is from CEPII database.

Data – Summary Statistics

PANEL A: OECD SAMPLE

Number of observations =3,828 (=29 countries ×22 industries ×3 payment terms ×2 annual periods)

	Risk-Weight	N	Mean	Median	Std. Dev.	Min.	Max.
EXPORTS		3,828	32.7	0.9	145.2	0	2,562.0
IMPORTS_EX_TUR		3,828	367,716.1	190,486.2	460,659.1	4,672.8	2,325,581.0
DISTANCE		3,828	4,579.8	2,209.7	4,507.6	1,123.0	1,7234.5
D_ADJACENT		3,828	0.000	0	0	0	0
D_CIA		3,828	0.333	0	0.472	0	1
D_CLC		3,828	0.333	0	0.472	0	1
D_OA		3,828	0.333	0	0.472	0	1
For CLC maturity > 3 months							
D_Aaa-Aa3	0.20	3,828	0.207	0	0.405	0	1
D_A1-Baa3	0.50	3,828	0.793	1	0.405	0	1

Data – Summary Statistics

PANEL B: Non-OECD SAMPLE

Number of observations =19,140 (=145 countries ×22 industries ×3 payment terms ×2 annual periods)

	Risk-Weight	N	Mean	Median	Std. Dev.	Min.	Max.
EXPORTS		19,140	6.0	0.02	42.3	0	2,132.6
IMPORTS_EX_TUR		17,292	49,561.5	8,624.6	176,453.1	100.739	1,873,147.0
DISTANCE		19,140	6,119.0	5,433.4	3,855.0	442.1	16,859.5
D_ADJACENT		19,140	0.034	0	0.183	0	1
D_CIA		19,140	0.333	0	0.471	0	1
D_CLC		19,140	0.333	0	0.471	0	1
D_OA		19,140	0.333	0	0.471	0	1
For CLC maturity < 3 months							
D_Aaa-Baa3_&_NR	0.20	19,140	0.593	1	0.491	0	1
For CLC maturity > 3 months							
D_Aaa-Aa3	0.20	19,140	0.021	0	0.142	0	1
D_A1-Baa3&NR	0.50	19,140	0.572	1	0.495	0	1

Table 3 (part 1): OECD sample

for the OECD sample:

$H_0: \beta_3 < 0$ since RW for A1 to Baa3 increased from 0.20 to **0.50**

		Log-linear (OLS) models				Poisson models					
		A		B		C		D		E	F
ln(IMPORTS_EX_TUR)		0.947	***	1.697		1.030	***	3.122			
		(0.0268)		(1.632)		(0.0525)		(1.955)			
ln(DISTANCE)		-0.923	***			-0.967	***				
		(0.0433)				(0.0837)					
D_A1-Baa3		-0.130				-0.303	***				
		(0.194)				(0.110)					
D_BASELII		0.444	*	0.467	**	0.0352		0.122			
		(0.242)		(0.232)		(0.118)		(0.141)			
D_A1-Baa3×D_BASELII		-0.318		-0.321		0.0449		0.0508			
		(0.271)		(0.254)		(0.151)		(0.137)			
		...		...		...		...		...	...
Estimator		OLS		OLS		PPML		PPML		PPML	PPML
Number of observations		3,278		3,278		3,828		3,828		3,278	3,278
R^2		0.646		0.692							
Robust standard errors		yes		yes		yes		yes		yes	yes
Fixed-Effects	*Industry*	yes		yes		yes		yes		yes	no
	Country	no		yes		no		yes		no	no
	Industry×time	no		no		no		no		no	yes
	Country×time	no		no		no		no		yes	yes

Table 3 (part 2): OECD sample

	Log-linear (OLS) models				Poisson models							
	A		B		C		D		E		F	
	...		...		...		...		...		...	
D_CLC	-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***
	(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)	
D_CLC×D_A1-Baa3	0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***
	(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)	
D_CLC×D_BASELII	0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**
	(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)	
D_CLC×D_A1-Baa3×D_BASELII	-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**
	(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)	
D_CIA	-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***
	(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)	
D_CIA×D_A1-Baa3	-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***
	(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)	
D_CIA×D_BASELII	-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*
	(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)	
D_CIA×D_A1-Baa3×D_BASELII	0.0160		0.0249		-0.681		-0.681		-0.684		-0.684	
	(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)	
Estimator	OLS		OLS		PPML		PPML		PPML		PPML	
Number of observations	3,278		3,278		3,828		3,828		3,278		3,278	
R^2	0.646		0.692									
Robust standard errors	yes		yes		yes		yes		yes		yes	
Fixed-Effects — *Industry*	yes		yes		yes		yes		yes		no	
Country	no		yes		no		yes		no		no	
Industry×time	no		no		no		no		no		yes	
Country×time	no		no		no		no		yes		yes	

Table 3 (part 2): OECD sample

	Log-linear (OLS) models				Poisson models							
	A		B		C		D		E		F	
	...		...		...		...		...		...	
D_CLC	-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***
	(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)	
D_CLC×D_A1-Baa3	0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***
	(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)	
D_CLC×D_BASELII	0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**
	(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)	
D_CLC×D_A1-Baa3×D_BASELII	-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**
	(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)	
D_CIA	-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***
	(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)	
D_CIA×D_A1-Baa3	-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***
	(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)	
D_CIA×D_BASELII	-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*
	(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)	
D_CIA×D_A1-Baa3×D_BASELII	0.0160		0.0249		-0.681		-0.681		-0.684		-0.684	
	(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)	
Estimator	OLS		OLS		PPML		PPML		PPML		PPML	
Number of observations	3,278		3,278		3,828		3,828		3,278		3,278	
R^2	0.646		0.692									
Robust standard errors	yes		yes		yes		yes		yes		yes	
Fixed-Effects — *Industry*	yes		yes		yes		yes		yes		no	
Country	no		yes		no		yes		no		no	
Industry×time	no		no		no		no		no		yes	
Country×time	no		no		no		no		yes		yes	

Table 3 (part 2): OECD sample

	Log-linear (OLS) models				Poisson models							
	A		B		C		D		E		F	
	...		...		...		...		...		...	
D_CLC	-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***
	(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)	
D_CLC×D_A1-Baa3	0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***
	(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)	
D_CLC×D_BASELII	0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**
	(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)	
D_CLC×D_A1-Baa3×D_BASELII	-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**
	(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)	
D_CIA	-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***
	(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)	
D_CIA×D_A1-Baa3	-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***
	(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)	
D_CIA×D_BASELII	-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*
	(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)	
D_CIA×D_A1-Baa3×D_BASELII	0.0160		0.0249		-0.681		-0.681		-0.684		-0.684	
	(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)	
Estimator	OLS		OLS		PPML		PPML		PPML		PPML	
Number of observations	3,278		3,278		3,828		3,828		3,278		3,278	
R^2	0.646		0.692									
Robust standard errors	yes		yes		yes		yes		yes		yes	
Fixed-Effects — *Industry*	yes		yes		yes		yes		yes		no	
Country	no		yes		no		yes		no		no	
Industry×time	no		no		no		no		no		yes	
Country×time	no		no		no		no		yes		yes	

Table 3 (part 2): OECD sample

	Log-linear (OLS) models				Poisson models									
	A		B		C		D		E		F			
	...		...		...		...		...		...			
D_CLC	-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***		
	(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)			
D_CLC×D_A1-Baa3	0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***		
	(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)			
D_CLC×D_BASELII	0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**		
	(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)			
D_CLC×D_A1-Baa3×D_BASELII	-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**		
	(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)			
D_CIA	-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***		
	(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)			
D_CIA×D_A1-Baa3	-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***		
	(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)			
D_CIA×D_BASELII	-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*		
	(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)			
D_CIA×D_A1-Baa3×D_BASELII	0.0160		0.0249		-0.681		-0.681		-0.684		-0.684			
	(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)			
Estimator	OLS		OLS		PPML		PPML		PPML		PPML			
Number of observations	3,278		3,278		3,828		3,828		3,278		3,278			
R^2	0.646		0.692											
Robust standard errors	yes		yes		yes		yes		yes		yes			
Fixed-Effects — *Industry*	yes		yes		yes		yes		yes		no			
Country	no		yes		no		yes		no		no			
Industry×time	no		no		no		no		no		yes			
Country×time	no		no		no		no		yes		yes			

Table 3 (part 2): OECD sample

		Log-linear (OLS) models				Poisson models							
		A		B		C		D		E		F	
		...		...		...		...		...		...	
D_CLC		-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***
		(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)	
D_CLC×D_A1-Baa3		0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***
		(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)	
D_CLC×D_BASELII		0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**
		(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)	
D_CLC×D_A1-Baa3×D_BASELII		-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**
		(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)	
D_CIA		-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***
		(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)	
D_CIA×D_A1-Baa3		-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***
		(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)	
D_CIA×D_BASELII		-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*
		(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)	
D_CIA×D_A1-Baa3×D_BASELII		0.0160		0.0249		-0.681		-0.681		-0.684		-0.684	
		(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)	
Estimator		OLS		OLS		PPML		PPML		PPML		PPML	
Number of observations		3,278		3,278		3,828		3,828		3,278		3,278	
R^2		0.646		0.692									
Robust standard errors		yes		yes		yes		yes		yes		yes	
Fixed-Effects	*Industry*	yes		yes		yes		yes		yes		no	
	Country	no		yes		no		yes		no		no	
	Industry×time	no		no		no		no		no		yes	
	Country×time	no		no		no		no		yes		yes	

Table 3 (part 2): OECD sample

	Log-linear (OLS) models				Poisson models								
	A		B		C		D		E		F		
	...		...		...		...		...		...		
D_CLC	-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***
	(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)	
D_CLC×D_A1-Baa3	0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***
	(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)	
D_CLC×D_BASELII	0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**
	(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)	
D_CLC×D_A1-Baa3×D_BASELII	-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**
	(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)	
D_CIA	-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***
	(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)	
D_CIA×D_A1-Baa3	-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***
	(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)	
D_CIA×D_BASELII	-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*
	(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)	
D_CIA×D_A1-Baa3×D_BASELII	0.0160		0.0249		-0.681		-0.681		-0.684		-0.684	
	(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)	
Estimator	OLS		OLS		PPML		PPML		PPML		PPML	
Number of observations	3,278		3,278		3,828		3,828		3,278		3,278	
R^2	0.646		0.692									
Robust standard errors	yes		yes		yes		yes		yes		yes	
Fixed-Effects — *Industry*	yes		yes		yes		yes		yes		no	
Country	no		yes		no		yes		no		no	
Industry×time	no		no		no		no		no		yes	
Country×time	no		no		no		no		yes		yes	

Table 3 (part 2): OECD sample

		Log-linear (OLS) models				Poisson models							
		A		B		C		D		E		F	
		...		...		...		...		...		...	
D_CLC		-4.302	***	-4.339	***	-3.657	***	-3.657	***	-3.608	***	-3.610	***
		(0.273)		(0.256)		(0.360)		(0.364)		(0.366)		(0.364)	
D_CLC×D_A1-Baa3		0.816	***	0.722	**	1.257	***	1.257	***	1.270	***	1.271	***
		(0.305)		(0.286)		(0.428)		(0.429)		(0.432)		(0.431)	
D_CLC×D_BASELII		0.0518		0.0856		1.583	**	1.583	**	1.637	**	1.638	**
		(0.389)		(0.364)		(0.705)		(0.702)		(0.702)		(0.701)	
D_CLC×D_A1-Baa3×D_BASELII		-0.0721		-0.0836		-1.509	**	-1.509	**	-1.578	**	-1.577	**
		(0.434)		(0.406)		(0.767)		(0.762)		(0.763)		(0.762)	
D_CIA		-2.717	***	-2.713	***	-3.646	***	-3.646	***	-3.646	***	-3.646	***
		(0.243)		(0.228)		(0.215)		(0.216)		(0.221)		(0.222)	
D_CIA×D_A1-Baa3		-0.0685		-0.0900		0.871	***	0.871	***	0.872	***	0.872	***
		(0.273)		(0.255)		(0.335)		(0.333)		(0.336)		(0.337)	
D_CIA×D_BASELII		-0.100		-0.102		0.551	*	0.551	*	0.555	*	0.555	*
		(0.345)		(0.323)		(0.333)		(0.332)		(0.331)		(0.331)	
D_CIA×D_A1-Baa3×D_BASELII		0.0160		0.0249		-0.681		-0.681		-0.684		-0.684	
		(0.387)		(0.362)		(0.462)		(0.456)		(0.456)		(0.456)	
Estimator		OLS		OLS		PPML		PPML		PPML		PPML	
Number of observations		3,278		3,278		3,828		3,828		3,278		3,278	
R^2		0.646		0.692									
Robust standard errors		yes		yes		yes		yes		yes		yes	
Fixed-Effects	*Industry*	yes		yes		yes		yes		yes		no	
	Country	no		yes		no		yes		no		no	
	Industry×time	no		no		no		no		no		yes	
	Country×time	no		no		no		no		yes		yes	

OECD sample – interpretation of the results

We focus on the triple interaction $D_CLC_{c,i,t} \times D_A1\text{-}Baa3_c \times D_BASELII_t$:

$$\beta_3 = -1.577$$

-This estimate suggests that as CLC-related RW increases from 0.20 to 0.50 (a 150% increase) for A1 to Baa3 rated counterparties, the incidence of CLC-exports (to countries whose banks on average fall in this rating range) decreases by 79% (= $e^{-1.557} - 1 = -0.79$).

-The associated RW-change elasticity of CLC-exports to A1 to Baa3 rated OECD destinations is equal to – 0.53 (= – 0.79 / +1.50)

-i.e., a 10% increase in (RW-related) cost of CLCs leads to a 5.3% drop in CLC-financed exports shipped to OECD countries whose banks are rated A1 to Baa3.

-These results are robust:

- we obtain similar results when we change the frequency of the data to quarterly,
- or use different sub-samples: high vs low CLC-usage industries in 2010, with a square panel, or right-winsorize industry-exports data at 95% of their distribution per year,
- we find no effect in a placebo test using two years of data around the fictitious Basel II adoption date of July 1, 2011.

Table 5: non-OECD sample (CLC maturities < 3 months)

Only PPML estimates, partial results focusing on CLC interactions:

H_0 : $\beta_3 > 0$ since RW for A1 to Baa3 decreased from 1.00 to **0.20**

- Column A main results
- Column B (C) industries more (less) dependent on CLC use
- Column D exports winsorized at the 95th percentile
- Column E square panel (industry-country level intensive margin)
- Column F quarterly data
- Column G placebo test (fictitious adoption date: July 1, 2011)

	A		B		C		D		E		F		G	
D_CLC	-1.316	***	-1.046	***	-3.349	***	-1.112	***	-1.377	***	-1.364	***	-1.559	***
	(0.267)		(0.254)		(0.227)		(0.191)		(0.276)		(0.266)		(0.241)	
D_CLC×D_Aaa-Baa3_&_NR	0.0429		0.0482		0.413		0.334		0.0893		0.0508		0.316	
	(0.464)		(0.465)		(0.511)		(0.239)		(0.476)		(0.460)		(0.448)	
D_CLC×D_BASELII	-0.453	***	-0.471	***	0.153		-0.187	*	-0.462	***	-0.319	***	0.115	
	(0.0874)		(0.0921)		(0.127)		(0.0965)		(0.0777)		(0.0917)		(0.138)	
D_CLC×D_Aaa-Baa3_&_NR×D_BASELII	0.444	***	0.448	***	0.210		0.272	**	0.446	***	0.429	***	-0.232	
	(0.142)		(0.146)		(0.260)		(0.111)		(0.138)		(0.153)		(0.173)	
Estimator	PPML		PPML		PPML		PPML		PPML		PPML		PPML	
Number of observations	11,958		6,626		5,332		11,958		6,558		56,824		15,128	
Clustered standard errors (country-level)	yes		yes		yes		yes		yes		yes		yes	
Fixed-Effects *Industry×time*	yes		yes		yes		yes		yes		yes		yes	
Country×time	yes		yes		yes		yes		yes		yes		yes	

- RW-change elasticity of CLC-exports for non-OECD countries with investment grade or non-rated banks on average: – 0.93 (= [$e^{0.444}$ – 1] / [(0.20 – 0.50) / 0.50)])

Table 5: non-OECD sample (CLC maturities < 3 months)

Only PPML estimates, partial results focusing on CLC interactions:

$H_0: \beta_3 > 0$ since RW for A1 to Baa3 decreased from 1.00 to **0.20**

- Column A main results
- Column B (C) industries more (less) dependent on CLC use
- Column D exports winsorized at the 95th percentile
- Column E square panel (industry-country level intensive margin)
- Column F quarterly data
- Column G placebo test (fictitious adoption date: July 1, 2011)

	A		B		C		D		E		F		G	
D_CLC	-1.316	***	-1.046	***	-3.349	***	-1.112	***	-1.377	***	-1.364	***	-1.559	***
	(0.267)		(0.254)		(0.227)		(0.191)		(0.276)		(0.266)		(0.241)	
D_CLC×D_Aaa-Baa3_&_NR	0.0429		0.0482		0.413		0.334		0.0893		0.0508		0.316	
	(0.464)		(0.465)		(0.511)		(0.239)		(0.476)		(0.460)		(0.448)	
D_CLC×D_BASELII	-0.453	***	-0.471	***	0.153		-0.187	*	-0.462	***	-0.319	***	0.115	
	(0.0874)		(0.0921)		(0.127)		(0.0965)		(0.0777)		(0.0917)		(0.138)	
D_CLC×D_Aaa-Baa3_&_NR×D_BASELII	0.444	***	0.448	***	0.210		0.272	**	0.446	***	0.429	***	-0.232	
	(0.142)		(0.146)		(0.260)		(0.111)		(0.138)		(0.153)		(0.173)	
Estimator	PPML		PPML		PPML		PPML		PPML		PPML		PPML	
Number of observations	11,958		6,626		5,332		11,958		6,558		56,824		15,128	
Clustered standard errors (country-level)	yes		yes		yes		yes		yes		yes		yes	
Fixed-Effects *Industry×time*	yes		yes		yes		yes		yes		yes		yes	
Country×time	yes		yes		yes		yes		yes		yes		yes	

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D_CLC	-1.316	***	-1.046	***	-3.349	***	-1.112	***	-1.377	***	-1.364	***	-1.559	***
	(0.267)		(0.254)		(0.227)		(0.191)		(0.276)		(0.266)		(0.241)	
D_CLC×D_Aaa-Baa3_&_NR	0.0429		0.0482		0.413		0.334		0.0893		0.0508		0.316	
	(0.464)		(0.465)		(0.511)		(0.239)		(0.476)		(0.460)		(0.448)	
D_CLC×D_BASELII	-0.453	***	-0.471	***	0.153		-0.187	*	-0.462	***	-0.319	***	0.115	
	(0.0874)		(0.0921)		(0.127)		(0.0965)		(0.0777)		(0.0917)		(0.138)	
D_CLC×D_Aaa-Baa3_&_NR×D_BASELII	0.444	***	0.448	***	0.210		0.272	**	0.446	***	0.429	***	-0.232	
	(0.142)		(0.146)		(0.260)		(0.111)		(0.138)		(0.153)		(0.173)	
Estimator	PPML		PPML		PPML		PPML		PPML		PPML		PPML	
Number of observations	11,958		6,626		5,332		11,958		6,558		56,824		15,128	
Clustered standard errors (country-level)	yes		yes		yes		yes		yes		yes		yes	
Fixed-Effects *Industry×time*	yes		yes		yes		yes		yes		yes		yes	
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Conclusion

- Our elasticity estimates range between -0.5 to -1.0 with the sample as a whole

- We obtain similar results with median or mean bank ratings & sovereign ratings

- We find no such effects for OA- or CIA-based export flows in any sample

- Changes brought about Basel II matter for trade flows
- Assuming that CLC costs about 1% to 5% of a transaction's value, our estimates suggest that export costs to A1-Baa3 grade OECD countries decreases by 0.5%-2.5%
- We cannot make welfare statements: estimates are not based on all Turkish exports
- Size of the impact depends on the weight of CLC-financed trade for a given country (for Turkey ~6% for the OECD sample and ~17% for the non-OECD sample)
- Assuming nothing else changes, elasticities for <u>total trade</u> range between -0.03 to -0.17

- Is trade finance responsible for exports' dramatic drop during Great Recession?
- Eaton et al. (2011): this was about the fall in the demand for durable goods
- Amiti and Weinstein (2011), Chor and Manova (2012): bank provided trade finance
- Both sides could be right if CLC-trade is important for durable goods.

Conclusion

A 2013 Asian Development Bank Survey:
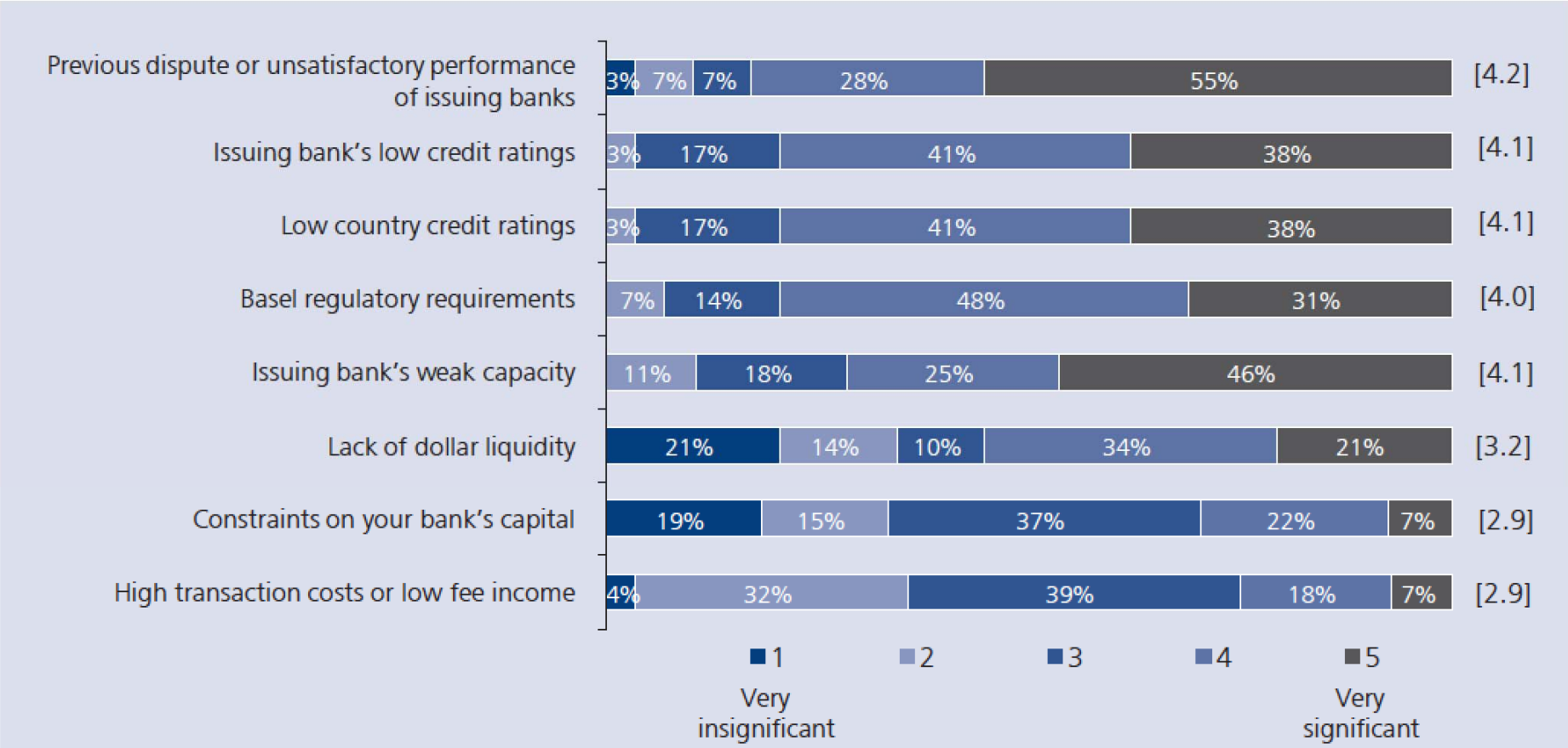
Figure 3 Obstacles aggravating the trade finance gap for international banks