Lender Concentration of External Debts and Sudden Stops

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Motivation

- Emerging markets (EM) prone to sudden stops tend to borrow too much (overborrowing) as borrowers fail to internalize pecuniary externality
  - Sudden stop: countries' capital inflows suddenly stop in downturns
  - Pecuniary externality: individual decisions affect aggregate asset prices
- Macroprudential policies decentralizes borrower's pecuniary externality
- However, large lenders may also internalize pecuniary externality to maintain collateral price (Favara & Giannetti, 2017)
- Empirical finding: EMs have more concentrated lender structure
- Questions: How does lender concentration affect overborrowing? What happen if lender countries can optimally choose lender concentration?

Recent foreclosure on private external debt

- In 2017 and 2019, a Venezuela oil firm PDVSA faced foreclosure after defaulting on debt to Russian company Rosneft in 2016.
- PDVSA's U.S. subsidiary shares served as collateral worth 1.5 billion USD (1.3% of Venezuela's GDP) were auctioned in October 2023

This paper

- Documents two empirical facts:
  - Lender structure of external debts are more concentrated in EMs
  - Lender concentration alleviates severity of sudden stops
  - Implications: EMs demand less precautionary saving hence borrow more
- Develop an SOE-DSGE model with heterogeneous lenders of different sizes
- Theoretically characterize effect of lender concentration on deb decision
- Calibrate to Argentina and quantify effect of lender concentration
- Numerical counterfactual: optimal lender concentration

Results overview

- Lender concentration affects eq via nominal tightness of constraint and future expected repayments in foreclosure states
- Lender concentration *increases* debt in competitive equilibrium (CE)?
  - Lender concentration raises future asset price and borrowing
- Lender concentration *does not affect* social planner's (SP) borrowing
  - SP completely avoids foreclosure
- Overborrowing ($CE - SP$) is increasing in lender concentration
- What happen when allowing lenders to choose concentration? *Lenders want to raise concentration, leading to more borrowing and 1.5% higher welfare*

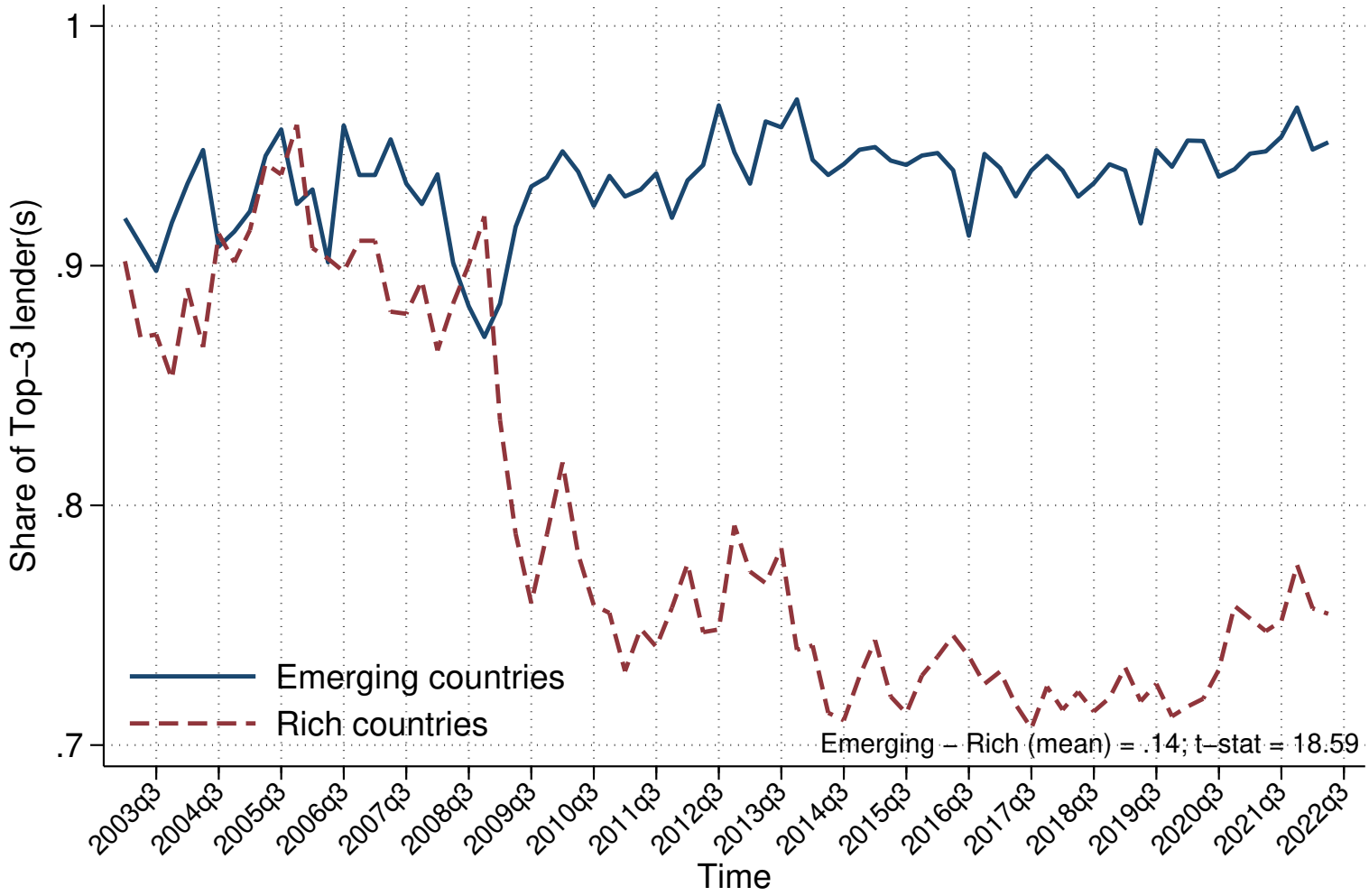
Related literature

- Open economy with pecuniary externality: Uribe (2006), Bianchi (2011), Benigno et al. (2013), Benigno et al. (2016), Bianchi & Mendoza (2018), Schmitt-Grohé & Uribe (2018), Jeanne and Korinek (2019), Schmitt-Grohé & Uribe (2021), Benigno et al. (2022), and Chi et al. (2024)
  - This paper focuses on how lenders internalize pecuniary externality (PE)
- Lender concentration & external debt: Fernández & Ozler (1999), Hardy (2019)
- Optimal creditor concentration: Bolton & Scharfstein (1996), Bolton & Jeanne (2009), Zhong (2021)
  - This paper emphasizes that lender structure internalizes inefficiency from PE
  - This paper focuses on private loans not subject to sovereignty

Bank-level Data of external debt

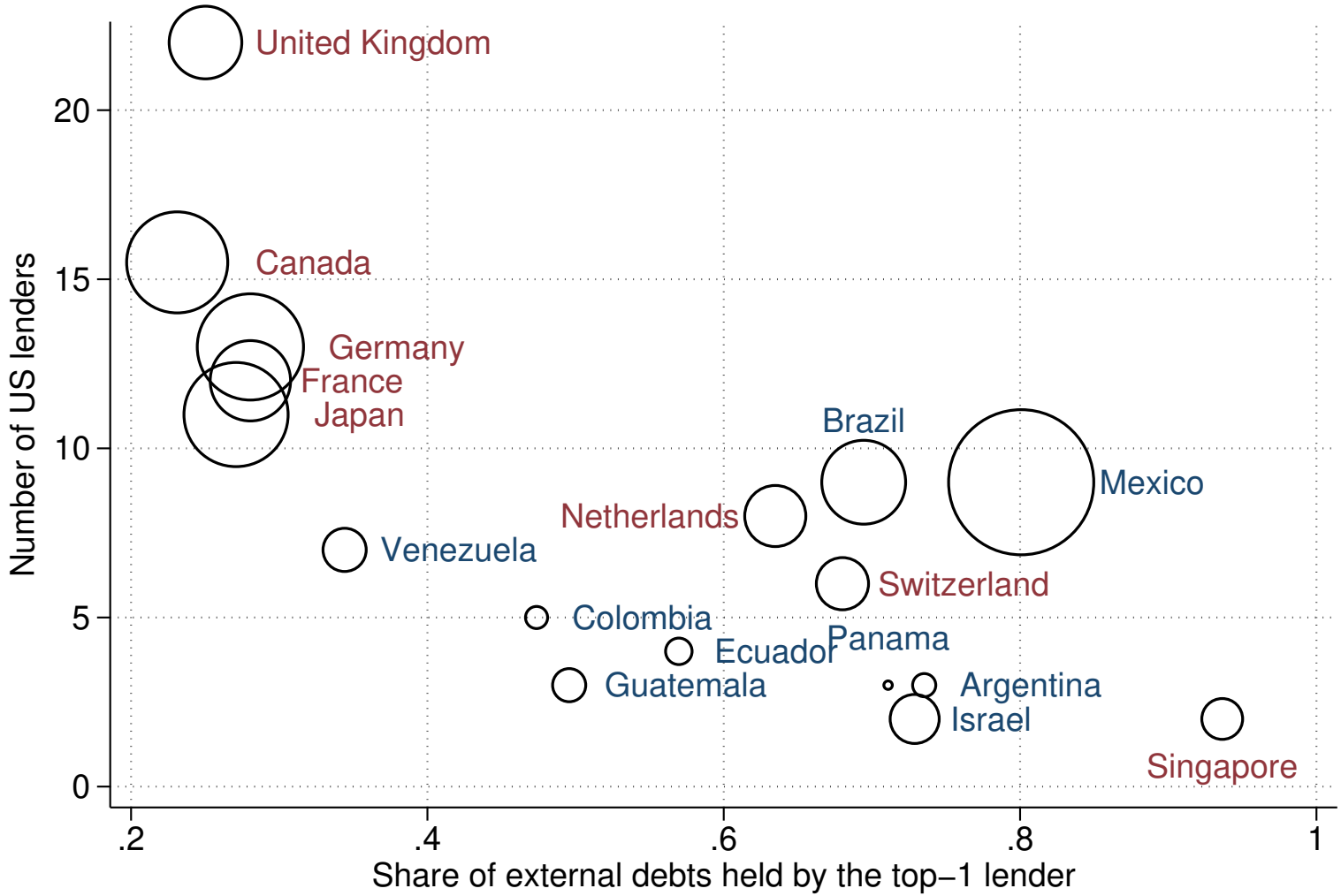
- Data source: Federal Financial Institutions Examination Council's 009a form
- Quarterly exposure of individual US banks to other countries' external debts
- 2003Q1 - 2022Q3; 125 US banks (lenders); 103 countries (borrowers)
- Balanced panel: 18 countries (excludes Cayman Islands, 9 EMs and 8 RMs)
- External Debt: deposit balances held at banks, securities, and loans
- Quarterly sudden stops: Eichengreen and Gupta (2016)
  - Start: capital flows drop below 1 s.d. lower than mean past 20 quarters
  - End: capital flows revert back to 1 s.d. below mean or back to mean
- Also use DealScan includes syndicated lending by all countries besides US
  - Universe of lender countries but only for specific loan type

Top-3 Lender concentration



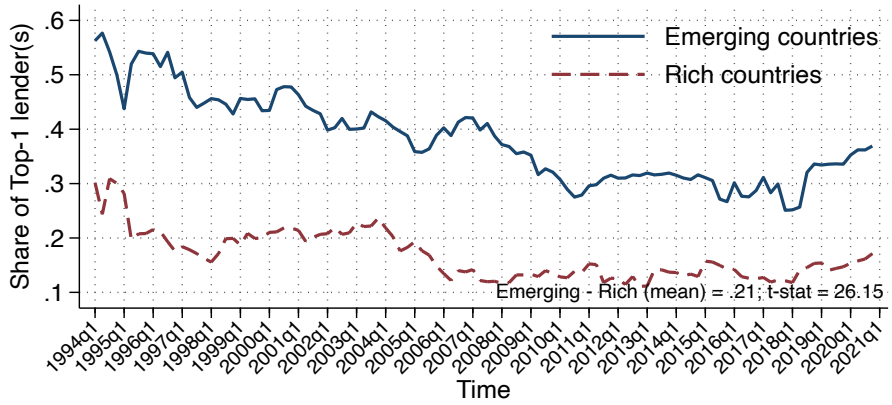
Lender structure in EM has been more concentrated than RM since GFC

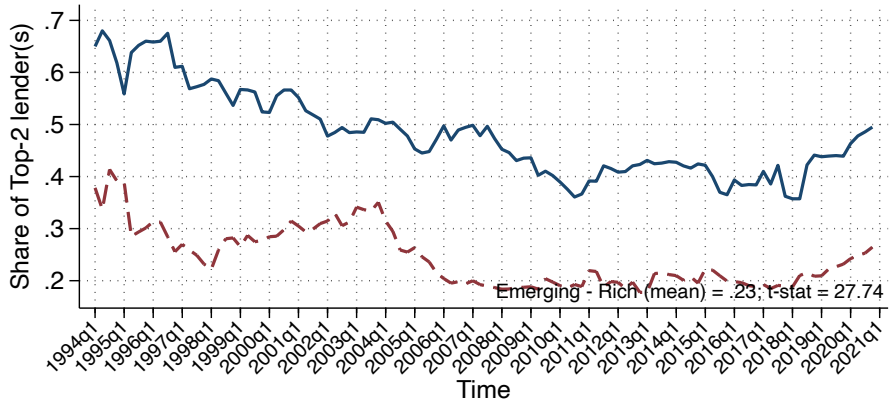
Number of lenders & top-1 share

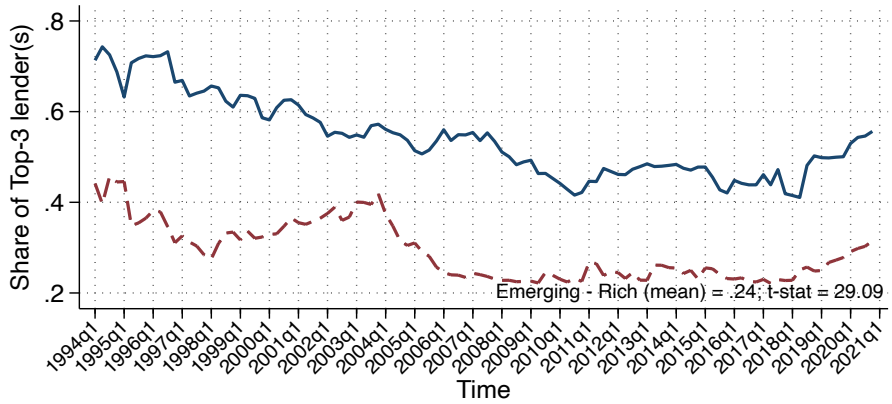


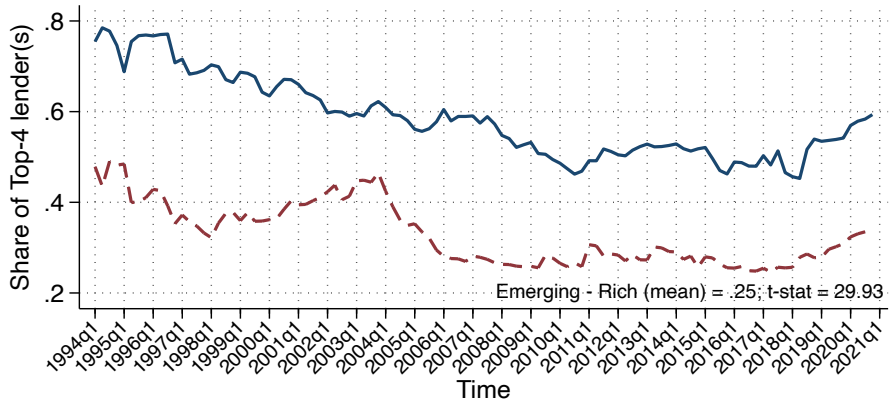
Rich countries heavily relied on US borrow from more lenders than EMs

Concentration in syndicated loan market









Lender concentration of emerging countries is higher than rich countries

Lender concentration alleviates sudden stops

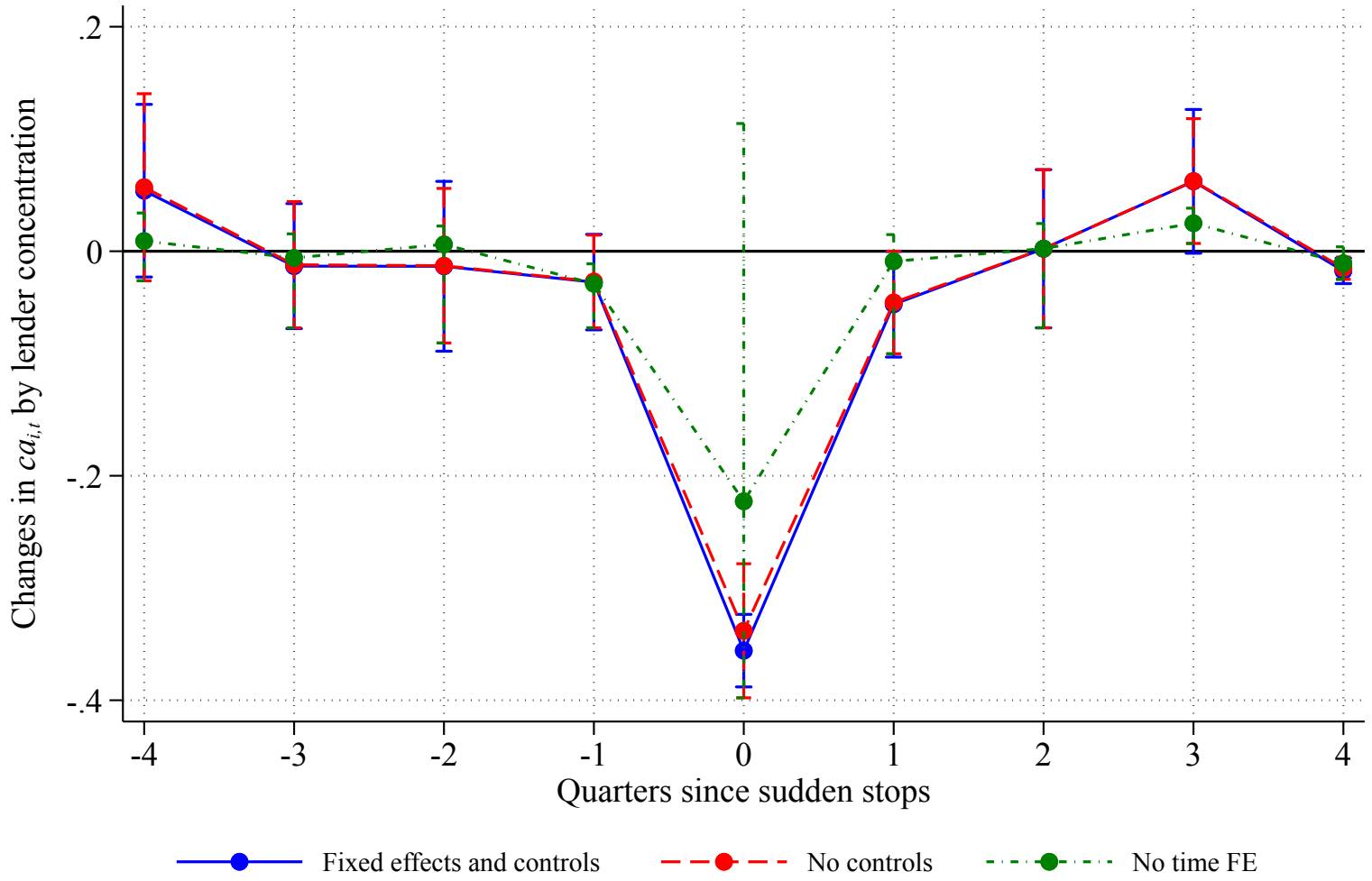
$$ca_{i,t} = \alpha_0 + \alpha_1 SS_{i,t} + \alpha_2 Con_{i,t-1} + \alpha_3 SS_{i,t} \times Con_{i,t-1} + X_{i,t} + F_i + F_t + \epsilon_{i,t}$$

$$Triple_{i,t} = SS_{i,t} \times Con_{i,t-1} \times RolloverRisk_{i,t-1}$$

Dependent: $ca_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Con_{i,t-1}$ measure	$L^{Top1}_{i,t-1}$	$L^{Top1}_{i,t-1}$	$L^{Top1}_{i,t-1}$	$L^{Top3}_{i,t-1}$	$L^{Top3}_{i,t-1}$	$L^{Top3}_{i,t-1}$	$HHI_{i,t-1}$	$HHI_{i,t-1}$	$HHI_{i,t-1}$
$SS_{i,t}$	1.475	2.157	2.447	15.51***	19.02**	18.78**	1.176	1.743	2.025
	(0.67)	(1.11)	(1.17)	(2.66)	(2.56)	(2.07)	(0.61)	(1.00)	(1.10)
$Con_{i,t-1}$	-0.024	-0.025	-0.027	-0.045	-0.041	-0.051	-0.016	-0.018	-0.019
	(-0.89)	(-0.94)	(-1.02)	(-0.84)	(-0.65)	(-0.77)	(-0.73)	(-0.79)	(-0.83)
$SS_{i,t} \times Con_{i,t-1}$	-0.067***	-0.081***	-0.095***	-0.195***	-0.235***	-0.233**	-0.065***	-0.079***	-0.093***
	(-2.66)	(-4.66)	(-2.71)	(-3.44)	(-3.47)	(-2.45)	(-2.95)	(-4.65)	(-2.75)
$ca_{i,t-1}$		-0.022***	-0.023***		-0.022***	-0.023***		-0.022***	-0.023***
		(-6.14)	(-5.42)		(-5.40)	(-4.63)		(-6.11)	(-5.57)
$gdp_{i,t}$		-2.991	-4.723		-2.631	-4.284		-3.144	-4.902
		(-0.41)	(-0.63)		(-0.35)	(-0.54)		(-0.43)	(-0.65)
$Triple_{i,t}$			0.089			-0.014			0.100
			(0.27)			(-0.03)			(0.30)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3,045	2,875	2,722	3,045	2,875	2,722	3,045	2,875	2,722
R^2	0.041	0.045	0.047	0.041	0.045	0.047	0.041	0.045	0.047

1 sd increase in $L^{Top3}_{i.t}$ (7%) alleviates 1.7% ca reversal (9% of ca reversal)

No pretrend on changes in current account



ca in Sudden stop features no pretrend and sudden reversal

Lender concentration alleviates price drop

$$rer_{i,t} = \alpha_0 + \alpha_1 SS_{i,t} + \alpha_2 Con_{i,t-1} + \alpha_3 SS_{i,t} \times Con_{i,t-1} + X_{i,t} + F_i + F_t + \epsilon_{i,t}$$

Dependent: $rer_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Con_{i,t-1}$ measure	$L^{Top1}_{i,t-1}$	$L^{Top1}_{i,t-1}$	$L^{Top1}_{i,t-1}$	$L^{Top3}_{i,t-1}$	$L^{Top3}_{i,t-1}$	$L^{Top3}_{i,t-1}$	$HHI_{i,t-1}$	$HHI_{i,t-1}$	$HHI_{i,t-1}$
$SS_{i,t}$	0.0480***	0.0489***	0.069***	0.261**	0.254***	0.363**	0.030***	0.031***	0.049**
	(4.05)	(5.66)	(3.04)	(2.59)	(2.76)	(2.43)	(3.51)	(5.32)	(2.55)
$Con_{i,t-1}$	0.000	0.000	0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(1.29)	(0.97)	(0.64)	(-0.59)	(-1.22)	(-1.85)	(1.39)	(1.06)	(0.71)
$SS_{i,t} \times Con_{i,t-1}$	-0.001***	-0.001***	-0.001***	-0.003**	-0.003***	-0.004**	-0.001***	-0.001***	-0.001***
	(-6.21)	(-9.66)	(-5.93)	(-2.64)	(-2.79)	(-2.47)	(-6.13)	(-9.69)	(-4.85)
$rer_{i,t-1}$		0.161***	0.156***		0.163***	0.157***		0.161***	0.156***
		(3.01)	(2.79)		(3.08)	(2.88)		(3.01)	(2.77)
$gdp_{i,t}$		-0.005	-0.006		-0.005	-0.005		-0.004	-0.006
		(-0.91)	(-1.03)		(-0.96)	(-1.03)		(-0.84)	(-0.99)
$Triple_{i,t}$			-0.008			-0.004*			-0.010
			(-1.39)			(-1.72)			(-1.49)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,197	2,077	1,979	2,197	2,077	1,979	2,197	2,077	1,979
R^2	0.099	0.120	0.126	0.095	0.117	0.122	0.099	0.120	0.126

rer (inverse of nontrable price) drops by less under higher concentration

A Model of lender concentration

- Goal: How does lender concentration affect agents and planner's borrowing?
- SOE-DSGE model with occasionally-binding collateral constraint and
  - Borrowers can only consume collateral once debts are repaid
  - When borrowers default, lenders foreclose on optimal collateral amount
- Exogenous lender structure: A largest lender provides η of total loans and atomistic lenders contribute remaining $(1-\eta)$ in aggregate.
  - Large lender internalizes price change, atomistic lenders take price as given
  - Lenders set interest rate endogeneously based on expected future repayments
  - Comparative static of η, later relax this by allowing lenders to choose η

A Model of lender concentration cont.

- A continuum of identical domestic borrowers subject to collateral constraint
- Endowment economy with tradable and nontradable goods y_t^T and y_t^N
- Foreclosure ($y_t^T < d_t$) and sudden stop ($d_{t+1}R_t^{-1} = \kappa p_t y_t^N$) are different
  - Foreclosure: defaults in which agents fail to repay initial debt
    - ★ Lenders affect borrowers consumption
  - Sudden stop: agents repay initial debt but are constrained to issue new debt
    - ★ Economy is subject to standard pecuniary externality
  - Correlation: foreclosure lowers collateral price and triggers sudden stops
  - Less likely to have multiple equilibria

Timing of competitive equilibrium

- Period t begins. Agents receive y_t^T to repay the initial debt d_t
- If $y_t^T < d_t$, agents can't fully repay their loans. Lenders waive d_t and foreclose collateral y_{t-1}^N; If $y_t^T \geq d_t$, agents fully repay debt (no foreclosure)
- Agents consume remaining (all) collateral y_{t-1}^N if there is (no) foreclosure
- Agents receive and pledge y_t^N as collateral
- Lenders sell seized collateral (if any). Agents choose d_{t+1} and c_t^T under (p_t, r_t). If y_t^N is so low that $d_{t+1}R_t^{-1} = \kappa p_t y_t^N$, economy falls into sudden stop
- Period $t+1$ begins. Agents receive y_{t+1}^T to repay the initial debt d_{t+1}

Domestic agents

$$\max U_0 = E_0 \left[\sum_{t=0}^{\infty} \beta^t u \left(c_t(c_t^T, c_t^N) \right) \right]$$

subject to

$$c_t^N = \zeta_t^* y_{t-1}^N I_t + y_{t-1}^N (1 - I)$$

$$c_t^T = y_t^T + \frac{d_{t+1}}{1 + r_t} - d_t(1 - I_t) - p_t c_t^N - \delta I_t$$

$$\frac{d_{t+1}}{1 + r_t} \leq \kappa p_t y_t^N$$

- I_t foreclosure dummy: $I_t = 1$ if $y_t^T < d_t$ (fail to repay debt), 0 otherwise
- $\zeta_t^* = \eta \zeta_t^{L*} + (1 - \eta) \zeta_t^{A*}$: weighted sum of foreclosure rates $\zeta_t^{L*}, \zeta_t^{A*} \in [0, 1]$

Domestic agents: optimality conditions

$$\lambda_t = \frac{\partial u(c_t)}{\partial c_t^T} \qquad (c_t^T)$$

$$p_t = \left(\frac{1-a}{a}\right)\left(\frac{c_t^T}{c_t^N}\right)^{1/\xi} \qquad (c_t^N)$$

$$\lambda_t = -\beta(1+r)\frac{\partial E_t U_{t+1}}{\partial d_{t+1}} + (1+r)\mu_t \qquad (d_{t+1})$$

$$0 \leq \mu_t \left[\kappa p_t y_t^N - d_{t+1}\right], \quad 0 \leq \mu_t \qquad (cs)$$

- λ_t shadow price of budget constraint; μ_t shadow price of collateral constraint

Back

Effect of foreclosure on agents' decision

$\forall y_t^T \in [\underline{y}^T, \bar{y}^T]$, expected utility in $t+1$ is given by

$$E_t U_{t+1} = \overbrace{\int_{\underline{y}^T}^{d_{t+1}} u\left(c_{t+1}^F\right) \phi_y dy_{t+1}^T}^{\text{Foreclosure states}} + \overbrace{\int_{d_{t+1}}^{\bar{y}^T} u\left(c_{t+1}^{NF}\right) \phi_y dy_{t+1}^T}^{\text{No-foreclosure states}}$$

$$\frac{\partial E_t U_{t+1}}{\partial d_{t+1}} \propto \phi(d_{t+1}|y_t^T) \left[\underbrace{u\left[c_{t+1}^F(\cdot; d_{t+1})\right] - u\left[c_{t+1}^{NF}(d_{t+1}; d_{t+1})\right]}_{\text{Change in utility from regime switching}} \right]$$

- Increasing d_{t+1} switches some y_{t+1}^T realization from no-foreclosure to foreclosure state
- Lender concentration only affects $U'(d_{t+1})$ via $u\left[c_{t+1}^F(\cdot; d_{t+1})\right]$

Foreign Lenders: foreclosure decisions

- **Atomistic lenders** foreclose ζ_t^A share of collateral y_{t-1}^N taking p_t as given:

$$\max_{\zeta_t^A} \zeta_t^A p_t y_{t-1}^N \Rightarrow \zeta_t^{A*} = 1, \ \ \forall t$$

- **Large lender** internalizes effect of ζ_t^L on p_t via nontradable supply:

$$\max_{\zeta_t^L} \zeta_t^L \left(\frac{1-a}{a}\right) \left(\frac{c_t^T}{\left[\eta_t \zeta_t^L + (1-\eta_t)\right] y_{t-1}^N}\right)^{1/\xi} y_{t-1}^N$$

$$\Rightarrow \zeta_t^{L*} = \frac{(1-\eta)}{\eta}\left(\frac{\xi}{1-\xi}\right)$$

  - ζ_t^{L*} decreases with η: internalizing pecuniary externality!
  - $\zeta_t^* = \eta\zeta_t^{L*} + (1-\eta)$ also decreases with η

Interest rates and default risk

- Risk-neutral lender l sets r_t^l, depending on lender-specific future repayments:

$$(1+r^*) = \left(1+r_t^l\right)\left[\int_{\underline{y}^T}^{d_{t+1}} \frac{\zeta_{t+1}^{l*} p_{t+1}^F y_t^N}{d_{t+1}} \phi_y dy_{t+1}^T + \int_{d_{t+1}}^{\bar{y}^T} 1\phi_y dy_{t+1}^T\right]$$

- Large lender charges higher rate ($r_t^L > r_t^A$) due to less expected repayments
- Rate of d_{t+1} is weighted: $(1+r_t)^{-1} = \eta\left(1+r_t^L\right)^{-1} + (1-\eta)\left(1+r_t^A\right)^{-1}$
- Special case: if default prob $\phi(y_{t+1}^T | y_{t+1}^T < d_{t+1}, y_t) = 0$, $r_t^A = r_t^L = r^*$

Lemma: Debt-dependent interest rate

If $(\zeta_{t+1}^* p_{t+1}^F y_t^N)/d_{t+1} < 1$, then $\partial r_t / \partial d_{t+1} > 0$

Effect of concentration in normal times

- η affects decentralized allocation via expected marginal utility:

$$\frac{\partial E_t U_{t+1}}{\partial d_{t+1} \partial \eta} = \phi(d_{t+1}|y_t^T) \frac{\partial u[c_{t+1}^F(c_{t+1}^{N,F}, c_{t+1}^{T,F})]}{\partial \eta}$$

- If $\frac{\partial E_t U_{t+1}}{\partial d_{t+1} \partial \eta} > 0 \Rightarrow \frac{\partial d_{t+1}}{\partial \eta} > 0$ as marginal benefit of debt increases with η
- It really depends on how η affect $c_{t+1}^{N,F}$ and $c_{t+1}^{T,F}$:
  - $c_{t+1}^{N,F} = \zeta_{t+1}^* y_t^N$ always decreases with η
  - $c_{t+1}^{T,F} = y_{t+1}^T + \frac{d_{t+2}}{1+r} - p_{t+1} \zeta_{t+1}^* y_t^N$ increases with η
- Quantitatively, effect of $c_{t+1}^{T,F}$ dominates so that $\frac{\partial E_t U_{t+1}}{\partial d_{t+1} \partial \eta} > 0 \Rightarrow \frac{\partial d_{t+1}}{\partial \eta} > 0$

CE conditions

Effect of concentration in sudden stops

- d_{t+1} is pinned down by the binding collateral constraint:

$$d_{t+1} = \kappa \underbrace{\left(\frac{1-a}{a}\right)\left(\frac{c_t^T}{\zeta_t^* y_{t-1}^N}\right)^{\frac{1}{\xi}}}_{p_t} y_t^N$$

- η alleviates crises: η decreases ζ_t^*, increasing p_t and d_{t+1} (in line with data)
- So far, we have focused on competitive equilibrium, but overborrowing also depends on social planner's allocation

Constrained-efficient equilibrium

SP chooses debt subject to collateral constraint but allows goods market to clear in a competitive way

$$V(b,y) = \max_{d',c^T} u(c(c^T, c^N)) + \beta E_{y'|y} V(b', y')$$

subject to

$$c^T = y^T + \frac{d'}{1+r} - d(1-I) - \left(\frac{1-a}{a}\right)\left(\frac{c^T}{c^N}\right)^{1/\xi}(c^N)$$

$$c^N = \zeta^* y^N I,$$

$$d' \leq \kappa \left(\frac{1-a}{a}\right)\left(\frac{c^T}{c^N}\right)^{1/\xi} y^N$$

SP's optimality conditions

$$\lambda_t^{SP} = \underbrace{\beta\left(1+r_t\right)\left[-\frac{\partial E_t U_{t+1}}{\partial d_{t+1}} \overbrace{-\frac{\kappa \partial E(\mu_{t+1}^{SP} p_{t+1} y_{t+1}^N)}{\partial d_{t+1}} - \frac{\partial\left(1+r_t\right)^{-1}}{\partial d_{t+1}} d_{t+1}}^{overborrowing}\right]}_{\text{Marginal benefit of reducing } d_{t+1} \text{ (saving)}} + \mu_t^{SP}$$

- Overborrowing is additional marginal benefit of lowering debt
  - Pecuniary externality of collateral price
  - Pecuniary externality of interest rate
- Reducing d_{t+1} shifts a slice of y_{t+1}^T from foreclosure to no-foreclosure
- SP gains (loses) slice of MB of saving in no-foreclosure (foreclosure) state

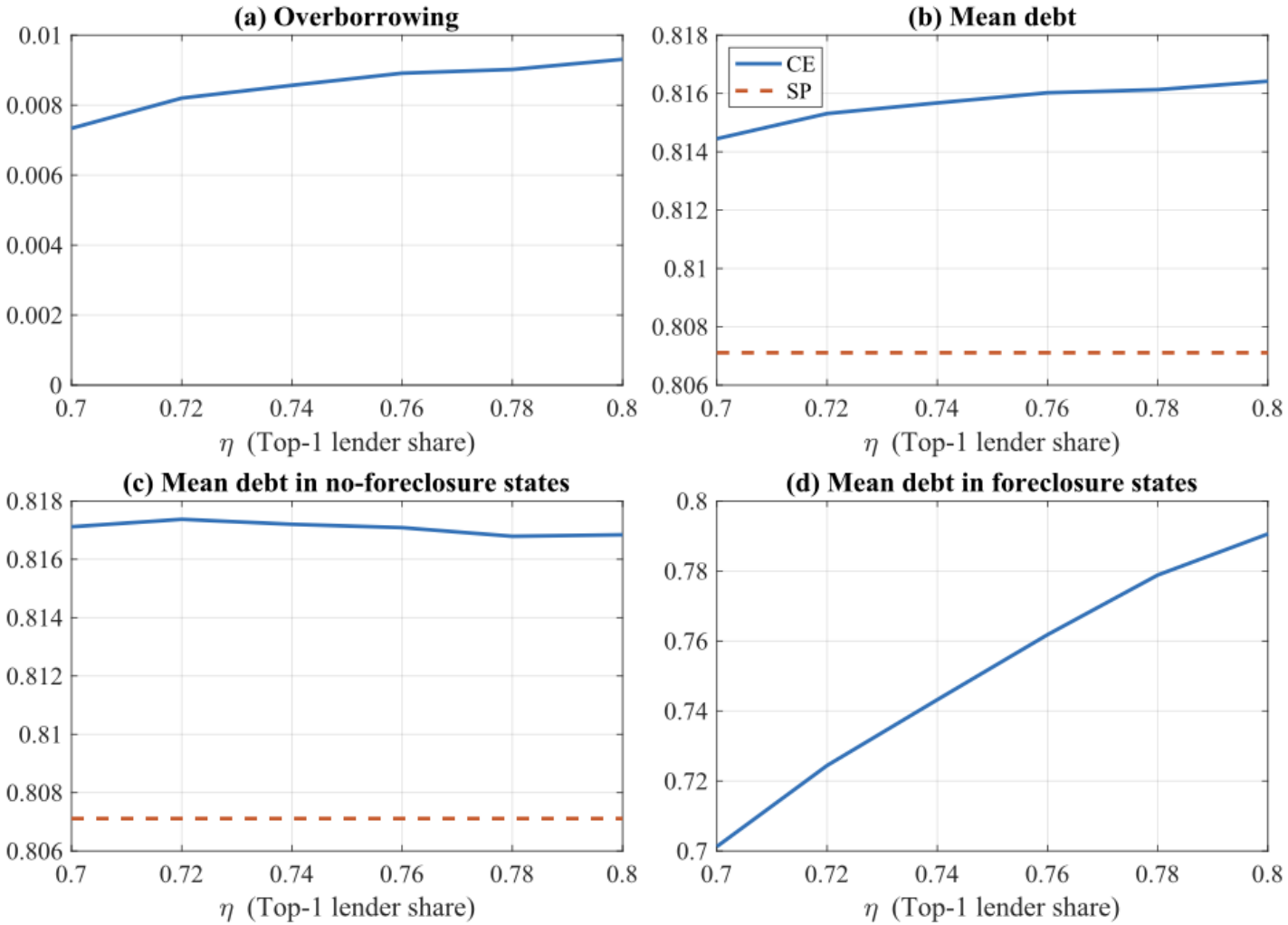
Concentration & pecuniary externality (PE)

- PE of collateral price in no-foreclosure states do not change with η
- PE of collateral price in foreclosure states changes with η:

$$-\kappa y^N \frac{\partial E(\mu_{t+1}^{SP} p_{t+1})}{\partial d_{t+1} \partial \eta} \propto [\overbrace{p_{t+1}^{F*} \underbrace{\frac{\partial \mu_{t+1}^{SP,F*}}{\partial \eta}}_{(-)}}^{(a)} + \overbrace{\mu_{t+1}^{SP,F*} \underbrace{\frac{\partial p_{t+1}^{F*}}{\partial \eta}}_{(+)}}^{(b)}]$$

- Similarly, PE of interest rate is ambiguous as it depends on future repayments $\zeta_{t+1}^{*} p_{t+1}^{F} y_t^N$
- η does not change SP's allocation if foreclosure never occurs [calibrated eq!]

Lender concentration raises overborrowing



Overborrowing is increasing in η via changes in CE

Calibration: Argentina

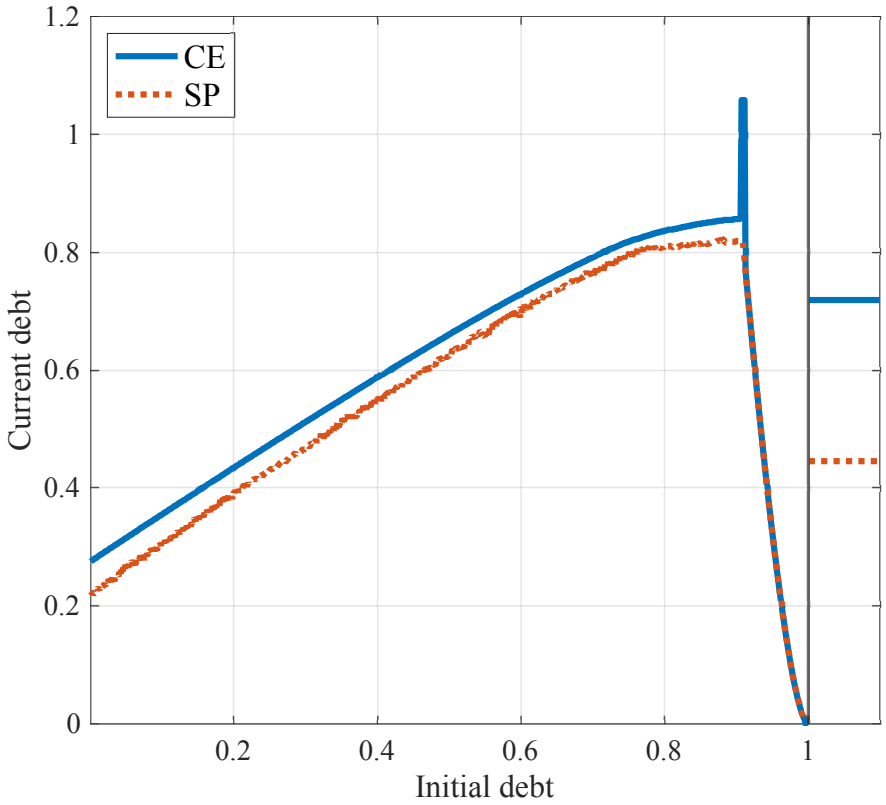
- Exogenous $y_t = \left[y_t^T, \bar{y}_t^N\right]'$ follows an AR(1) process $logy_t = \alpha logy_{t-1} + \epsilon_t$

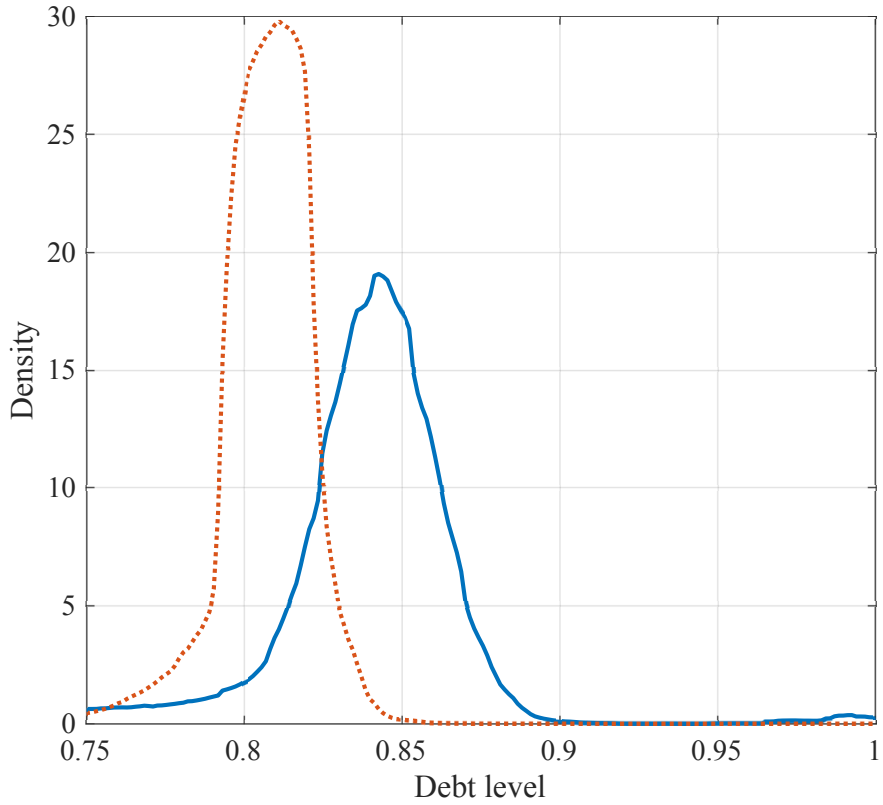
Discretization of State Space (Schmitt-Grohé & Uribe, 2018)		
n_{y^T}	13	Number of equally-spaced grid points for lny^T
$n_{\bar{y}^N}$	13	Number of equally-spaced grid points for $ln\bar{y}^N$
n_d	800	Number of equally-spaced grid points for d_t
$[ln\underline{y}^T, ln\overline{y}^T]$	$[-0.1093, 0.1093]$	Range for logarithm of tradable endowment
$[ln\underline{\bar{y}}^N, ln\overline{\bar{y}}^N]$	$[-0.1328, 0.1328]$	Range for logarithm of nontradable endowment
$[\underline{d}, \overline{d}]$	$[0, 1.1]$	Debt range

Parameter values

Parameter	Value	Description
σ	2.00	Parameter of risk aversion
β	0.91	Subjective discount factor
κ	0.972	Collateral margin of nontradable goods
r^*	0.04	World interest rate
η	0.74	Median top-1 concentration of emerging countries
δ	0.32	Coefficient of output loss
ξ	0.55	Elasticity of substitution between c^T and c^N
a	0.0015	Weights on tradables in CES aggregator
y^N	6.90	Collateralizable non-tradable endowment
Model	Data	Calibration target
0.102	0.108	Average debt-to-output ratio
0.051	0.055	Sudden stop probability (Bianchi, 2011)
0.021	0.026	Foreclosure probability (Schmitt-Grohe & Uribe, 2017)
0.746	0.747	Foreclosure rate in defaults (Favara & Giannetti, 2017)

Policy function & overborrowing





- Initial debt raises borrowing when constraint never binds, not so much when constraint binds with positive probability
- Borrowing is independent to initial debt when it is waived
- Policy jumps when d_{t+1} raises p_t so that constraint binds at two levels Multi

Simulating pecuniary externality (PE)

	SP	CE	CE^{full}
Median debt	0.8071	0.8157	0.8092
Mean debt in sudden stops	0.7694	0.5281	0.5021
Mean debt in normal times	0.8075	0.8320	0.8236
Foreclosure probability	0.0000	0.0206	0.0259
Sudden stop probability	0.0098	0.0514	0.0419
Mean ζ_t^{L*} in foreclosure	NaN	0.6571	1.0000

- SP: both lenders & borrowers internalize PE; CE: only lenders internalize PE
- Consider CE^{full}: lenders do not internalize PE ($\zeta_t^{L*} = 1$)
- Agents borrow more when crises is less severe in CE than in CE^{full}
- PE internalized by lenders is 2/3 of PE internalized by borrowers

Optimal lender concentration

- Coordination problem of lenders reemphasized since Covid as debt hiked
- Lender countries may want to concentrate lender structure to raise gain

$$\max_{\eta_t} \zeta_t^*(\eta) p_t^F(\eta_t) y_{t-1}^N + \pi_{t+1} d_{t+1} + (1 - \pi_{t+1}) \zeta_{t+1}^* p_{t+1}^F y_t^N$$

where $\pi_{t+1} = Pr\left(d_{t+1} \leq y_{t+1}^T\right)$ is probability borrowers fully repay debt

- Assumption: lender country takes borrower's debt decision d_{t+1} as given
- Simplified question: maximizing $\zeta_t^*(\eta_t) p_t^F(\eta_t) y_{t-1}^N$ by choosing η_t:

$$\frac{d\zeta_t^*}{d\eta_t}\left(p_t^F + \frac{\partial p_t^F}{\partial \zeta_t^*}\zeta_t^*\right) = 0 \Rightarrow \zeta_t^*(\eta_t^*) = -p_t^F\left(\frac{\partial p_t^F}{\partial \zeta_t^*}\right)^{-1}$$

Trade-off: η_t raises collateral price yet lowers foreclosure rate

Simulation: Optimal lender concentration

	SP	CE	CE
	fixed η_t	fixed η_t	optimal η_t
Median debt	0.8071	0.8157	0.8176
Mean debt in sudden stops	0.7694	0.5281	0.6200
Mean debt in normal times	0.8075	0.8320	0.8342
Mean consumption	7.2868	7.2512	7.2834
Foreclosure probability	0.0000	0.0206	0.0000
Sudden stop probability	0.0098	0.0514	0.0773
Mean η_t	0.7400	0.7400	1
Mean ζ_t^{L*} in foreclosure	NaN	0.6571	NaN

- Optimal η is 26% higher than concentration in data
- Optimal η increases borrowing and consumption-equivalent welfare by 1.5%
- More sudden stops under optimal η, reducing debt and prevents foreclosure

Conclusion

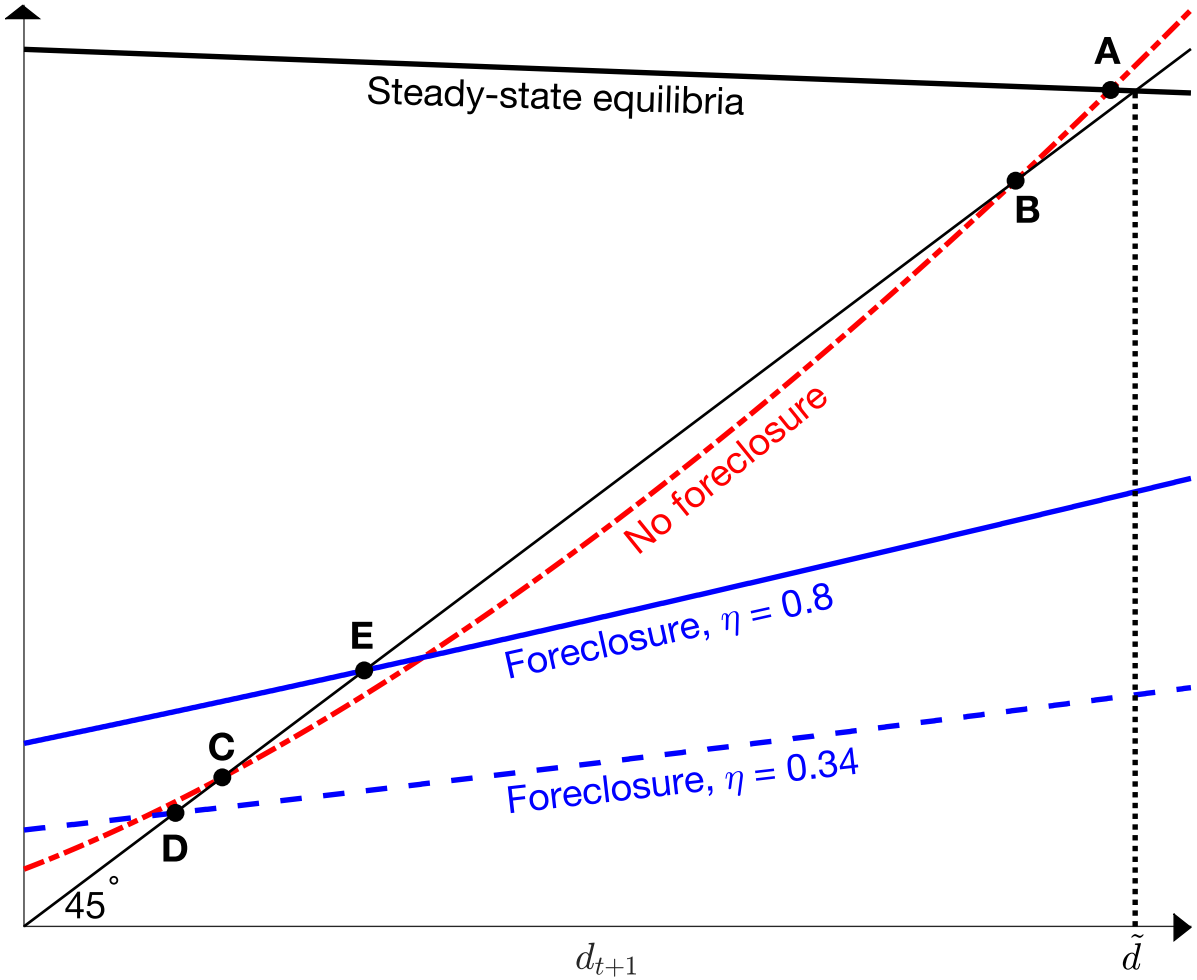
- EMs tend to have more concentrated lender structure that alleviates crises
- Lender concentration raises debt in CE but won't affect SP $\Rightarrow$ overborrow $\uparrow$
- Pecuniary externality (PE) from lenders is quantitatively nonnegligible
- Achieving SP requires both lenders and borrowers to internalize PE
- Letting lenders choose concentration optimally raises borrowers' welfare

Thank you!

Appendix

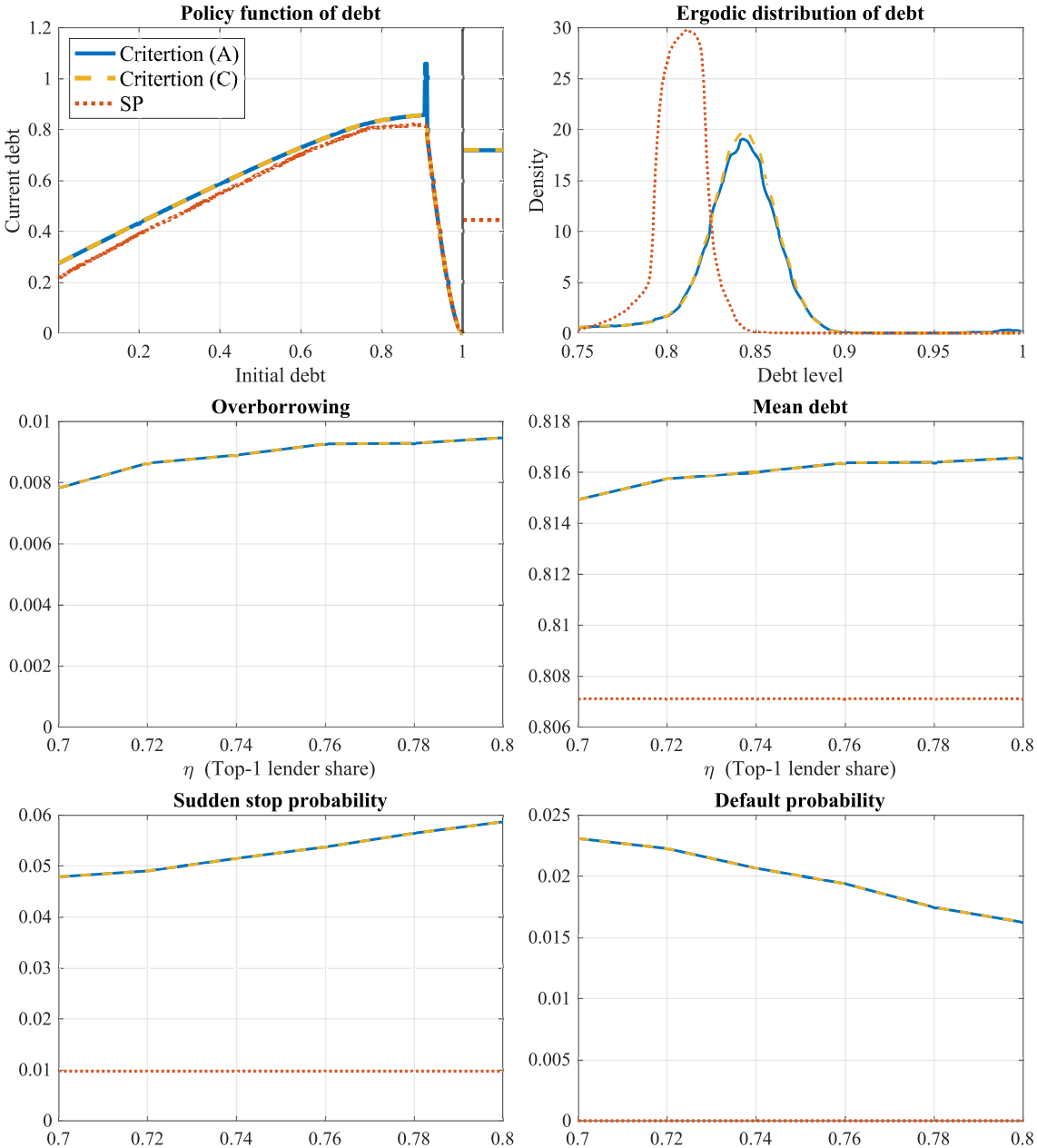
Multiple binding equilibria

$$d_{t+1}(1+r_t)^{-1} \leq \kappa p_t y_t^N$$

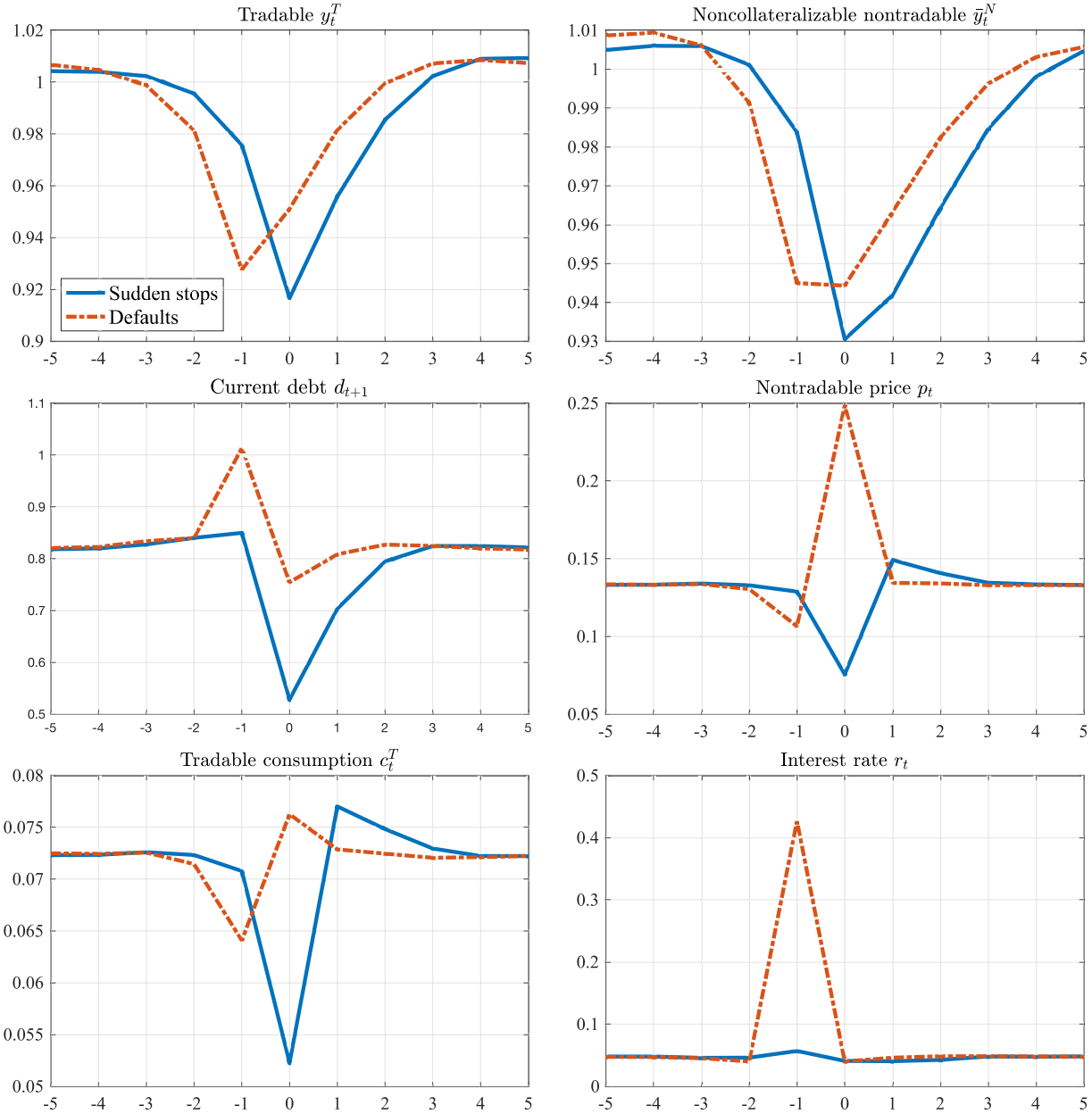


Under convex price, sudden stops come in two sizes (B and C)

Model not subject to multiple equilibria

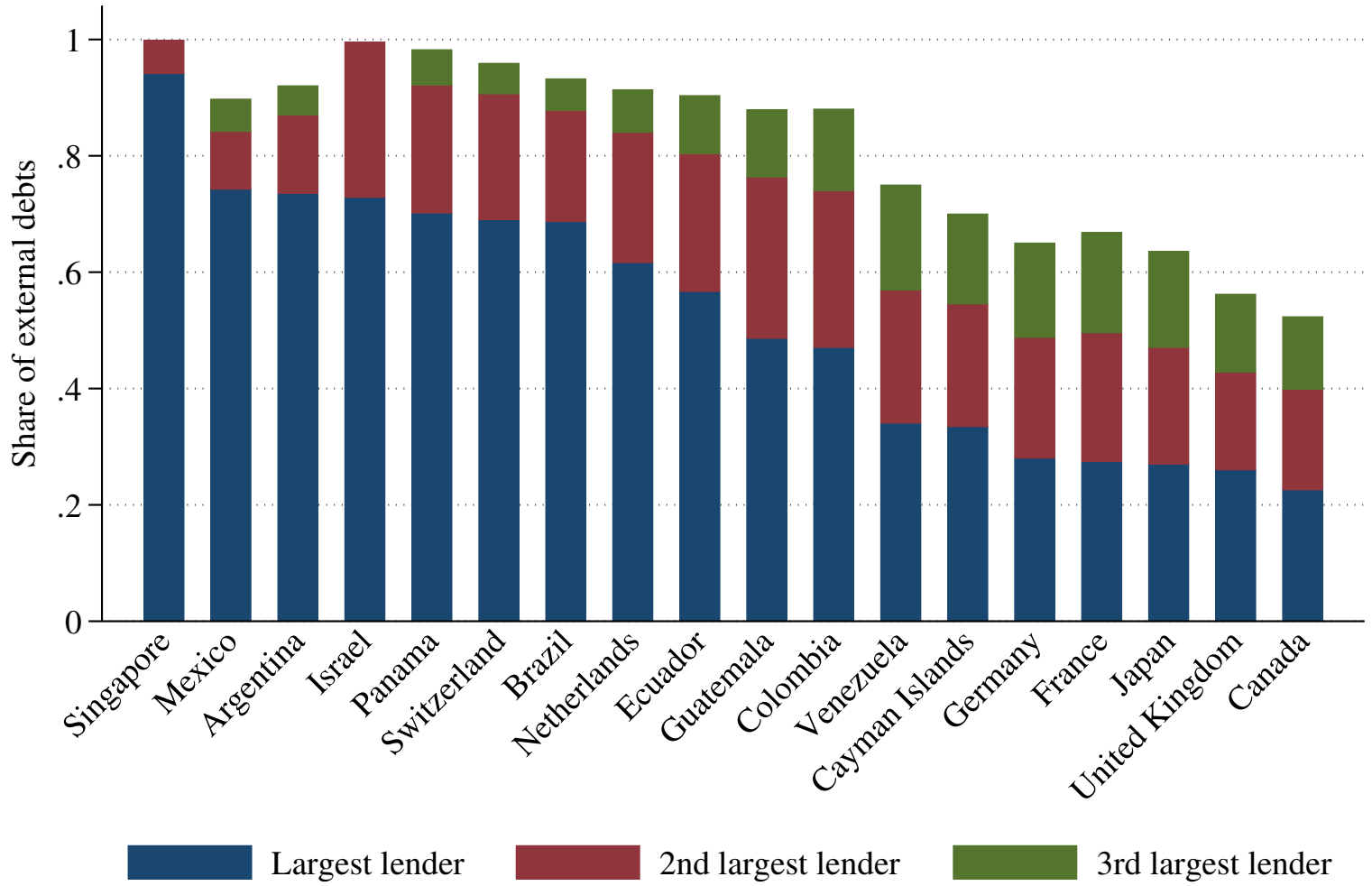


Sudden stop vs. foreclosure events



- Sudden stops triggered by shocks at period 0. Foreclosures triggered by shocks at period -1
- Both feature credit boom-bust cycle
- Nontradable price and consumption increase in foreclosure under limited foreclosure
- Interest rate hikes prior to foreclosures as default probability rises

Top-3 Lender concentration



Top-3 lenders contribute 95% (74%) of external debts of RMs (EMs)