Table OA1

Relationship banking and credit constraints: additional robustness tests

This table shows additional robustness tests of our baseline results in Table 5. Robust standard errors are clustered by locality instead of by country in Columns 1–2. In Columns 3–4 the models are estimated using a linear probability (ordinary least squares) model and standard errors are Wild cluster bootstrapped. Columns 5–6 include a locality-level and branch-weighted Lerner index instead of the Hirshmann-Herfindahl index to measure local credit-market competition. Columns 7–8 include locality-level and branch-weighted control variables that measure the *Share small banks* and *Share foreign banks*. Column 9 is estimated for a pooled 2005–2008/2009 sample. Columns 10–11 exclude all Ukrainian observations. Columns 12–13 exclude banks where ownership changes took place during our sample period when computing *Share relationship banks*. Column 14–15 exclude multi-establishment firms whose headquarters are based in another locality. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*) where *Share relationship banks* is measured at the locality level. In all regressions, the dependent variable is a dummy variable that is one if the firm was credit constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 6. Robust standard errors are clustered by country (except in Columns 1 and 2) and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of significance. Table A1 contains all variable definitions.

	Clustering at locality level		Linear probability model, wild cluster bootstrapped s.e.		Alternative control for local competition		Controlling for foreign and small banks		Pooled sample	Excluding Ukraine		Excl. banks with ownership change		Excl. multi-establishment firms	
	2005	2008–2009	2005	2008–2009	2005	2008–2009	2005	2008–2009	2005; 2008–2009	2005	2008–2009	2005	2008–2009	2005	2008–2009
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Share relationship banks	0.206	-0.439***	0.073	-0.149***	0.196	-0.450***	0.110	-0.413***	0.218	0.327	-0.468***	0.359	-0.286*	0.127	-0.428***
	(0.219)	(0.152)	(0.088)	(0.051)	(0.290)	(0.155)	(0.297)	(0.146)	(0.289)	(0.280)	(0.157)	(0.239)	(0.170)	(0.294)	(0.147)
Lerner index					-0.407	0.343									
					(0.901)	(1.055)									
Share foreign banks							0.099	-0.079							
							(0.426)	(0.257)							
Share small banks							-0.131	0.007							
							(0.474)	(0.126)							
*Share relationship banks*2008-09									-0.648**						
									(0.326)						
Inverse Mills' ratio	0.584*	-0.207	0.604*	-0.303	0.502*	-0.235	0.506*	-0.195	0.232	0.593*	-0.169	0.512*	-0.192	0.507*	-0.182
	(0.316)	(0.301)	(0.329)	(0.223)	(0.274)	(0.206)	(0.280)	(0.212)	(0.196)	(0.324)	(0.217)	(0.276)	(0.200)	(0.279)	(0.211)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	4,527	4,085	4,527	4,085	4,519	4,084	4,402	3,919	8,612	4,138	3,545	4,527	4,085	4,404	3,921
Pseudo r²	0.132	0.100	0.147	0.127	0.133	0.099	0.135	0.102	0.119	0.137	0.099	0.133	0.099	0.134	0.102
Correctly predicted outcomes (percent)	0.67	0.65	—	—	0.67	0.65	0.67	0.65	0.66	0.67	0.65	0.67	0.65	0.67	0.65
Sum of percent correctly predicted zero and one	1.36	1.29	—	—	1.36	1.29	1.36	1.30	1.33	1.36	1.29	1.36	1.30	1.36	1.30
Hosmer-Lemeshow test (P-value)	0.104	0.489	—	—	0.101	0.340	0.158	0.761	0.156	0.245	0.133	0.286	0.250	0.091	0.795

Table OA2

Relationship banking and credit constraints: endogeneity

This table shows alternative specifications of our baseline regressions in Table 5 to address possible endogeneity concerns. Columns 1–2 and Columns 3–4 are based on samples that exclude firms younger than five and twelve years, respectively (twelve years is the median firm age in the total sample). In Columns 5–6 and Columns 7–8 the contemporaneous share of relationship banks in each locality is replaced by the historical share of these banks in 1995 and 2000, respectively. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*), where *Share relationship banks* is measured at the locality level. In all regressions, the dependent variable is a dummy variable that is one if the firm was credit-constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of significance. Table A1 in the Appendix contains all variable definitions.

Variable	Firms 5 years and older		Firms 12 years and older		Share relationship banks (1995)		Share relationship banks (2000)	
	2005	2008-09	2005	2008-09	2005	2008-09	2005	2008-09
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share relationship banks	0.173	-0.487***	0.177	-0.513***	0.038	-0.331***	0.196	-0.318***
	(0.288)	(0.139)	(0.394)	(0.176)	(0.216)	(0.081)	(0.156)	(0.101)
Inverse Mills' ratio	0.512*	-0.317	0.668*	-0.576	0.538*	0.004	0.541*	-0.153
	(0.294)	(0.215)	(0.382)	(0.226)	(0.283)	(0.213)	(0.280)	(0.198)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	4,174	3,738	2,153	2,525	4,205	3,731	4,283	3,888
Pseudo r²	0.134	0.104	0.159	0.112	0.133	0.098	0.133	0.100
Correctly predicted outcomes (percent)	0.67	0.66	0.70	0.67	0.67	0.65	0.67	0.65
Sum of percent correctly predicted zero and one	1.36	1.30	1.39	1.31	1.36	1.29	1.36	1.30
Hosmer-Lemeshow test (P-value)	0.263	0.238	0.161	0.179	0.060	0.842	0.131	0.170

Table OA3

Relationship banks and lending characteristics in Armenia

This table shows ordinary least squares regressions to explain the probability that a loan is collateralized (Columns 1–3), the loan maturity in months (Columns 4–6) and the probability that a new credit contract between a firm and a bank is a credit line (Columns 7–9). Columns 1–6 are based on a sample of standard loan contracts provided to all borrowers. Columns 7–9 are based on a sample of all credit products provided to firms that borrowed at least once from a relationship bank *and* at least once from a transaction bank during the sample period. Covariates control for the ex ante internal risk rating (0–5 range, with higher a better rating); the (squared) length of the firm-bank relationship (the number of months since the bank provided the firm with the first standard loan, credit line, factoring or leasing contract, guarantee, letter of credit, overdraft agreement, or repurchase agreement); the breadth of the relationship as measured by the number of different credit-product types (standard loan, credit line, factoring or leasing contract, guarantee, letter of credit, overdraft agreement, or repurchase agreement) that a client received from the bank during the relationship; and a dummy variable that indicates whether the bank is the firm's primary bank (i.e., a bank that provides more than 50 percent of all outstanding loans). Source: Banking Environment and Performance Survey (BEPS II) and Armenian credit registry (ACRA). ***, ** and * indicate statistical significance at the 1%, 5% and 10% level. All specifications include firm and semi-annual fixed effects. Robust standard errors are clustered by firm. Constants not shown.

Variable	Collateral			Maturity			Credit line		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relationship bank	-0.054**	-0.057***	-0.056***	0.066	0.048	0.055	0.083***	0.073***	0.056***
	(0.021)	(0.022)	(0.020)	(0.049)	(0.047)	(0.042)	(0.009)	(0.020)	(0.018)
Ex ante internal risk rating		-0.038	-0.028		0.065	0.125		0.025	0.019
		(0.043)	(0.042)		(0.129)	(0.111)		(0.052)	(0.053)
Relationship length		-0.009	0.007		-0.063	0.018		-0.008	0.014
		(0.017)	(0.020)		(0.039)	(0.038)		(0.025)	(0.024)
Relationship length ^{2}		0.001	-0.002		-0.001	-0.010		0.010	0.005
		(0.005)	(0.006)		(0.012)	(0.012)		(0.009)	(0.008)
Primary bank		0.066**	0.034		0.458***	0.302***		0.046**	0.078***
		(0.032)	(0.036)		(0.068)	(0.062)		(0.021)	(0.018)
Relationship breadth			0.014			-0.080			-0.804***
			(0.024)			(0.054)			(0.026)
Loan amount			0.043***			0.224***			0.007
			(0.012)			(0.024)			(0.006)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm clusters	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(Pseudo) r²	0.526	0.529	0.539	0.547	0.574	0.622	0.473	0.480	0.632
Number of observations	5,901	5,901	5,901	5,901	5,901	5,901	9,966	9,966	9,966
Product sample		Standard loans only					All types of credit products		
Borrower sample		All borrowers					Borrowed at least once from a relationship and a transaction bank		

Table OA4

Relationship banking and regional business cycle variation

This table shows linear probability ordinary least squares regressions to estimate how the relation between the impact of the local presence of relationship lenders and firms' access to bank credit in 2008–2009 depended on the severity of the crisis in the region where the firm is incorporated. Output growth is measured at the regional level in Columns 1–2 and at the regional level where available and country level otherwise in Columns 3–4. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*), where *Share relationship banks* is measured at the locality level. In all regressions, the dependent variable is a dummy variable that is one if the firm was credit-constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of significance. Table A1 contains all variable definitions.

Variable	Regional GDP growth		Regional GDP growth if available; country GDP growth otherwise	
	(1)	(2)	(3)	(4)
Share relationship banks	-0.180***	-0.213***	-0.121**	-0.152***
	(0.065)	(0.062)	(0.050)	(0.049)
*Share relationship banks *Output growth 2008–2009*	0.874**		0.880**	
	(0.421)		(0.387)	
*Share relationship banks *Output growth 2007–2009*		0.409**		0.449***
		(0.198)		(0.169)
Inverse Mills' ratio	-0.401	-0.334	-0.323	-0.274
	(0.281)	(0.274)	(0.224)	(0.215)
Firm controls	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Number of observations	3,099	3,099	4,085	4,085
r²	0.111	0.108	0.121	0.119

Table OA5

Relationship banking, decentralization and concentration

This table shows linear probability ordinary least squares regressions to estimate the relation between the local presence of relationship banks and firms' access to bank credit during the credit boom (2005) and the credit crunch (2008–2009), while controlling for local bank concentration and the local presence of decentralized banks. *HHI* is a locality-level Herfindahl-Hirschmann Index where market shares are measured by branches. *Share decentralized banks* is a locality-level variable that measures the share of bank branches that are owned by banks where loan officers make the final decision on small and medium-size enterprise loan applications (i.e., banks with only one hierarchical approval level). Robust standard errors are clustered by country and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of significance. Table A1 contains all variable definitions.

| Variable	2005				2008–2009			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share relationship banks	0.073	0.083		0.091	-0.149***	-0.110*		-0.155**
	(0.088)	(0.125)		(0.117)	(0.051)	(0.065)		(0.077)
*Share relationship banks * HHI*		-0.021		-0.001		-0.086		0.075
		(0.108)		(0.103)		(0.155)		(0.144)
Share decentralized banks			-0.177	-0.218			-0.132	-0.108
			(0.147)	(0.162)			(0.150)	(0.154)
*Share decentralized banks * HHI*			0.202	0.255			0.514***	0.476**
			(0.157)	(0.182)			(0.190)	(0.220)
HHI	-0.031	-0.017	-0.046	-0.058	0.114**	0.160	0.044	0.004
	(0.058)	(0.051)	(0.051)	(0.057)	(0.057)	(0.126)	(0.047)	(0.112)
Inverse Mills' ratio	0.604*	0.611*	0.624*	0.635*	-0.303	-0.306	-0.291	-0.288
	(0.329)	(0.332)	(0.335)	(0.338)	(0.223)	(0.223)	(0.210)	(0.211)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	4,527	4,527	4,527	4,527	4,085	4,085	4,085	4,085
r²	0.147	0.147	0.147	0.147	0.119	0.119	0.119	0.120
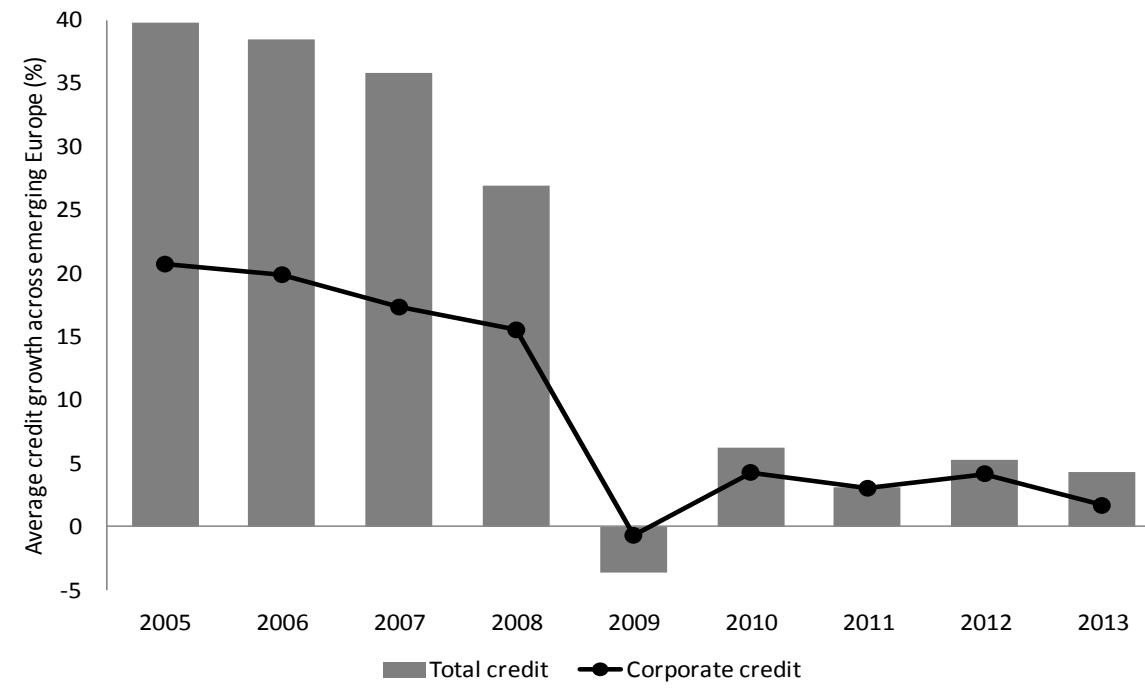
Fig. OA1.

The credit cycle across emerging Europe

This figure shows annual nominal credit growth (percent) across emerging Europe over the period 2005–2013. The bars and line indicate total and corporate credit growth, respectively. Growth rates are based on the difference in end-year credit stocks. Source: CEIC Data.