Aggregate Demand and Sovereign Debt Crises

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- Sovereign debt crises associated with **deep** recessions (▸ More)

Output and Consumption for Spain

- Conventional view: low output $\implies$ high spreads

(▸ Detrended data) (▸ Trade balance) (▸ Low demand?) (▸ Nondurable consumption)

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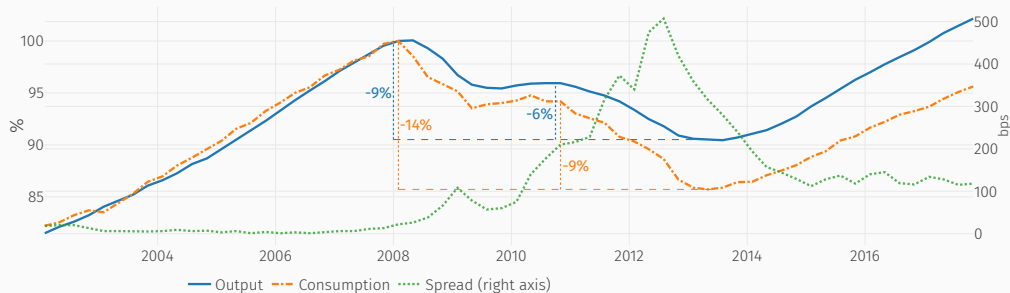
(▶ Detrended data) (▶ Trade balance) (▶ Low demand?) (▶ Nondurable consumption)

1

- Spain: large output and consumption drops
  - $|\Delta C| > |\Delta Y| \implies$ Saving rate ↑ in the crisis

- IVs on Eurozone country-level data show
  1. High spreads cause output to fall
  2. High spreads cause consumption to fall more than output

- Sovereign debt literature assumes hand-to-mouth households or Law of One Price
  - Saving rate in the crisis?
  - Consequences?

  - Household sector manages substantial wealth (avg 96% of GDP) ▸ Spanish data
  - Substantial fraction of government debt held by residents ▸ Spanish data

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- I propose a model of debt crises
    - Prominent role for household consumption/savings decision
        - Heterogeneous domestic savers can choose to be exposed to sovereign debt
    - Savings pattern in the crisis
    - Feedback loop between spreads and output
        - ↑ Spreads $\implies$ ↓ Demand $\implies$ ↓ Output

- Model
    - Expectations of outcomes in case of default
        - Aggregate income losses   ⟵ TFP costs of default
        - Redistributive effects   ⟵ Domestic debt holdings
    - Economy looks riskier when the default probability increases
        - Default risk interacts with precautionary behavior

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- Feedback effect explains significant portion of the crisis
  - Calibration numbers soon

- Highlight role of inequality, identity of debt holders

- New light on Aguiar-Gopinath facts ▸ More
  - Amplification of negative shocks, demand-driven recessions
  - In downturns volatility of C > volatility of Y

Literature

- Sovereign risk affecting the supply side through finance
  Neumeyer and Perri (2005), Bocola (2016), Arellano, Bai, and Mihalache (2018), Balke (2017)

- Domestic debt and default incentives
  Gennaioli, Martin, and Rossi (2014), Mengus (2014), Mallucci (2015), Pérez (2016), D'Erasmo and Mendoza (2016), Ferriere (2016)

- Sovereign risk and fiscal austerity
  Cuadra, Sánchez, and Sapriza (2010), Romei (2015), Bianchi, Ottonello, and Presno (2016), Anzoategui (2017), Philippon and Roldán (2018)

- Shocks affecting aggregate demand through redistribution
  Auclert (2017), Eggertsson and Krugman (2012), Korinek and Simsek (2016), …

Roadmap

- Evidence

- Description of Model

- Model Results

- Simulations

- Crises

Evidence

- Regress outcome variable Q_{jt} on country j's spread

$$Q_{jt} = \beta \Delta Spread_{jt} + \gamma X_{jt} + \delta_t + \mu_j + \epsilon_{jt}$$

  where $Q_{jt} = \log Y_{jt}, \log C_{jt}$

- IV strategy (based on Martin and Philippon, 2017)

$$\Delta Spread_{jt} = \underbrace{\phi B_{j0} + \delta_t}_{Z_{jt}} + \eta_{jt}$$

- Data for 11 European countries between 2010Q1 – 2013Q1
  Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain

	Dependent variable:			
	$\log Y_{jt}$ (1)	$\log C_{jt}$ (2)	$\log Y_{jt}$ (3)	$\log C_{jt}$ (4)
$\Delta Spread_{jt}$	−0.008*** (0.001)	−0.013*** (0.001)		
$\Delta Spread_{jt}$ (IV)			−0.006** (0.002)	−0.010*** (0.003)
Country + Time FE	✓	✓	✓	✓
Observations	143	143	143	143
Adj. R^2	0.772	0.784	0.765	0.776

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

▶ The Cycle is the Trend

Description of Model

- Small open economy with
    - Uninsurable idiosyncratic income risk + Incomplete markets
    - Default risk
    - Nominal rigidities
- Actors:
    - A government
        - Issues long-term debt, purchases goods, decides repayment
    - Households
        - Consume, work, save in the gov't **bond** + risk-free **debt**
        - Differ in 'cash' holdings, idiosyncratic income shock
    - Firms
        - Produce the goods with labor, subject to **wage rigidities**
    - Foreigners
        - Lend to the government and to the private sector
        - Price all assets

$$B_t \in \{B'_{t-1}, (1 - \hbar)B'_{t-1}\}$$
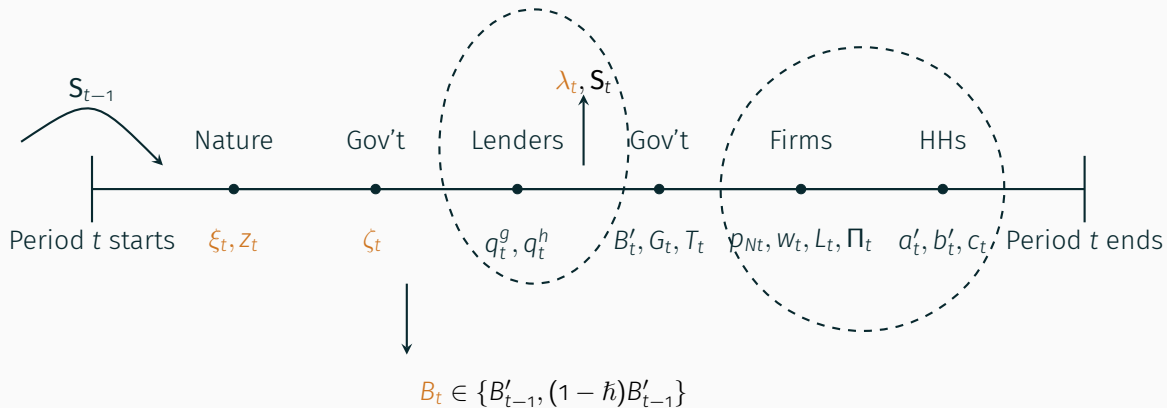
Decisions within a period
Dashed ellipses encircle simultaneous decisions

At each t, the government

- Chooses repayment $h_t \in \{1, 1 - \hbar\}$
- Follows fiscal rules for new **issuances** $B'(\mathsf{S}_t)$ and spending $G(\mathsf{S}_t)$
  - Can depend on full state: $(B_t, \lambda_t, \xi_t, \zeta_t, z_t)$ ▸ Fiscal rules
- Must satisfy its budget constraint

$$\underbrace{q_t^g}_{debt\ price} \underbrace{(B_t' - (1-\rho)B_t)}_{new\ debt\ issued} + \underbrace{T_t}_{lump\text{-}sum} + \underbrace{\tau w_t L_t}_{payroll\ tax} = \underbrace{G_t}_{spending} + \underbrace{\kappa B_t}_{coupon}$$

$\rightarrow$ T_t summarizes a default / austerity tradeoff

Given a government policy $h(\mathsf{S}, \xi', z'), B'(\mathsf{S}), T(\mathsf{S}, q^g)$, in a **comp eq'm**

- Risk-neutral foreigners ▸ General Formulation
  - Price all assets

$$q^h(\mathsf{S}) = \frac{1}{1+r^\star}$$

$$q^g(\mathsf{S}) = \frac{1}{1+r^\star}\mathbb{E}\left[\underbrace{\mathbb{1}_{(\zeta'=1)}(1-\xi')\kappa}_{coupon} + \underbrace{(1-\rho)}_{depreciation}\underbrace{\left(1-\hbar\mathbb{1}_{(\zeta=1\cap\zeta'\neq1)}\right)}_{potential\ haircut}\underbrace{q^g(\mathsf{S}')}_{resale\ price}\;\Bigg|\;\mathsf{S}\right]$$

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- Firms
  - Traded and nontraded goods, CES aggregator, wage rigidities

$$Y_{Nt} = L_{Nt}^{\alpha_N}\left(1 - \Delta\mathbb{1}_{(\zeta\neq1)}\right) \qquad\qquad Y_{Tt} = z_t L_{Tt}^{\alpha_T}\left(1 - \Delta\mathbb{1}_{(\zeta\neq1)}\right) \qquad\qquad w_t \geq \bar{w}$$

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- Households
  - Access to both assets with borrowing limits, inelastic labor supply
- **Approximation**: $\lambda_t = \log\mathcal{N}(\mu_t, \Sigma_t)$. So $\mathsf{S} = (B, \mu, \sigma, \xi, \zeta, z)$

- Given govt's policies, aggregates, and evolution of the state

$$v(\omega, \epsilon, \mathsf{S})^{\frac{\psi-1}{\psi}} = \max_{c,a',b'} (1-\beta)c^{\frac{\psi-1}{\psi}} + \beta \mathbb{E}\left[\left(v(\underbrace{a' + R_{\mathsf{S},\mathsf{S}'}b'}_{=\omega'}, \epsilon', \mathsf{S}')\right)^{1-\gamma} \middle| \omega, \epsilon, \mathsf{S}\right]^{\frac{\psi-1}{\psi(1-\gamma)}}$$

subject to $p_C(\mathsf{S})c + q^h(\mathsf{S})a' + q^g(\mathsf{S})b' = \omega + \ell(\mathsf{S})\epsilon - T(\mathsf{S})$

$\ell(\mathsf{S}) = w(\mathsf{S})L(\mathsf{S})(1-\tau) + \Pi(\mathsf{S})$

$R_{\mathsf{S},\mathsf{S}'} = \mathbb{1}_{(\zeta'=1)}\kappa + (1-\rho)\left(1 - \hbar\mathbb{1}_{(\zeta=1)(\zeta'\neq1)}\right)q^g(\mathsf{S}')$

$a' \geq \bar{a}; \qquad b' \geq 0$

$\mathsf{S}' = \Psi(\mathsf{S}, \xi', z', h')$

Exog LoMs for (ϵ, ξ, z); prob of h' given (S, ξ', z')

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- Skipping steps: in crisis times
  - $\pi \uparrow \implies \mathbb{E}[w'L'] = \pi\mathbb{E}[w'L'|\zeta' \neq 1] + (1-\pi)\mathbb{E}[w'L'|\zeta' = 1] \downarrow \leftarrow$ Aggregate effect
  - $q^g \downarrow \implies \omega \downarrow$ for all $\leftarrow$ Distributional effect
  - $\text{cov}(R_{\mathbf{S},\mathbf{S}'}, sdf' \mid \mathbf{S}) \downarrow$ $\leftarrow$ 'Savings technology' effect

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- Given govt's policies, aggregates, and evolution of the state
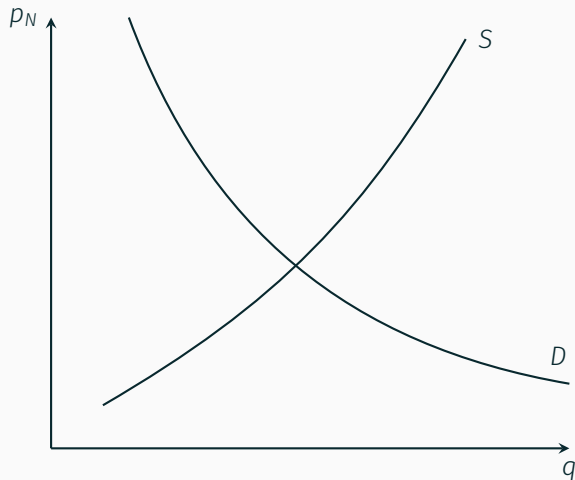
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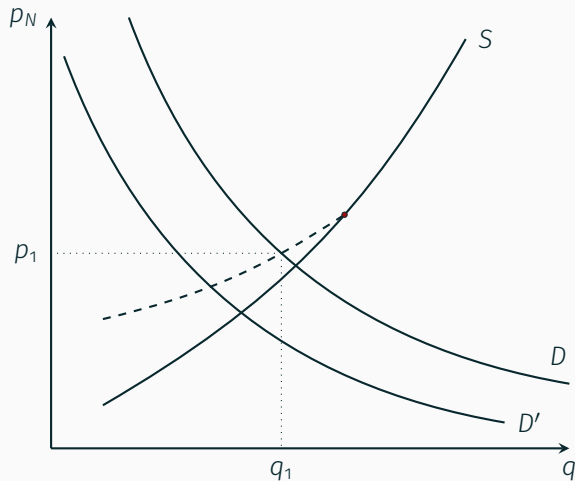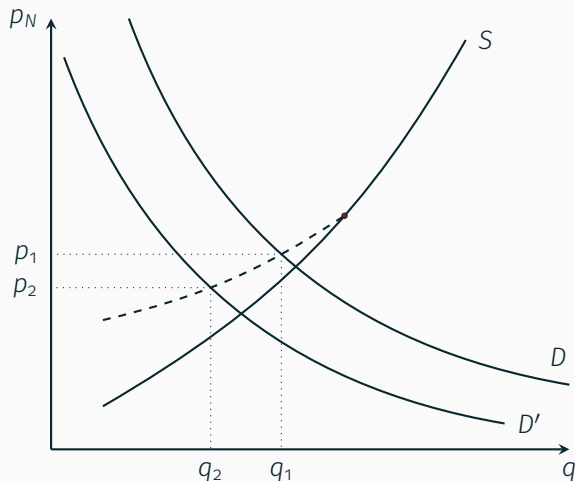
Aggregate Demand

$$Y_N^d = C\varpi \left(\frac{p_N}{p_C}\right)^{-\eta} + \frac{\vartheta_N}{p_N} G$$

$$Y_N^s = L_N^{\alpha_N} \left(1 - \mathbb{1}_{(\zeta \neq 1)} \Delta\right)$$

$$L_N^d = \left(\alpha_N \frac{p_N}{W}\right)^{\frac{1}{1-\alpha_N}}$$
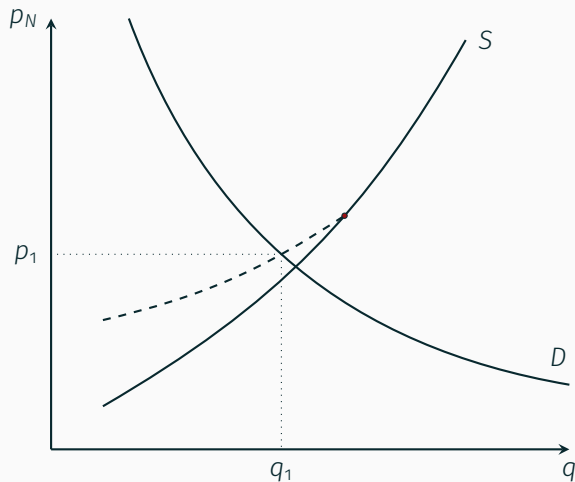
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· $C\downarrow \implies p_N\downarrow \implies w\downarrow$

· Wage rigidity creates price stickiness

- B'_t and G_t are given functions of S_t
- Default / Repayment is an optimal **choice**
  - Utilitarian objective

$$\mathcal{W}(\mathsf{S}) = \int v(\mathsf{s}, \mathsf{S}) d\lambda_{\mathsf{S}}(\mathsf{s})$$

- In period t, observe S_{t-1} and (ξ_t, z_t)
- Gov't understands $\mathsf{S}_t = \Psi(\mathsf{S}_{t-1}, \xi_t, z_t, \zeta_t)$ ▸ Distribution
- Default iff

$$\underbrace{\mathcal{W}\left(\Psi(\mathsf{S}_{t-1}, \xi_t, z_t, \zeta_t \neq 1)\right)}_{\text{v under def}} - \underbrace{\mathcal{W}\left(\Psi(\mathsf{S}_{t-1}, \xi_t, z_t, \zeta_t = 1)\right)}_{\text{v under rep}} \geq \sigma_g \xi_t^{\text{def}}$$

where $\xi_t^{\text{def}} \overset{iid}{\sim} \mathcal{N}(0,1)$

Definition

Given fiscal rules $B'(\mathbf{S})$, $G(\mathbf{S})$, an *equilibrium* consists of ▸ Algorithm

- A government policy $h'(\mathbf{S}, \xi', z')$
- Policy functions $\{\phi_a, \phi_b, \phi_c\}(\mathbf{s}, \mathbf{S})$
- Prices $p_C(\mathbf{S}), p_N(\mathbf{S}), w(\mathbf{S}), q^g(\mathbf{S})$. Quantities $L_N(\mathbf{S}), L_T(\mathbf{S}), \Pi(\mathbf{S}), T(\mathbf{S})$
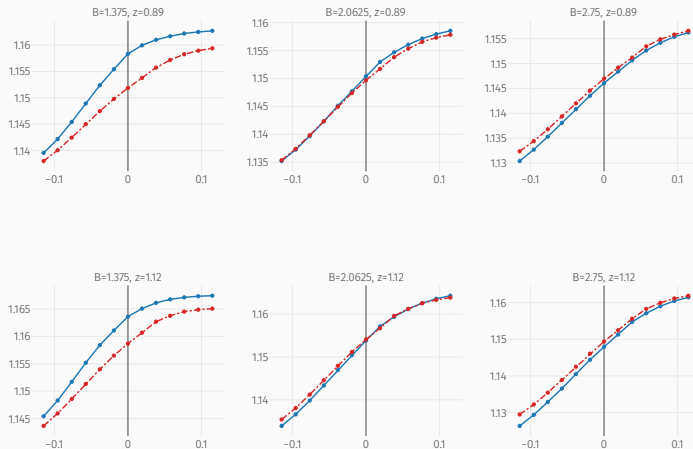- Laws of motion $\mu'(\mathbf{S}, \xi', z'; h), \sigma'(\mathbf{S}, \xi', z'; h)$

such that

- The policy functions solve the household's problem
- The laws of motion are consistent with the policy functions
- Firms maximize profits, $w(\mathbf{S}) \geq \bar{w}$, markets clear ▸ Market Clearing
- The government's default policy maximizes $\mathcal{W}(\Psi(\mathbf{S}, \xi', z', \cdot))$

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Model Results

Anticipated objective function
Blue: repayment, red: default

Transfers

Blue: repayment, red: default
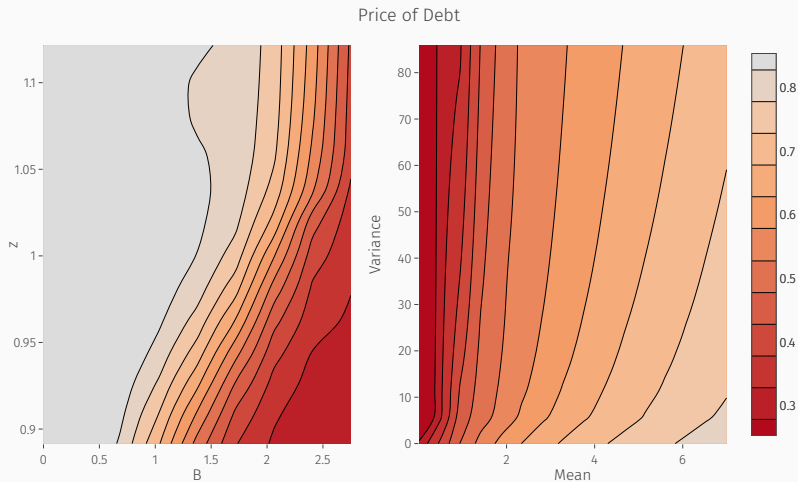
Price of Debt

Model: Benchmark

Unemployment
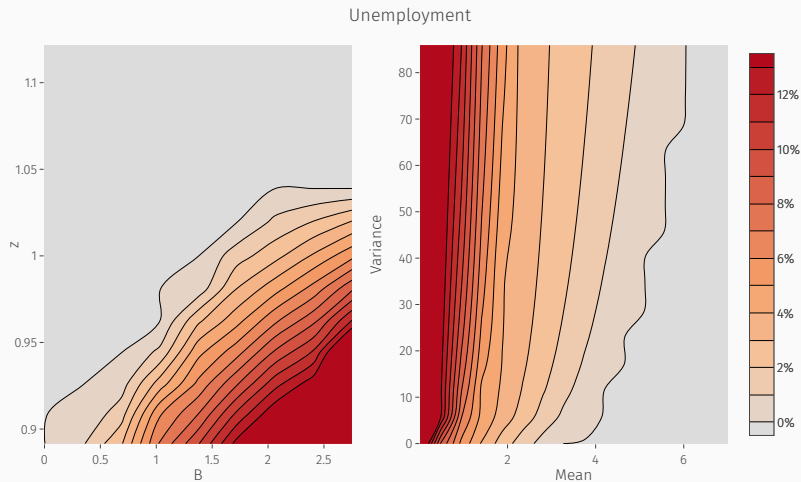
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Simulations

Calibration

Parameter	Value	Description	Source
$r^\star$	4% ann.	Risk-free rate	Anzoategui (2017)
$\hbar$	50%	Haircut in case of default	Philippon and Roldán (2018)
Δ	10%	TFP loss in case of default	Philippon and Roldán (2018)
ϖ	0.74	Share of nontraded in prod	Anzoategui (2017)
ϑ_N	80%	Share of nontraded in G	Anzoategui (2017)
$\rho_\epsilon, \sigma_\epsilon$	(0.978, 0.022)	Idiosyncratic income	D'Erasmo and Mendoza (2016)

Internally calibrated			Target (Spain)
Discount rate of HHs	$1/\beta - 1$	4.5% ann.	Moments in Table 1
Risk aversion	γ	14.1	Moments in Table 1
Progressivity of tax schedule	τ	19.3%	Moments in Table 1
Wage minimum	$\bar{w}$	1.15	Moments in Table 1
TFP process	ρ_z, σ_z	(0.892, 0.029)	Moments in Table 1
Mean risk premium	$\bar{\xi}$	1.4%	Moments in Table 1
Risk premium AR(1)	ρ_ξ, σ_ξ	(0.947, 0.002)	Moments in Table 1

Target	Model	Data
AR(1) coef $\log(Y_t)$	0.996	0.966
Std coef $\log(Y_t)$	0.0343	0.0129
AR(1) coef $\log(C_t)$	0.995	0.962
Std coef $\log(C_t)$	0.0207	0.0166
AR(1) coef spread	0.966	0.967
Std coef spread	0.161	0.103
Avg Debt-to-GDP	64.2%	64.6%
Std Debt-to-GDP	25.3%	23.5%
Avg unemployment	15.9%	15.9%
Std unemployment	7.59%	6.09%
Median dom holdings	79.6%	56.5%
Avg wealth-to-GDP	58%	94.5%

All data from Eurostat 2000Q1:2017Q4, except private consumption from OECD 2000Q1:2017Q4, domestic holdings from Banco de España, 2004Q1:2017Q4

Table 1: Model Fit

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Std coef $\log(C_t)$	0.0207	0.0166
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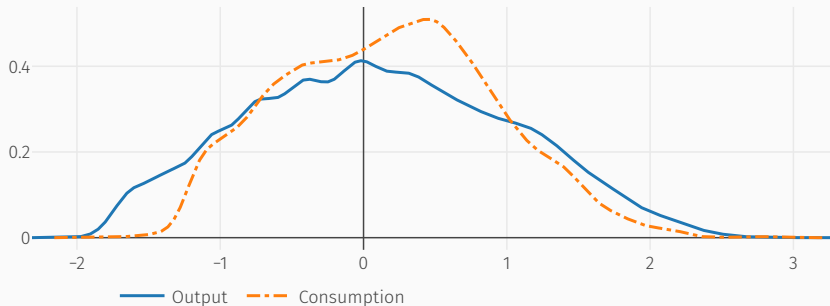Response of Output to a TFP shock

95% confidence intervals shaded
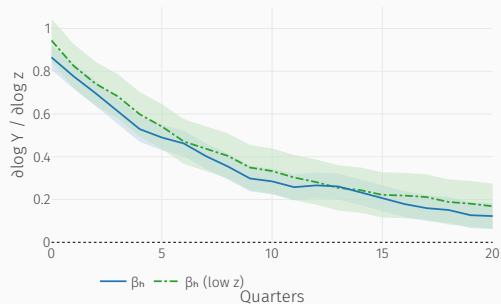
For large shocks
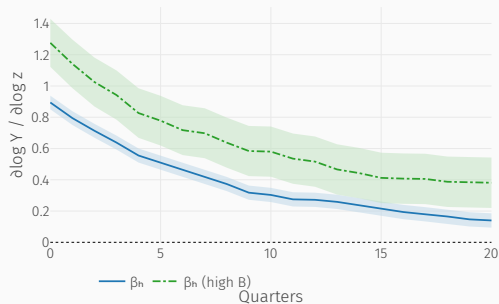
For indebted economies

Ergodic Densities for Normalized Output and Consumption

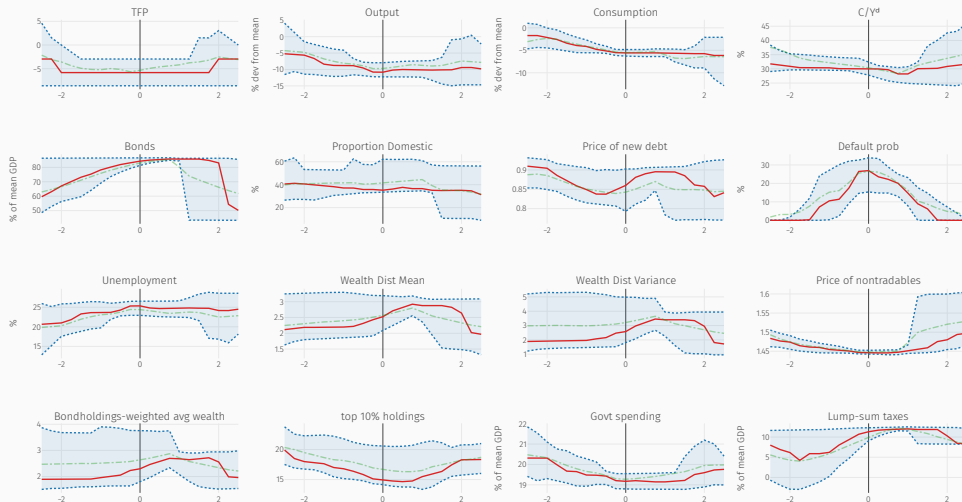Crisis   Default   Unconditional

CRISES

Simulate model economy for 2000 years

- Record all episodes of
    - *i.* High spreads for 6 quarters
    - *ii.* Default
- Take 2-year windows around each
    - Left with 131 defaults ($\sim$ 6% annual freq)
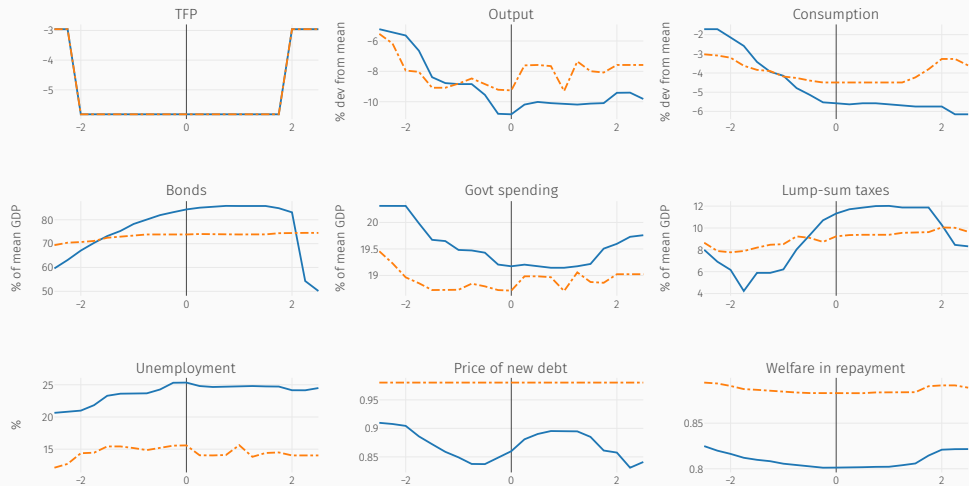- Compute distribution of endogenous variables around them
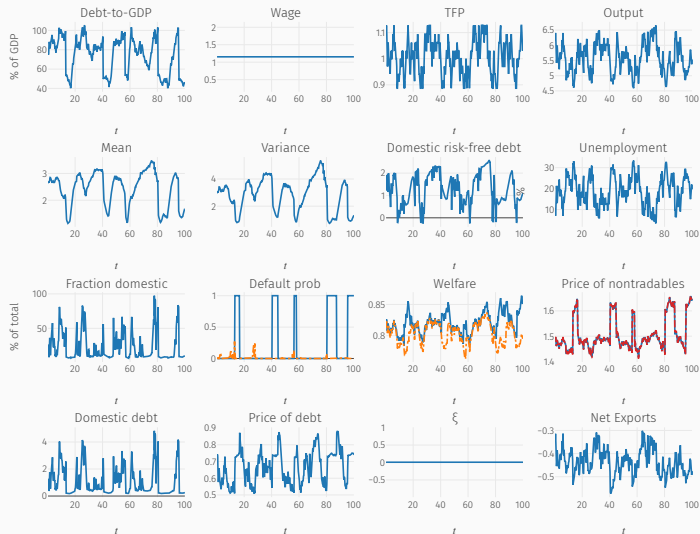
SIMULATED DATA – HIGH SPREADS

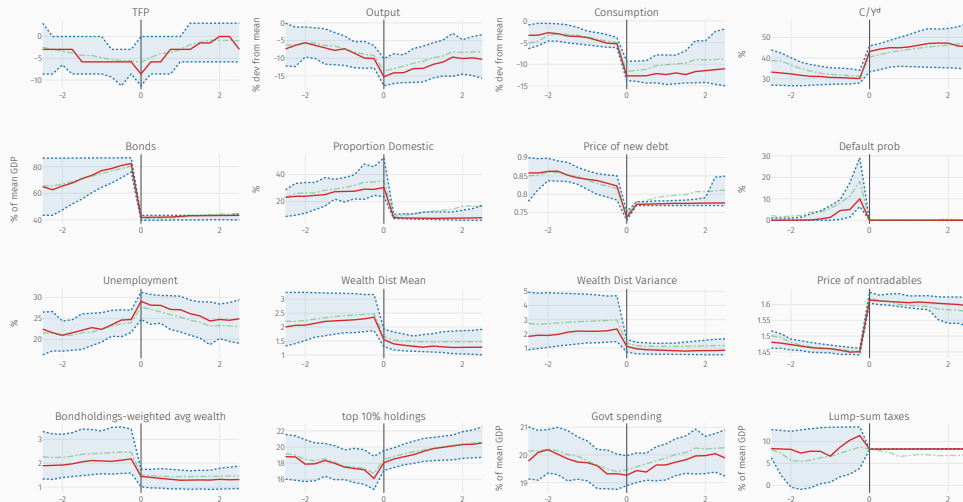Red: Median, Shaded blue: [0.25, 0.75] percentiles, Dashed green: Mean

28

Blue: Benchmark, Dashed orange: No default
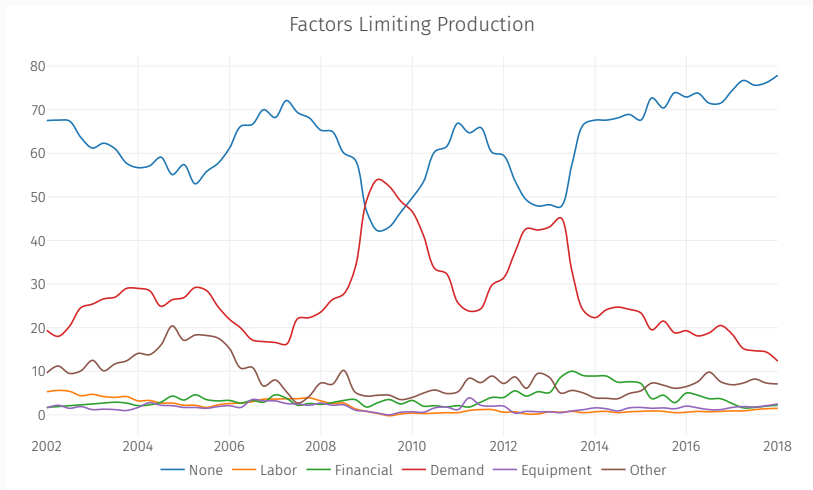
Red: Median, Shaded blue: [0.25, 0.75] percentiles, Dashed green: Mean

30

- **Calibrate** to match moments of Spanish economy
  - Standard: output, employment, spreads, net exports
  - New: distribution of exposures from Morelli and Roldán (2018) ▸ MR

- Compare episodes of high spreads in simulated data against
  - Same economy with no nominal rigidities
  - Same economy with **no risk**
    - Myopic domestic agents and foreigners who **perceive** no default risk
    - Myopic domestic agents only
  - No TFP costs of default   ← shuts down aggregate income losses
  - No capital losses + $\hbar = 0$ ← shuts down redistributive wealth effects
  - → Notions of **potential** output

- Difference is amplification through extra precautionary behavior
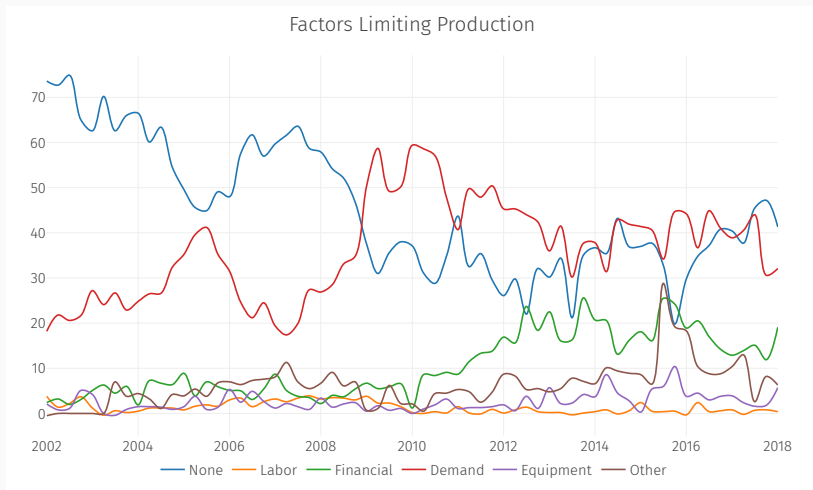 - Different benchmarks emphasize different channels

- Interested in interaction of
  - Default risk
  - Precautionary behavior

  + implications for amplification of shocks

- Potentially helps explain severity of Eurozone debt crisis
  - Exploit Spanish data for calibration of exposures

- Key:
  - Aggregate + redistributive wealth effects if default
  - Agents take precautions against those
  - Timing flips usual MPC / transfer argument

- All comments welcome!

Factors Limiting Production

Legend: None, Labor, Financial, Demand, Equipment, Other

Italian firms' self-reported limits to production

Source: Eurostat

Factors Limiting Production

70
60
50
40
30
20
10
0

2002 2004 2006 2008 2010 2012 2014 2016 2018

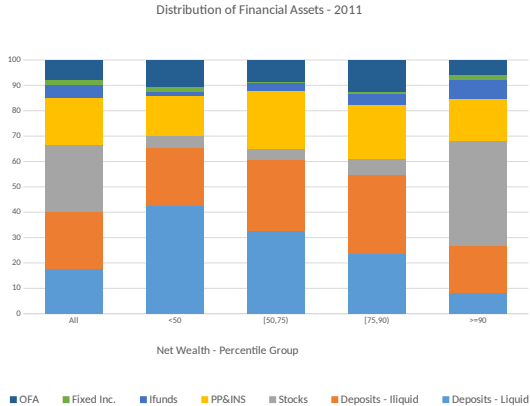— None — Labor — Financial — Demand — Equipment — Other

Greek firms' self-reported limits to production

Source: Eurostat

HOUSEHOLD SURVEY

- Companion paper: dom exp to Spanish sovereign risk ◂ Back

Distribution of Financial Assets - 2011

Net Wealth - Percentile Group

Legend: OFA, Fixed Inc., Ifunds, PP&INS, Stocks, Deposits - Iliquid, Deposits - Liquid

Measuring Exposures to Sovereign Debt - Banks

Measure exposure based on Philippon and Salord (2017)

- study European banks resolutions in Cyprus
- average total recapitalization need was around 17.4% of assets
- private investors provided 33% of need via loss in equity (91%), junior debt (53%) and senior debt (14%)
- remaining 2/3 came from government intervention

  → assumed not possible in Spain!
  → remaining need comes from senior debt and depositors

◂ Back

Measuring Exposures to Sovereign Debt - Deposits

Work with different scenarios of loss on deposits:

Scenario	SD Loss	Dep. Loss
Extreme	25%	14%
Mild	50%	10%
Conservative	75%	5%

Table 2: Expected losses on deposits

- Assume a 50% haircut on public debt that triggers a bank crisis
- Loss for depositors of 10%
- Overall, public debt and bank crisis would induce a fall of between 8% and 10% of financial assets

- Companion paper: dom exp to Spanish sovereign risk ▸ More
- Pension funds, mutual funds, insurance – perfect passthrough
- Deposits – more complicated
  - Philippon and Salord (2017): bank resolutions in Cyprus ▸ Details

Loss Over Financial Assets (2011)

Fiscal Rules
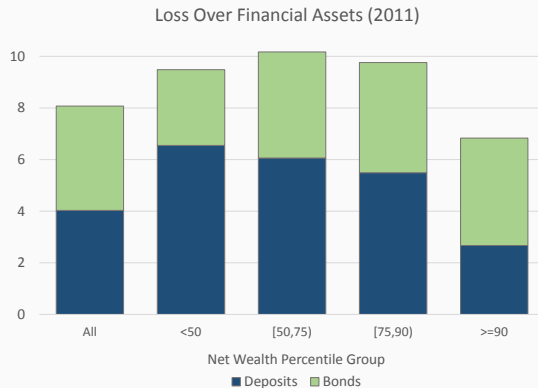
	G_t/Y_t		$\left(B_t' - (1-\rho)B_t\right)/Y_t$	
	(1)	(2)	(3)	(4)
Unemployment$_t$	0.031	0.073***	0.334**	0.346***
	(0.039)	(0.015)	(0.158)	(0.059)
Unemployment$_t^2$	0.002		0.0001	
	(0.001)		(0.006)	
B_t/Y_t	0.010*	-0.017^{***}	-0.010	0.009
	(0.005)	(0.002)	(0.020)	(0.007)
$(B_t/Y_t)^2$	-0.0002^{***}		0.0001	
	(0.00004)		(0.0001)	
Net Exports$_t$	0.009	0.007	0.046	0.019
	(0.019)	(0.012)	(0.075)	(0.046)
Net Exports$_t^2$	-0.0001		-0.001	
	(0.001)		(0.003)	
Mean FE	20.675	21.085	1.079	0.571
Country + Time FE	✓	✓	✓	✓
Observations	968	968	957	957
Adj. R^2	0.904	0.901	0.697	0.698

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Government Spending

Debt Issuances

Observed · — · — Predicted
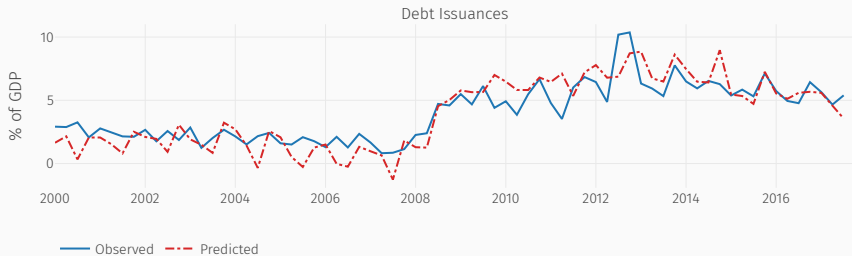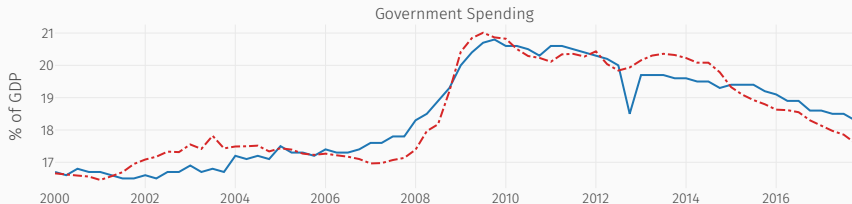
EVOLUTION OF THE DISTRIBUTION

The law of motion for λ

- Policy functions ϕ_a, ϕ_b at S_t determine assets at $t+1$
- After seeing z_{t+1}, the government decides repayment
- At S_{t+1}, relationship between $q^g(S_{t+1})$, $R_b(S_{t+1})$, μ_{t+1}, σ_{t+1}

$$R_b(S_{t+1}) = \mathbb{1}_{(\zeta_{t+1}=1)}\kappa + (1-\rho)q^g(S_{t+1})$$

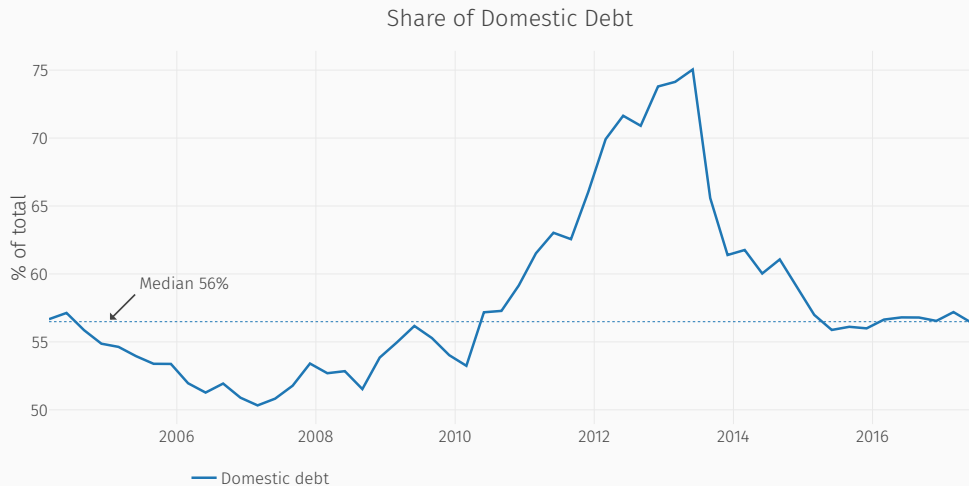$$\int \omega d\lambda_{t+1} = \int \phi_a(S_t) + R_b(S_{t+1})\phi_b(S_t)d\lambda_t$$

$$\int \omega^2 d\lambda_{t+1} = \int (\phi_a(S_t) + R_b(S_{t+1})\phi_b(S_t))^2 d\lambda_t$$
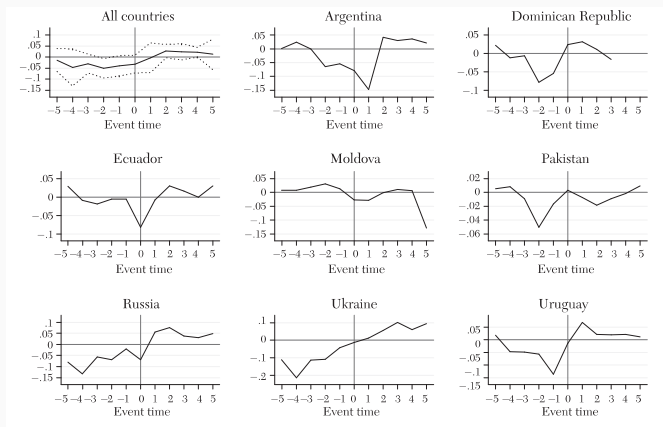
Defaults and output growth
Source: Panizza, Sturzenegger, and Zettelmeyer (2009)

SHARE OF DOMESTIC DEBT

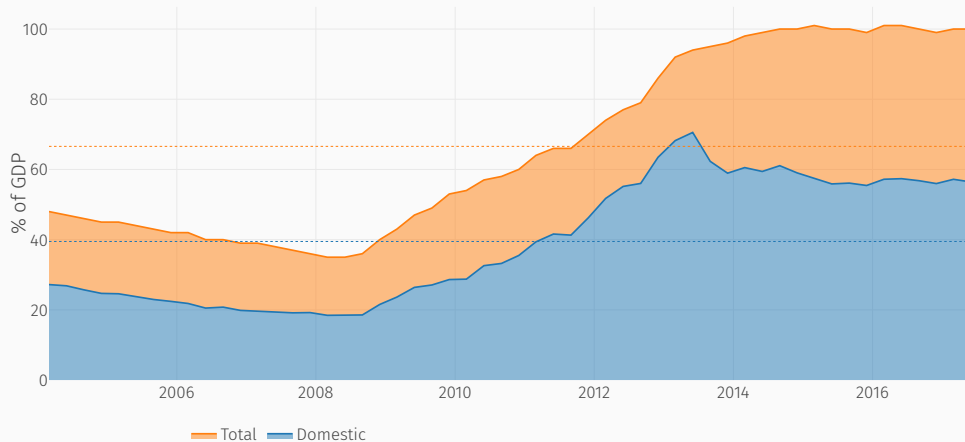Share of Domestic Debt

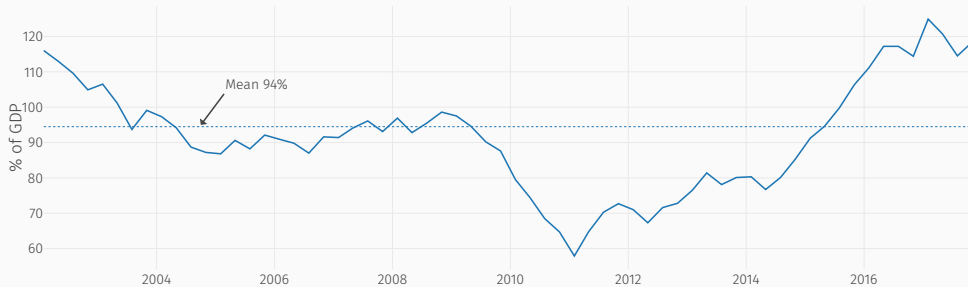Source: Morelli and Roldán (2018) on Banco de España

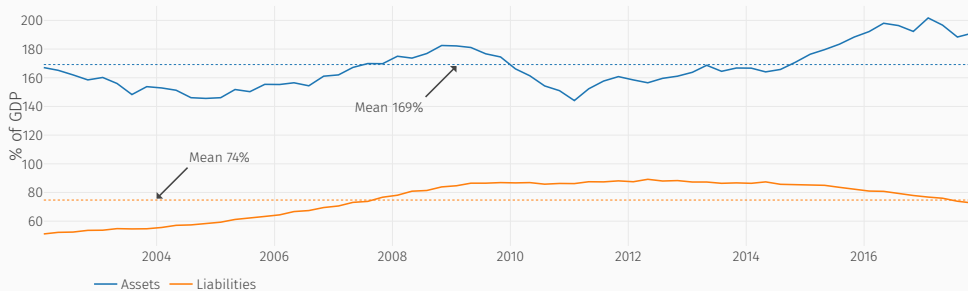# Share of Domestic Debt

Spanish Government Debt

Source: Morelli and Roldán (2018) on Banco de España
Dotted lines are sample averages

Net Worth of Spanish Households

Mean 94%

Source: Eurostat
Dotted lines are sample averages

Net Worth of Spanish Households

Source: Eurostat
Dotted lines are sample averages

General sdf of Foreigners

- If risk-averse foreigners

$$q_t^h = \frac{1}{1 + r^\star} \mathbb{E}_t \left[\left(\frac{C_{t+1}^f}{C_t^f} \right)^{-\gamma_f} \right]$$

$$q_t^g = \frac{1}{1 + r^\star} \mathbb{E}_t \left[\left(\frac{C_{t+1}^f}{C_t^f} \right)^{-\gamma_f} R_{t,t+1}^b \right]$$

where $R_{t,t+1}^b = \mathbb{1}_{(\zeta_{t+1}=1)} \tilde{\kappa} + (1 - \rho)(1 - \hbar \mathbb{1}_{(\zeta_t = 1 \cap \zeta_{t+1} \neq 1)}) q_{t+1}^g$

- Reduces to risk-neutral if

$$\text{cov}\left(\left(\frac{C_{t+1}^f}{C_t^f} \right)^{-\gamma_f}, R_{t,t+1}^b \right) = 0$$

SOLUTION METHOD

- Guess a policy for the government

    - Guess a law of motion for the distribution
        - Compute $q^g(\mathsf{S}), q^h$ from lenders' sdf.
        - Compute w, L_N, L_T, Π, T as functions of (S, p_N)
        - Guess a relative price of nontraded goods p_N
            - Solve the household's problem at $(\mathsf{s}, \mathsf{S}, p_N)$
            - Check market clearing for nontraded goods.
        - Iterate until $p_N(\mathsf{S})$ converges

    - Iterate until the law of motion converges

- Iterate on the government's policy

	Unemployment$_{jt}$			Saving rate$_{jt}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Spread$_{jt}$	1.381***			0.461***		
	(0.064)			(0.097)		
Spread$_{jt}$ (IV)		2.372***	1.951**		1.634	2.048
		(0.826)	(0.896)		(1.186)	(1.515)
Spread Non-fin$_{jt}$		−0.172	−0.450		0.654	0.832
		(0.297)	(0.306)		(0.628)	(0.626)
Spread Fin$_{jt}$		−0.364	0.076		−0.265	−0.595
		(0.530)	(0.601)		(0.666)	(0.901)
B_{jt}/Y_{jt}			0.040***			−0.035
			(0.012)			(0.035)
Model	OLS	IV	IV	OLS	IV	IV
Country FE	Y	Y	Y	Y	Y	Y
Quad Time Trend	Y	Y	Y	Y	Y	Y
Observations	968	304	304	569	179	179
Adj. R^2	0.731	0.715	0.713	0.450	0.420	0.398

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Gilchrist-Mojon (2017) indices of corporate spreads for FRA, DEU, ITA, ESP. 2000Q1 – 2017Q4

- Three markets need to clear

$$Y_{Nt} = C_{Nt} + \frac{\vartheta_N}{p_{Nt}} G_t$$

$$Y_{Tt} = C_{Tt} + (1 - \vartheta_N)G_t - \text{NFI}_t$$

$$(L_{Nt} + L_{Tt} - 1)\,(w_t - \gamma w_{t-1}) = 0$$

where net foreign inflows are

$$\text{NFI}_t = \int \left(\omega - q_t^h \phi_a - q_t^g \phi_b \right) d\lambda_t - \kappa B_{t-1} + q_t^g (B_t - (1 - \rho)B_{t-1})$$

| | *Dependent variable Q_{jt}:* | | | | | | | |
| | log Y_{jt} | | | | log C_{jt} | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Spread$_{jt}$	−0.011***				−0.011***			
	(0.003)				(0.002)			
Spread$_{jt}$ (IV)		−0.048**	−0.031	−0.031		−0.088***	−0.035**	−0.035**
		(0.019)	(0.023)	(0.024)		(0.022)	(0.017)	(0.016)
R_{jt}^h			0.054***	0.049***			0.004	−0.009
			(0.010)	(0.011)			(0.007)	(0.007)
R_{jt}^s				0.013				0.036
				(0.046)				(0.031)
Model	OLS	IV	IV	IV	OLS	IV	IV	IV
Country + Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	968	968	540	540	968	968	540	540
Adj. R^2	0.995	0.994	0.997	0.997	0.997	0.993	0.999	0.999

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
ECB borrowing rates for AUT, BEL, DEU, ESP, FRA, IRL, ITA, NLD, PRT. 2003Q1 – 2017Q4

Dependent variable Q_{jt}

	(7)	(8)
Spread$_{jt}$		
Spread$_{jt}$ (IV)	0.035**	−0.035**
	(0.017)	(0.016)
R^h_{jt}	0.004	−0.009
	(0.007)	(0.007)
R^s_{jt}		0.036
		(0.031)
Model	IV	IV
Country + Time FE	✓	✓
Observations	540	540
Adj. R^2	0.999	0.999

What if *Spreads* affect Q through W?
... if $W \perp\!\!\!\perp U \mid S, Q$

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
ECB borrowing rates for AUT, BEL, DEU, ESP, FRA, IRL, ITA, NLD, PRT. 2003Q1 – 2017Q4

The Cycle is the Trend

	$\sigma(C)$	$\sigma(Y)$	$\sigma(C)/\sigma(Y)$	$\sigma(C)/\sigma(Y)$ (AG)
Austria	0.716	0.782	0.916	0.870
Belgium	0.556	0.795	0.700	0.810
Denmark	1.047	1.178	0.889	1.190
Finland	1.278	1.957	0.653	0.940
France	0.780	0.773	1.009	—
Germany	0.692	0.867	0.799	—
Ireland	3.140	3.680	0.853	—
Italy	1.165	0.978	1.191	—
Netherlands	1.726	1.244	1.388	1.070
Portugal	1.827	1.576	1.160	1.020
Spain	1.901	1.396	1.362	1.110

HP filtered data with $\lambda = 1600$. Std deviations in %.

Filtered Spanish output and consumption

Legend: Output, Consumption
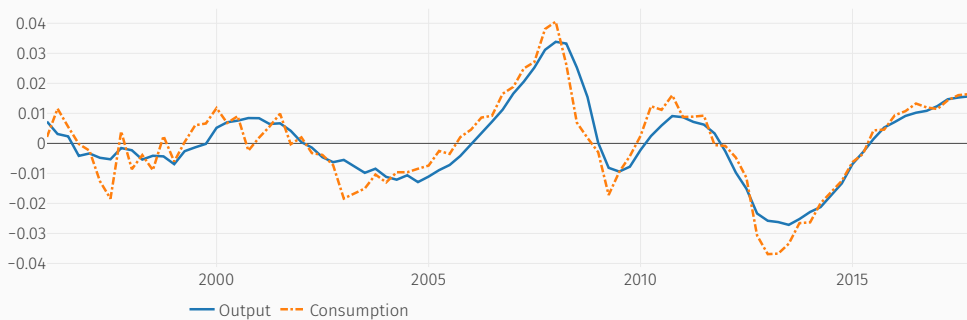
Spain in the 2000s

Trade balance for Spain
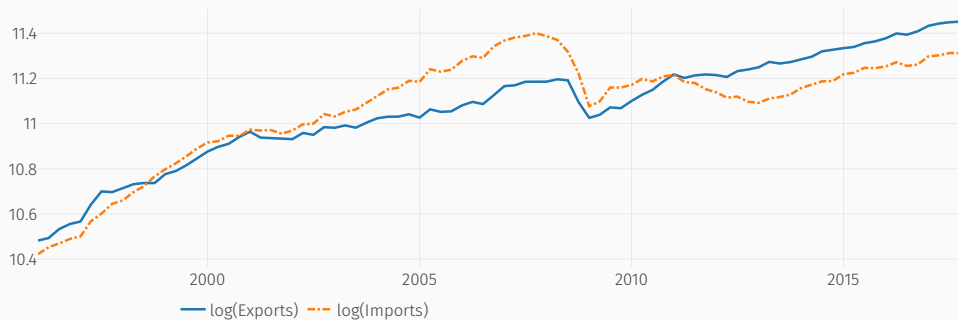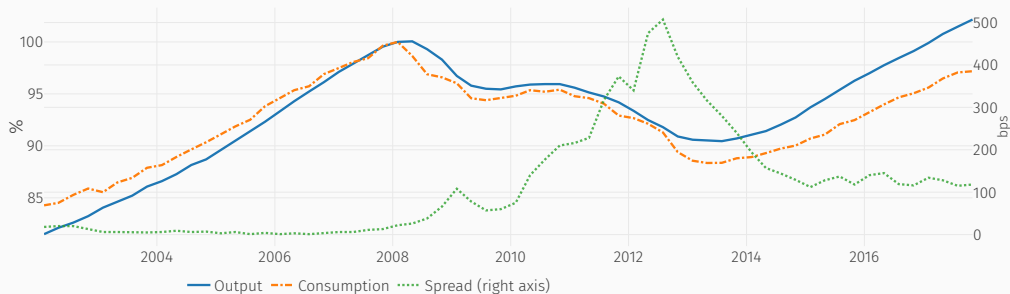

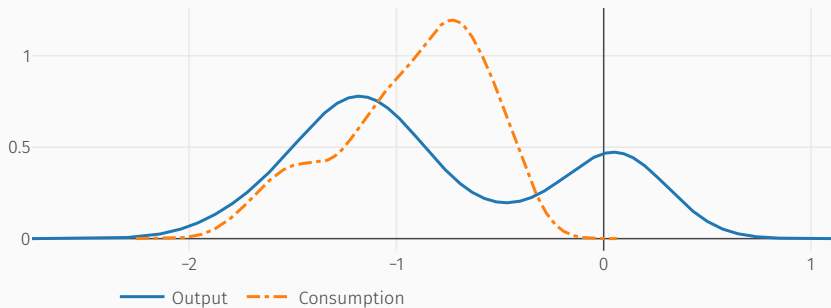Spain in the 2000s

Low demand?

Factors Limiting Production
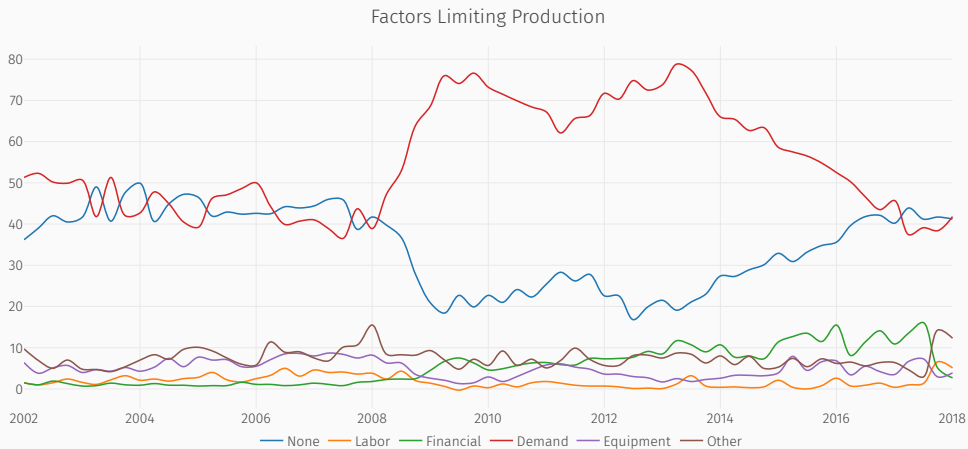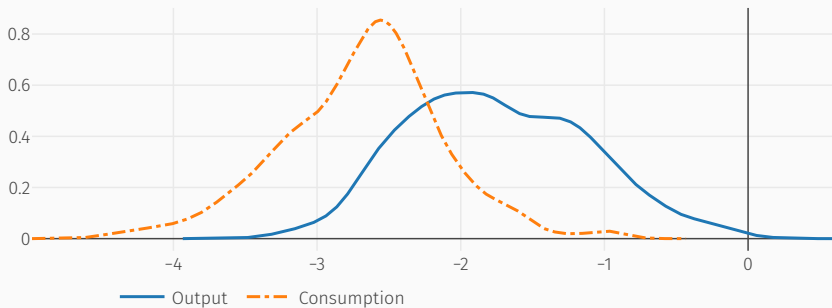
Spanish firms' self-reported limits to production
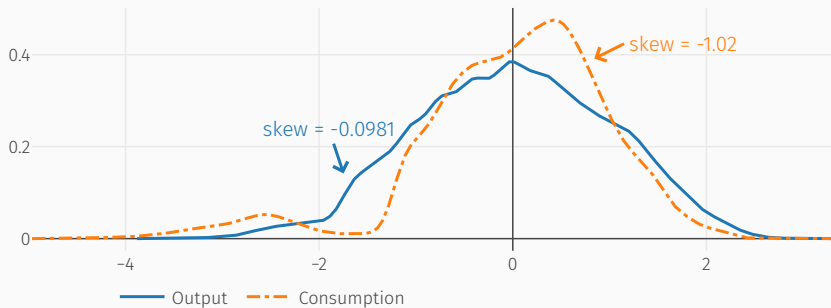Source: Eurostat

Output and Consumption for Spain

Densities for Output and Consumption during Crises ($\pi \geq 15\%$)

Densities for Output and Consumption during Defaults

ERGODIC DISTRIBUTIONS

skew = -1.02

skew = -0.0981

Output
Consumption

Unconditional Ergodic Densities for Output and Consumption

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