Liberalization and Regulation traps

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Motivation

- **Financial regulation is prone to big swings**

  - Regulation: Great Depression (1930s), Great Recession (2010s)

  - Deregulation: industrial countries (1980s), developing countries (1990s)

- **Financial regulation as a cause of a financial crisis**

  - Crisis frequency doubled after Bretton Woods (1973)

  - Liberalization before crises in 70% of banking crises (Kamisky-Rainhart)

- **Institutional quality matters for financial liberalization**

  - Efficient market paradigm: liberalization enhances efficiency

  - Good institutions continue to play an important role

- **Mixed evidence of regulation-crises nexus. Nonlinearity?**

Empirical Evidence

From 2000s theoretical debate moved into the empirical field

- **Initial empirical works**
  - negative impact of regulation on financial stability
  - larger impact in developing countries

- **After-crisis papers**
  - sensitivity of results to regulation measure and crisis identification
  - impact depending on the channel (e.g. compliance to Basel principles)

- **Recent results**
  - impact depending on the dimension of regulation: technical debate
  - mixed results also for developing countries: institutional quality matters

- **Financial Freedom Index**
  - 36 countries: Lower FFI, riskier policies (Gonzalex 2005)
  - 83 countries: developed vs developing countries (Cubillas-Gonzalez 2014)
  - 173 countries: clear results for Economic Financial Index (Bjornskov 2016)

2-period 2-asset 2-player Model

Assumptions and definitions:

- Representative bank and regulator; q = level of regulation; H = high-risk assets; L = low-risk assets

- $r_p = (1 - q)[1 + r_L + \alpha(r_H - r_L)] - 1$ Portfolio return

- $\delta_P^2 = (1 - q)^2[\alpha^2(\delta_H^2 + \delta_L^2 - 2\rho_{HL}\delta_H\delta_L) + 2\alpha(\rho_{HL}\delta_H\delta_L - \delta_L^2) + \delta_L^2]$ Portfolio risk

- $G = G(q, \theta)$ G caps the level of risky assets determined by the level of regulation q

- $Q = Q(q, \tau)$ Q indicates the loss given default given the level of regulation q

Step 1 *(Bank):*

$$\min_{\alpha}\{\delta_P^2\} \quad s.t. \quad a \leq G \ (\gamma) \quad and \quad (1 - q)[\alpha r_H + (1 - \alpha)r_L] \geq \bar{r} \ (\lambda)$$

Step 2 *(Regulator):*

$$\max_{q}\{(1 - q) + \beta(1 - q)[1 + r_L + \alpha(r_H - r_L)](1 - PQ)\}$$

2-period 2-asset 2-player Model

Under…	$\widehat{\alpha}$	$\partial P / \partial q$
Financial liberalization $\gamma = 0, \lambda = 0$	$\widehat{\alpha} = \dfrac{\delta_L^2 - \rho_{HL}\delta_H\delta_L}{\delta_H^2 + \delta_L^2 - 2\rho_{HL}\delta_H\delta_L}$	$\dfrac{\delta P}{\delta q} \geq 0$ if $2Q_G' G_q' \geq (1-q)\left[Q_G'' G_q'^2 + Q_G' G_q''\right]$
Market constraint $\gamma > 0, \lambda = 0$	$\widehat{\alpha}_\gamma = \dfrac{2(1-q)(\delta_L^2 - \rho_{HL}\delta_H\delta_L) + \gamma(r_H - r_L)}{2(1-q)(\delta_H^2 + \delta_L^2 - 2\rho_{HL}\delta_H\delta_L)}$	$\dfrac{\delta P}{\delta q} > 0$ if $Q_G'' < 0$
Regulatory constraint $\gamma = 0, \lambda > 0$	$\widehat{\alpha}_\lambda = G = \dfrac{2(1-q)(\delta_L^2 - \rho_{HL}\delta_H\delta_L) - \lambda}{2(1-q)(\delta_H^2 + \delta_L^2 - 2\rho_{HL}\delta_H\delta_L)}$	$\dfrac{\partial P}{\partial q} \leq 0$ if $N'(q)D(q) \leq N(q)D'(q)$

where:

$$N(q) = 1 + \beta(1 + r_L) + \beta(r_H - r_L)\big(G - (1-q)G_q'\big)$$
$$D(q) = \beta(1 + r_L)\big(Q - (1-q)Q_G'G_q'\big) + \beta(r_H - r_L)\left[QG - (1-q)\big(Q_G'G_q'G + QG_q'\big)\right]$$

2-period 2-asset 2-player Model

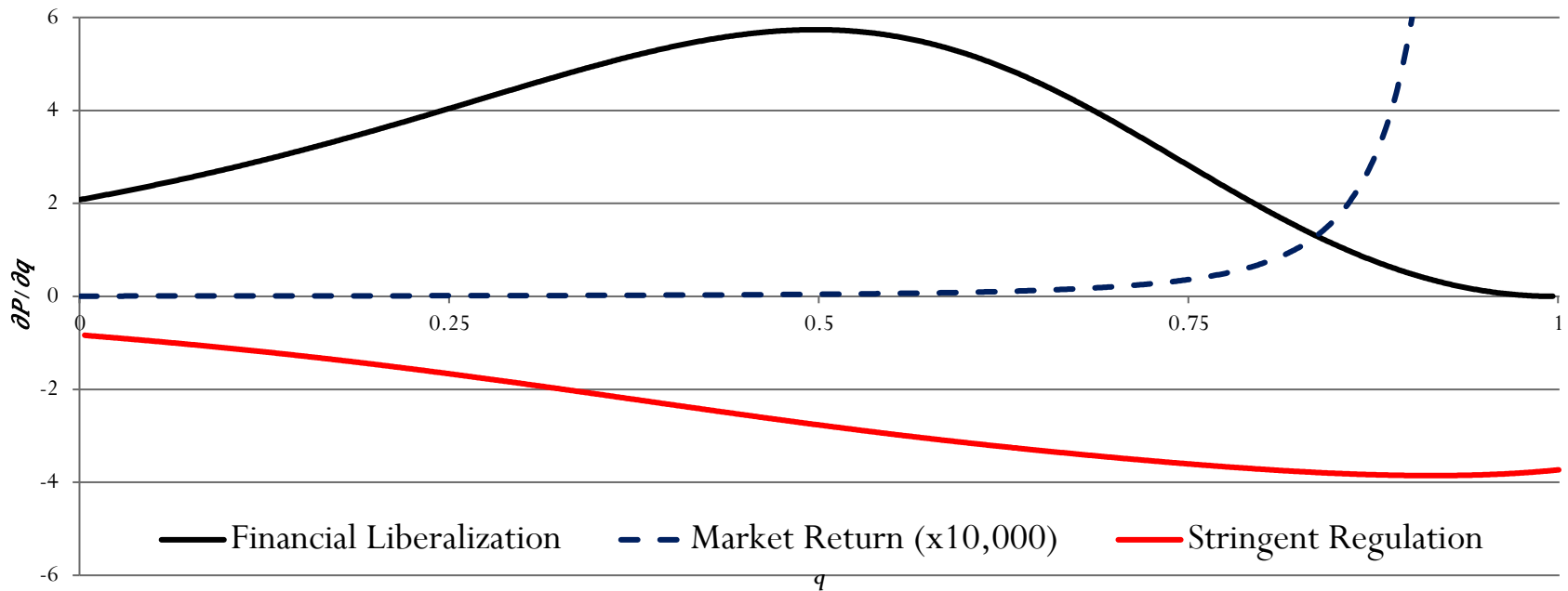$$G = 1 - \frac{\theta}{B(y,z)} \int_0^q x^{a_G - 1}(1-x)^{b_G - 1} dx \qquad \text{with } \theta = 1.0, a_G = 3, \text{ and } b_G = 1$$

$$Q = 1 - \frac{\tau}{B(y,z)} \int_0^q x^{a_Q - 1}(1-x)^{b_Q - 1} dx \qquad \text{with } \tau = 0.5, a_Q = 1, \text{ and } b_Q = 3$$

$$\text{where } B(y,z) = \int_y^z x^{a-1}(1-x)^{b-1} dx$$

Figure 1: Impact of regulation on the probability of a crisis under three scenarios.

NOTES: $\partial P/\partial q$ is divided by 10,000 under market return scenario. Scenarios are alternative: market return scenario at low levels of q, financial liberalization at medium levels of q, and stringent regulation at high levels of q. This pattern implies an inverted U-shaped relationship between q and P.

Testable Hypotheses

- Assumption: Casual nexus from financial regulation to banking crises
- Aim: How regulation and institution affect the probability of banking crises
- Approach: Probit (with macroeconomics and cultural control variables)
- Advance: Nonlinear relationship or interactive terms

- **H1: LINEARITY**. Too strict regulation limits diversification opportunities and incentives banks to undertake risky policies to achieve profits in line with the rest of the market

$$CRISIS_{it} = f(\alpha + \beta REG_{it} + \gamma INST_{it} + \partial CTRL_{it} + \varepsilon_{it}) \qquad \textbf{H1: } \boldsymbol{\beta < 0}$$

- **H2: NON-LINEARITY.** Liberalization rises the probability of banking crisis and improves financial stability only after a given threshold (inverted U-shaped link as '*liberalization trap*').

$$CRISIS_{it} = f(\alpha + \beta_1 REG_{it} + \beta_2 REG2_{it} + \gamma INST_{it} + \partial CTRL_{it} + \varepsilon_{it}) \quad \textbf{H2: } \boldsymbol{\beta_1 > 0, \beta_2 < 0}$$

- **H3: INTERACTION.** The inverted U-shaped link (*liberalization trap*) is more severe in countries with poorer institutions (interactive linear and quadratic terms).

$$CRISIS_{it} = f(\alpha + \beta_1 REG_{it} + \beta_2 REG2_{it} + \gamma INST_{it} + \partial CTRL_{it} \qquad \textbf{H3: } \boldsymbol{\psi_1 < \beta_1, \beta_2 > \psi_2}$$
$$+ \Psi_1 REG * INST + \Psi_2 REG2 * INST + \varepsilon_{it})$$

Econometric Issues

- **SIMULTANEITY**

  - Determinants (included regulation) could be determined by a bank crisis (**ENDOGENEITY PROBLEM**).

  - Regulation is quite persistent. Reform needs time to be implemented.

- **POOLED PROBIT WITH ONE-YEAR LAGGED INDEPENDENT VARIABLES**

  - Crisis dummy and EU dummy poorly manage time and country effects

- **FIXED EFFECTS MODEL (FE):**

  - Limited time dimension severely biases results (**INCIDENTAL PARAMETER PROBLEM)**

  - Countries not affected by crises are dropped (**ATTRITION** and **SELECTION BIAS**)

- **RANDOM EFFECTS MODEL (RE):**

  - Unbiased if the random effects uncorrelated with independent variables (**ORTHOGONALITY**)

  - Crisis could persist (**SERIAL CORRELATION)**

Main Results

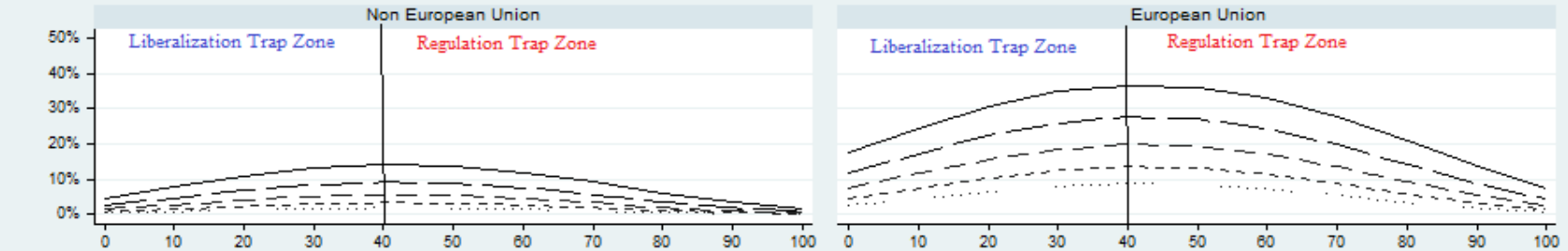**Table 3: Different specifications of the benchmark model, pooled Probit regressions**

VARIABLES	Base (1)	HYP1 (2)	HYP2 (3)	HYP1 (4)	HYP2 (5)	Abiad et al. (6)[a]	Barth et al. (7)[b]
$L.GDPpc$	0.1126***	0.1169***	0.1463***	0.1508***	0.1772***	-0.0154	0.1798***
$L.TOP5$	-0.0136***	-0.0134***	-0.0135***	-0.0123***	-0.0123***	-0.0124**	-0.0180***
IQI	-0.5268	-0.8140#	-1.0337*	-0.8094#	-1.0188*	2.1034**	-0.0870
GFC	0.4115***	0.4112***	0.3717***	0.3971***	0.3615***		1.0959***
$POST\text{-}GFC$	-0.6641***	-0.6681***	-0.7248***	-0.6934***	-0.7432***		
EU	0.7371***	0.7359***	0.7530***	0.7285***	0.7404***		0.8835***
$L.INF$				0.0023**	0.0023**	0.0009	0.0111***
$L.CAB$				-0.0134*	-0.0137*	0.0068	-0.0076
$L.REG$		-0.0029	0.0302**	-0.0004	0.0285**	0.1203***	0.0607***
$L.REG^2$			-0.0004***		-0.0003**	-0.0013***	-0.0005**
$Constant$	-0.5845**	-0.3104	-0.7909*	-0.5706	-0.9769**	-3.8068***	-3.0164***
Observations	2,081	2,028	2,028	1,890	1,890	497	995
Pseudo R^2	0.181	0.180	0.188	0.191	0.198	0.155	0.362
LL Model	-413.7	-411.4	-407.1	-389.1	-385.9	-93.41	-198.6
AIC	841.5	838.9	832.3	798.1	793.8	202.8	417.1
BIC	881	883.8	882.8	853.6	854.8	236.5	466.1
F^{ALL}	88.22	86.90	86.46	83.92	83.39	4.304	69.85
$Pr(F^{ALL})>F$	0	0	0	0	0	0.038	0
F^{REG}	-	0.619	7.973	0.00863	5.764	14.84	9.884
$Pr(F^{REG})>F$	-	0.431	0.019	0.926	0.056	0.001	0.007

NOTES: Pooled Probit regressions. Columns 1-5: 138 countries, 1996-2017. Column 6: 91 countries, 1996-2005. Column 7: 180 countries, 1999-2011. Dependent variable $CRISIS = 1$ if a banking crisis occurred, 0 otherwise. GFC identifies the period around the Great Financial Crisis (2008-2012). $POST\text{-}GFC$ identifies the period after the Great Financial Crisis (2013-2017). $EU = 1$ for EU member countries, 0 otherwise. Prefix L indicates a one-year lagged variable. See Appendix B for the complete list of variable definitions and sources. (a) REG is replaced with the REG-rescaled liberalization index from Abiad et al. (2010). (b) REG is replaced with the REG-rescaled liberalization index from Barth et al. (2013). Pseudo R^2 and LL Model report McFadden's R^2 and the log-likelihood function of the model. AIC and BIC refers to Akaike and Bayesian Information Criterion. F^{ALL} is the statistics of the full specification F-test. F^{REG} is the statistics of a joint F-test on REG terms only. *** $p<0.01$, ** $p<0.05$, * $p<0.10$, # $p<0.15$.
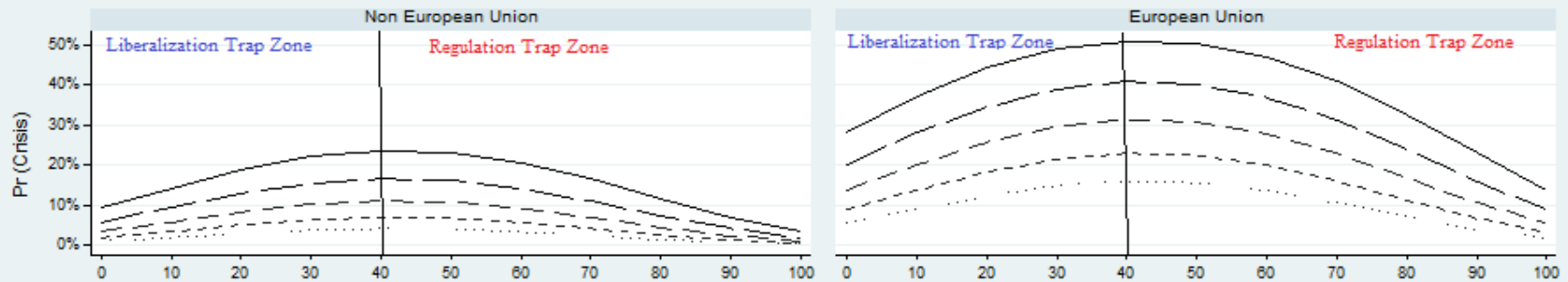
Regulation-Institution Interaction Effect

Adjusted Predictions
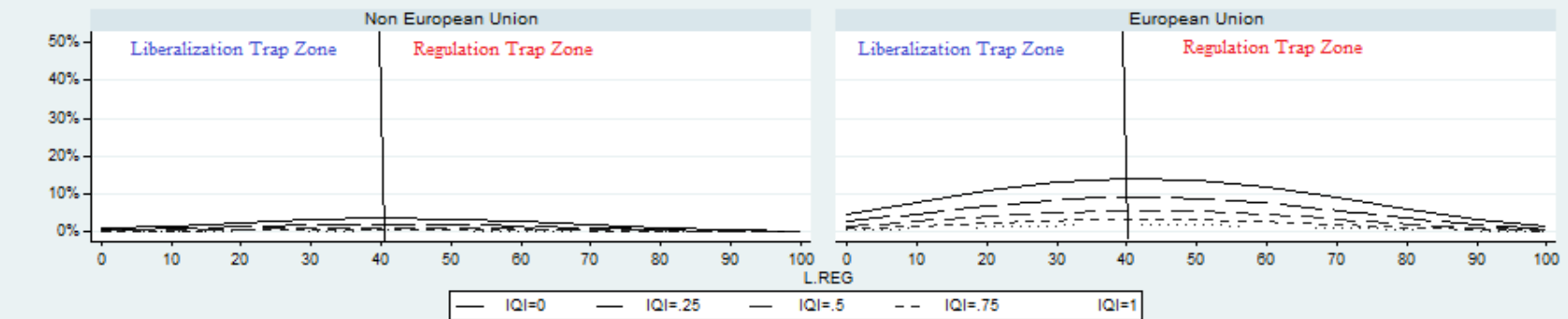
More severe problems for EU

Additional Results

Table 4: Different specifications of the benchmark model, pooled Probit regressions

| VARIABLES	(1) CRISIS	(2) CRISIS	(3) CRISIS	(4) CRISIS	(5) CRISIS	(6) CRISIS	(7) CRISIS	(8) CRISIS	(9) CRISIS	(10) ALL CRISIS
$L.GDPpc$	0.1772***	0.1864***	0.1362***	0.1661***	0.1736***	0.1664***	0.1730***	0.2255***	0.2107***	0.1794***
$L.TOP5$	-0.0123***	-0.0097***	-0.0106***	-0.0096***	-0.0077**	-0.0078**	-0.0090**	-0.0107***	-0.0098***	-0.0109***
IQI	-1.0188*	-3.0932***	-2.8979***	-2.6168***	-2.8753***	-2.7026***	-3.2925***	-3.8151***	-4.1380***	-1.3801***
GFC	0.3615***	0.2869**	0.3314***	0.0443	0.2891**	0.2156#	0.3233***	0.7151*	0.8004**	0.3477***
$POST\text{-}GFC$	-0.7432***	-0.8321***	-0.8136***	-0.8324***	-1.0550***	-1.0432***	-0.8794***	-0.0483	-0.0681	-0.7412***
EU	0.7404***	0.5268***		0.3962**	0.3290*	0.2884#	0.4548**	0.7830***	0.7323***	0.7339***
$L.BAS$		0.0058***	0.0058***	0.0049***	0.0036**	0.0033*	0.0063***	0.0061***	0.0072***	
$L.GINI$		-2.4056***	-2.8981***	-1.7105**	-2.3335**	-2.1071**	-1.3431	-2.5206***	-1.4904	
$ENGLISH$		0.1491	0.1485	0.2494*	0.0505	0.0884	0.4207**	0.2056	0.5139***	
$MUSLIM$		-0.0077***	-0.0077***	-0.0083***	-0.0061*	-0.0063*	-0.0065*	-0.0086***	-0.0069*	
$L.INF$	0.0023**	0.0020*	0.0020*	0.0018#	0.0009	0.0009	0.0017#	0.0007	0.0002	0.0024**
$L.CAB$	-0.0137*	-0.0173**	-0.0173**	-0.0135#	-0.0194**	-0.0183*	-0.0110	-0.0143#	-0.0060	-0.0101#
$L.REG$	**0.0285****	**0.0374*****	**0.0258***	**0.0355*****	**0.0274***	**0.0268***	**0.0390*****	**0.0337****	**0.0357****	**0.0293****
$L.REG2$	**-0.0003****	**-0.0005*****	**-0.0004****	**-0.0004*****	**-0.0004****	**-0.0004****	**-0.0004*****	**-0.0004****	**-0.0004****	**-0.0004*****
$EURO$			0.6594***							
$L.CONTAGION$					0.0468***	0.0153#				
$L.TREND$					0.5433***	0.5189***				
Constant	-0.9769**	0.7278	1.2737*	0.1407	0.6343	0.4445	-0.0095	0.3867	-0.5474	-0.7982*
Regional Dummies	No	No	No	No	No	No	Yes	No	Yes	No
Year Dummies	No	No	No	No	No	No	No	Yes	Yes	No
Observations	1,890	1,666	1,666	1,666	1,666	1,666	1,485	1,566	1,397	1,890
Pseudo R^2	0.198	0.225	0.233	0.255	0.386	0.388	0.228	0.305	0.312	0.180
LL Model	-385.9	-353.5	-349.9	-339.9	-280.4	-279.3	-340.3	-311.5	-297.5	-413.3
AIC	793.8	737.1	729.8	711.9	592.8	592.5	718.5	679	659	848.6
BIC	854.8	818.4	811.1	798.6	679.5	684.6	819.3	829	826.8	909.6
F^{ALL}	83.39	73.54	78.54	43.16	56.85	44	76.99	123.4	125.1	86.62
$Prob(F^{ALL}) > F$	0	0	0	0	0	0	0	0	0	0
F^{REG}	5.764	9.123	6.968	7.327	5.768	5.118	8.376	6.793	5.860	7.186
$Prob(F^{REG}) > F$	0.0560	0.0100	0.0310	0.0260	0.0560	0.0770	0.0150	0.0330	0.0530	0.0280

NOTES: Pooled Probit regressions: 138 countries, 1996-2017. $CRISIS$ = 1 banking crisis, 0 otherwise. ALL_CRISIS = 1 banking, sovereign debt crisis or twin crises, 0 otherwise. GFC identifies the period around the Great Financial Crisis (2008-2012). $POST\text{-}GFC$ identifies the period after the Great Financial Crisis (2013-2017). EU = 1 EU member country, 0 otherwise. $EURO$ = 1 Eurozone member country, 0 otherwise. Prefix L indicates a one-year lagged variable. See Appendix B for the complete list of variables. Pseudo R^2 and LL Model report McFadden's R^2 and the log-likelihood function of the model. AIC and BIC refers to Akaike and Bayesian Information Criterion. F^{ALL} is the statistics of the full specification F-test. F^{REG} is the statistics of a joint F-test on REG terms. *** $p<0.01$, ** $p<0.05$, * $p<0.10$, # $p<0.15$.

What about the Eurozone?

Adjusted Predictions
Pre Great Financial Crisis (1996-2007)
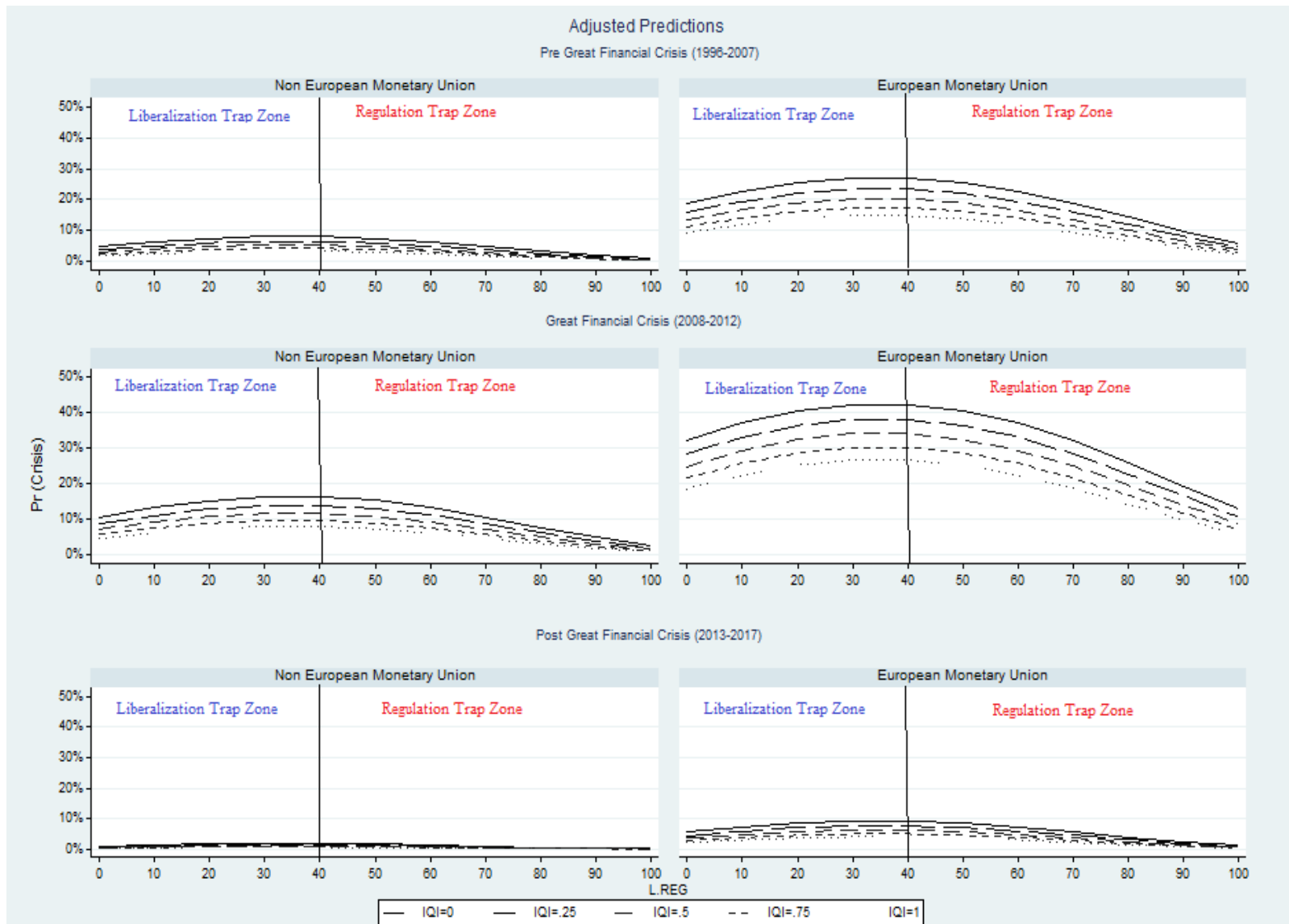
Even more severe problems for EURO

Robustness checks

- **Correlated Random Effects Model (CREM)** approach to allow unobserved heterogeneity to be correlated with observed covariates in a random effects model (Wooldridge, 2010)

- **Dynamic Random Effects Model (DREM)** to allow for the inclusion of the lagged dependent variable as a covariate without incurring the initial conditions problem (Wooldridge 2005)

- **Double correction (DCOR)**: CREM and DREM simultaneously

- **Instrumental Variables:** different instruments

- **Two-years waves** collapse

- **Different data frequency**

Conclusions

- Mixed impact of financial regulation on the probability of banking crises

- Potential presence of on non-linearity or interactive terms

- We test both the hypotheses assuming that regulation causes banking crises

- **The regulation-crisis relationship is inverted U-shaped**

- The relationship is **sensitive to the country-specific institutional quality**

- A vicious cycle at work triggers **a regulation and a liberalization trap.**

- **Coordination issue for the EU**: more rules or a freer sector? Brexit?

- Digging deeper: **more bad news for the Eurozone**. Structural shortcomings?