

The impact of macroprudential policies on industrial output

Carlos Madeira

Central Bank of Chile

Workshop Identification and measurement of macroprudential policies' effects: June 3, 2021

Impact of financial regulation on growth

- Recent studies show a negative impact of macroprudential policies (MaPPs) on the growth of housing prices, mortgages, total credit, household credit and corporate credit (Cerutti, Claessens and Laeven 2017, Akinci and Olmstead-Rumsey 2018). Non-financial effects are still understudied with no clear effect on GDP (Alam et al. 2019).
- Rajan and Zingales (1998)** find that industrial growth (industry-country panel, UNIDO) is positively affected by the interaction of the industry's **external finance dependence** (measured as the median firm value of $\frac{\text{Capital_Expenditures} - \text{Cash_flow}}{\text{Capital_Expenditures}}$ in each US industry in the 1980s) with the country's financial development (Domestic credit to private sector over GDP).
- Past (Braun and Larrain 2005, Raddatz 2006, Cowan and Raddatz 2013): $EXFD_i \times \{FD_c; R_{c,t}; SS_{c,t}\}$. **Today:** $EXFD_i \times MaPP_{c,t}$.

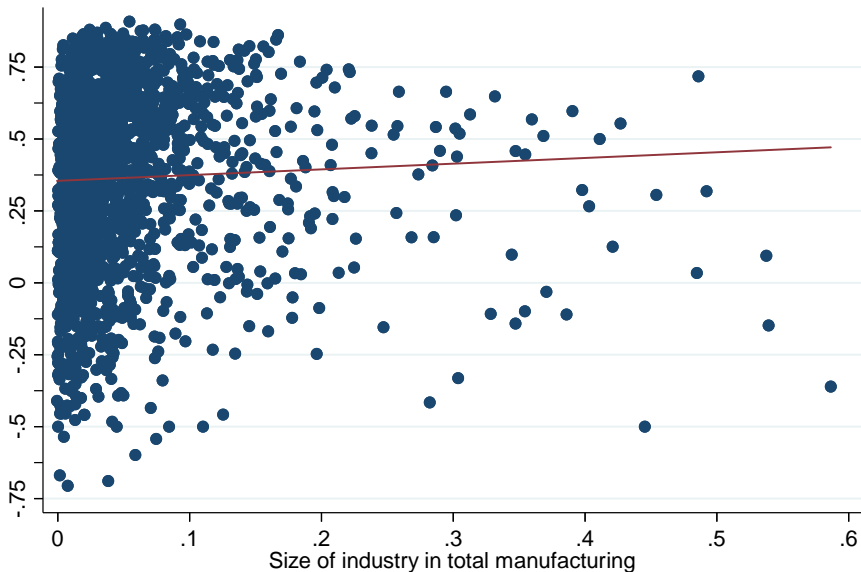
This work

- I test the impact of the MaPPs (IMF: Alam et al. 2019) on the Index of Industrial Production growth ($g_{i,c,t} = \ln\left(\frac{IIP_{i,c,t}}{IIP_{i,c,t-1}}\right)$) of 93 countries and 23 manufacturing industries (UNIDO: Indstat2) for the period 1990-2016 (annual). $PP_{c,t}$ is the net tightening actions in a period. Cumulative policy impact: $CPP_{c,t} = \sum_{j=1990}^t PP_{c,j}$.
- $g_{i,c,t} = \beta [PP_{c,t}, CPP_{c,t}] + \gamma EFD_i [PP_{c,t}, CPP_{c,t}] + \delta x_{i,c,t} + f_{i,c} + f_t + \varepsilon_{i,c,t}$
- $\ln(\hat{V}(g_{i,c,t})) = \beta_v [PP_{c,t}, CPP_{c,t}] + \gamma_v EFD_i \times [PP_{c,t}, CPP_{c,t}] + \delta_v x_{i,c,t} + \tilde{f}_{i,c} + \tilde{f}_t + \tilde{\varepsilon}_{i,c,t}$, with $\hat{V}(g_{i,c,t}) = (g_{i,c,t} - E[g_{i,c,t} | z_{i,c,t}])^2$
- Identification (MaPP exogeneity): Manufacturing is just 11.1% of the GDP for the median country, therefore each of the 23 manufactures has no impact on the regulatory decisions. OLS-FE; QREG-FE; BB-FE (Blundell-Bond 1998). Can add $f_{i,t}$.

- 17 MaPPs of different types (vector $PP_{c,t}$).
 - Loan Demand: LTV + DSTI
 - Loan Supply: Limits on Credit Growth (LCG) + Loan Loss Provisions (LLP) + Loan restrictions (LoanR) + Limits and penalties to the loan-to-deposit (LTD) + Limits on foreign currency lending (LFC)
 - **Loan Sum** ($LPP_{c,t}$) = Loan Demand + Loan Supply
 - Supply general = RR + Liquidity + Limits on foreign exchange exposure (LFX).
 - Supply capital = Unweighted Leverage Ratio (LVR) + CCB + Conservation buffer + Capital requirements
 - **Supply Sum** ($SPP_{c,t}$) = Supply general + Supply capital
 - **Institutional Sum** ($OPP_{c,t}$): Tax + SIFI + Other (ex: stress tests, limits on dividends)

- Total MaPPs ($TPP_{c,t}$) = Sum of Loan + Supply + Institutional

Correlation between industries and GDP growth



● Correlation coef of real industry growth with GDP

— Fitted values

Analysis: OLS-FE

Effects on manufacture growth ($Y = g_{i,c,t}$) of the countries' overall macropudential ($TPP_{c,t}$, $CTPP_{c,t}$): OLS-FE

Exogenous var.	OLS $TPP_{c,t}$	$CTPP_{c,t}$	w/ $CTPP_{c,t-1}$	BB-FE
$TPP_{c,t}$	0.0032***	0.0030***	0.00087	0.0012
$CTPP_{c,t}$	5.07e-05	-0.0003	-0.0001	-0.0094***
$TPP_{c,t} \times EFD_i$	-0.0038**	-0.0039**	-0.0035*	-0.0060***
$CTPP_{c,t} \times EFD_i$	-0.0019***	-0.0019***	-0.0020***	-0.0075***
$Share_{i,c,t-1}$	-0.172***	-0.165***	-0.166***	-0.875***
$\ln(GDPpcPPP_{c,t})$		-0.0024	-0.0081	
$g_{c,t}^{GDP}$			1.111***	-0.143***
$g_{c,t-1}^{GDP}$		0.309***	-0.118***	0.179***
$inf_{c,t}^{GDP}$		-0.0462***	-0.0340***	-0.103***
$g_{i,c,t-1}$				-0.150***
FE (i,c) +FE (t)			Yes	
N	35,401	35,401	34,701	33,660
R-2 (within)	0.101	0.112	0.161	
Nr of id	1,730	1,730	1,730	1,730

Analysis: QREG-FE

Effects on manufacture growth ($Y = g_{i,c,t}$) of the countries' overall macropudential ($TPP_{c,t}$, $CTPP_{c,t}$): QREG-FE

Exogenous var.	Q 25	Q 50	Q 75	Q 90
$TPP_{c,t}$	0.0039*	0.0030**	0.0021	0.0012
$CTPP_{c,t}$	-0.0006	-0.0003	-7.80e-05	0.0002
$TPP_{c,t} \times EFD_i$	-0.0019	-0.0011	-0.0003	0.0004
$CTPP_{c,t} \times EFD_i$	-0.0009	-0.0020*	-0.0030**	-0.0040**
$Share_{i,c,t-1}$	-0.146	-0.166***	-0.185***	-0.204**
$\ln(GDPpcPPP_{c,t})$	0.0351	-0.0036	-0.041**	-0.076***
$g_{c,t-1}^{GDP}$	0.419***	0.306***	0.198***	0.0959
$inf_{c,t}^{GDP}$	-0.068***	-0.046***	-0.0236	-0.0029
FE (i,c)+FE (t)	Yes			
N / id	35,401 / 1,730			

Periods of low, median and high growth (HP filter)

Effects on manufacture growth ($Y = g_{i,c,t}$) of the countries'

overall macropudential ($TPP_{c,t}$, $CTPP_{c,t}$): OLS-FE

Exogenous var.	Low (pc: 1-30)	Median (pc: 31-60)	High (pc: 61-100)
$TPP_{c,t}$	0.0079***	0.0014	0.0013
$CTPP_{c,t}$	-0.0023***	0.0003	0.0010
$TPP_{c,t} \times EFD_i$	-0.0175***	0.0011	0.0012
$CTPP_{c,t} \times EFD_i$	-0.0011	-0.0037***	-0.0047**
$Share_{i,c,t-1}$	-0.192***	-0.094**	-0.188***
$\ln(GDPpcPPP_{c,t})$	0.0081	-0.046***	-0.0143
$g_{c,t-1}^{GDP}$	0.498***	0.295***	0.113**
$inf_{c,t}^{GDP}$	-0.0207*	-0.094***	-0.024***
FE (i,c)+FE (t)		Yes	

Variance analysis: OLS-FE and QREG-FE

Effects on manufacture growth volatility ($Variance_{i,t} = \ln((g_{i,c,t} - \hat{g}_{i,c,t})^2)$)
of the overall macropudential ($TPP_{c,t}$, $CTPP_{c,t}$)

Controls	OLS-FE	BB	Q25	Q50	Q75
$TPP_{c,t}$	-0.035**		-0.045**	-0.031**	-0.021
$CTPP_{c,t}$	0.0016	0.028*	0.0007	0.002	0.003
$EFD_j \times TPP$	0.058*		0.076*	0.051*	0.033
$EFD_j \times CTPP_{c,t}$	-0.033**	-0.010***	-0.033**	-0.033***	-0.033***
$Variance_{i,t-1}$		-0.132***			
$Share_{i,c,t-1}$	-0.054	3.847***	0.634	-0.298	-0.970*
$\ln(GDPpc_{c,t})$	-0.960***	-2.032***	-0.997***	-0.947***	-0.911***
$g_{c,t-1}^{GDP}$	-2.309***	0.287	-2.248***	-2.331***	-2.390***
$inf_{c,t-1}^{GDP}$	0.602***	0.550***	0.614***	0.598***	0.587***

FE (i,c)+FE (t): Yes. N / id: 35,396 / 1,725

Different kinds of countries

Effects on manufacture growth ($Y = g_{i,c,t}$) of the macroprudential policies across country types

OLS-FE	Country types		
	AEs	EMs	LICs
Controls			
$TPP_{c,t}$	0.001 (0.001)	-0.0005 (0.001)	0.003 (0.003)
$CTPP_{c,t-1}$	0.0008 (0.0006)	-0.001*** (0.0005)	0.0005 (0.001)
$TPP_{c,t} \times EFD_i$	-0.010*** (0.003)	-0.006** (0.003)	0.015*** (0.004)
$CTPP_{c,t-1} \times EFD_i$	-0.003** (0.001)	-0.0005 (0.0008)	-0.006** (0.003)
N	16,186	11,166	7,460
R-square	0.215	0.156	0.042
Nr of groups	708	560	462

Policy implications: All countries and AEs

Impact (in percentage points) of 5 additional macroprudential policies

Dependent variable	Industrial growth					ln(volatility)
Table (column) model	T2 (3)	T3 (1)	T3 (2)	T3 (3)	T3 (4)	T5 (1)
Regression type	OLS	Q25	Q50	Q75	Q90	OLS-FE
All countries (percentiles) - 93 countries						
P10	-0.50	-0.55	-0.64	-0.73	-0.81	-5.73
P25	-0.42	-0.50	-0.55	-0.60	-0.65	-4.46
P50	-0.33	-0.45	-0.46	-0.47	-0.48	-3.07
P75	-0.26	-0.41	-0.38	-0.36	-0.33	-1.91
P90	-0.19	-0.37	-0.31	-0.26	-0.20	-0.89

Conclusions

The growth of industries with high external financial dependence is negatively affected by Macroprudential policies, whether through the cumulative policy stance or newly introduced policies.

The effect is stronger in periods of high growth (q75, q90).

The cumulative total policy stance ($CTPP_{c,t}$) has a negative impact on the growth variance.

Impact higher on AEs and EMs (impact is higher on LICs' industries, but LICs have fewer industries with high external dependence).