The Economics of Sovereign Debt, Bailouts and the Eurozone Crisis

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IAES Conference

October 2020

Motivation

- No Bailout clause: art. 125 of Lisbon Treaty:

  "A Member State shall not be liable for or assume the commitments of central governments, regional, local or other public authorities, ... of another Member State"

- ECB Executive Board member, Jurgen Stark (January 2010):

  "The markets are deluding themselves when they think at a certain point the other member states will put their hands on their wallets to save Greece."

- German finance minister Peer Steinbrueck (February 2009)

  "The euro-region treaties don't foresee any help for insolvent countries, but in reality the other states would have to rescue those running into difficulty."

- Economics Commissioner Joaquin Almunia (January 2010):

  "No, Greece will not default. Please. In the euro area, the default does not exist."

Motivation: COVID crisis:

- Large fiscal transfers for fiscally fragile countries in case of shock that would potentially endanger EU, Eurozone
- European Recovery plan (July 2020): transfers net of expected repayments (ECB) around 4% of GDP for Spain, 5% for Portugal, and 8% for Greece.

Objectives

- We have seen both some default (Greece) and large loans of EFSF/ESM to Cyprus, Greece, Ireland, Portugal and Spain: transfers/bailouts have materialized
- What is the effect of “no bailout clauses” if they are not fully credible?
- What determines the existence and size of bailouts?
- What consequences on risk shifting, debt issuance and yields?
- Is an ironclad no bailout clause desirable?
- What about debt monetization?

Main results

- Estimate of implicit NPV transfers from Europeans to crisis countries: lower bound from 0% (Ireland) to more than 40% of GDP (Greece)
- Theoretical model of monetary union with collateral damage of default/exit and ex-post efficient bailouts to prevent default/exit
- Bailouts do not improve welfare of crisis country: creditor countries get entire surplus from avoiding default (Southern view)
- Ex-ante, bailouts generate risk-shifting and over-borrowing (Northern view)
- No-bailout commitment reduces risk-shifting but may be not ex-ante optimal for creditor country, if risk of immediate insolvency: “kicking the can down the road” optimal?

Relevant Literature – (just a few)

- Sovereign debt crisis: why do countries repay their debt ?
  - Eaton and Gersovitz (1981): reputation
  - Cohen and Sachs (1986), Bulow and Rogoff (1989): disruption costs
- Collateral damage of sovereign default in EMU (default + exit)
  - Bulow and Rogoff (1989)
  - Bolton and Jeanne (2011) on the diversification-contagion trade-off
  - Tirole (2014) and Farhi and Tirole (2016) focus on optimal debt contract, bailout of banks
- Home bias in portfolios
  - Broner, Erce, Martin and Ventura (21014) with creditor discrimination
- Self-fulfilling expectations driven crisis (Calvo, 1988)
  - role of financial backstop and monetary policy: de Grauwe (2011), Aguiar et al (2015), Corsetti & Dedola (2012)): financial backstop eliminates transfers
  - no multiple equilibria but transfers in equilibrium in our paper

Greek Bailout Program (see Corsetti, Erce and Uy (2017))

Three rounds:

- Programme 1 (2010-2011)
  - Greek Loan Facility(GLF): €80 Billion; many amendments (2011, 2012): longer grace period and maturity, lower interest rates (€52.9 Billion disbursed)
  - IMF: €20 Billion
- Programme 2 (2010)
  - EFSF : €142 Billion, disbursed;
    ESM (2017) adjustments : deferred interest payments (10 years), increased maturity (to max. 32.5 years), reduced interest rates
  - IMF: €8.3 Billion
- Programme 3 (2015-2018)
  - ESM : €86 Billion (€31.7 Billion disbursed)

Size of implicit transfers during crisis

- Crisis countries (Ireland, Greece, Cyprus, Portugal, Spain) received loans from GLF/EFSF/EFSM/ESM and IMF; see Corsetti, Erce and Uy (2017)

- How much implicit transfers in the loans?

- Key issue: how much default risk and therefore what discount rate? If discount rate reflects default risk then no transfer

- Default risk on European institutions lower than on private creditors

- Assumption for discount rate: risk of default on European institution loans $\geq$ IMF $\Rightarrow$ Lower bound estimate of transfer
  - IMF programs are short to medium term (3 to 9 years): if increasing yield curve, underestimate NPV of transfer
  - Risk of default higher on ESM than on IMF (loans to IMF are senior)
  - We assume no more debt renegotiations

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Size of implicit transfers during crisis

- Methodology (Zettelmeyer and Joshi, 2005) to estimate NPV of total transfers $Tr_t^{i,j}$ (borrower i; creditor j, time t)

- We discount at Internal rate of return (*irr*) of IMF program for same borrower:

$$Tr_{2010}^{i,j} = \sum_{t=2010}^{T} \frac{1}{(1+irr^{i,IMF})^t} NT_t^{i,j}$$

- Series of net transfers with $irr^{i,j}$ such that =0:

$$NT_t^{i,j} = D_t^{i,j} - R_t^{i,j} - i_{t,1}^{i,j}\tilde{D}_{t,1}^{i,j} - \ldots - i_{t,\tau}^{i,j}\tilde{D}_{t,\tau}^{i,j}$$

$R_t^{i,j}$ =repayments; $D_t^{i,j}$ = disbursements;
$\tilde{D}_{t,\tau}$ = outstanding balance at t on amount disbursed at $t-\tau$;
$i_{t,\tau}$: interest rate at t on amount disbursed at $t-\tau$.

Implicit Transfers in the Eurozone

Borrower i	Lender j	$irr^{i,j}$	$\Delta irr^{i,j}$	$\sum D^{i,j}$	$TR^{i,j}$	$Tr^{i,j}/GDP^i$
Cyprus	ESM	0.82	0.90	6.30	0.74	3.62%
	IMF	1.73		0.95		
Greece	EC	0.68	2.58	52.90	18.49	8.18%
	EFSF	1.16	2.11	171.2	66.82	28.19%
	ESM	1.83	1.43	61.90	16.64	7.30%
	IMF	3.26		31.99		
Ireland	EFSF	1.83	0.83	17.70	2.22	1.29%
	EFSM	3.23	-0.57	22.50	-1.51	-0.88%
	IMF	2.66		22.61		
Portugal	EFSF	1.78	1.46	26.00	5.47	2.93%
	EFSM	3.10	0.14	24.30	0.38	0.21%
	IMF	3.25		26.39		
Spain	ESM	0.93	1.73	41.33	5.55	0.49%
	IMF*	2.66				

The table reports the irr ($irr^{i,j}$) for each recipient country i and funding agency j, the difference with IMF irr ($\Delta irr^{i,j}$), the total amount disbursed ($\sum D^{i,j}$), the implicit transfer $Tr^{i,j}$ in €billions and scaled by 2010 GDP. $*$ For Spain, average of IMF irr of other countries.

Non euro-zone countries

Borrower i	Lender j	$irr^{i,j}$	$\Delta irr^{i,j}$	$\sum D^{i,j}$	$TR^{i,j}$	$Tr^{i,j}/GDP^{i}$
Hungary	BoP	3.56	-1.13	5.50	-0.28	-0.31%
	IMF	2.42		8.75		
Latvia	BoP	3.09	-0.53	2.90	-0.09	-0.49%
	IMF	2.55		1.11		
Romania	BoP	3.00	-0.30	5.00	-0.10	-0.08%
	IMF	2.70		11.87		

Theory

- Start with a version of Calvo (1988) model
- 2 periods: $t = 0, 1$
- 3 countries: i, g (inside monetary union) and u (rest of the world)
- g is fiscally sound (safe bonds as u), i is fiscally fragile
- i's output is uncertain: $y_1 = \bar{y}_1^i \epsilon_1$ with $E[\epsilon_1] = 1$, cdf $G(\epsilon_1)$, with bounded support $[\epsilon_{\min}, \epsilon_{\max}]$
- Preferences of country j:

$$U^j = c_0^j + \beta E[c_1^j] + \omega^j \lambda^s \ln b_1^{s,j} + \omega^j \lambda^{i,j} \ln b_1^{i,j}$$

  - Bonds from i provide liquidity services $\lambda^{i,j}$ to j with: $\lambda^{i,i} > \lambda^{i,g} \geq \lambda^{i,u}$ (ECB collateral policy)
  - Bonds from g and u are 'safe', with $b^{s,j} = b^{g,j} + b^{u,j}$

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Debt portfolios

Pins down portfolio shares, regardless of yields, $\alpha^{i,j}$: share of i's debt held by country j:

$$\alpha^{i,j} = \frac{b_1^{i,j}}{b_1^i} = \omega^j \frac{\lambda^{i,j}}{\bar{\lambda}^i}$$

with $\bar{\lambda}^i = \sum_k \omega^k \lambda^{i,k}$

- Portfolio shares proportional to relative liquidity benefits of i debt across each class of investors, and size, independent from yields.
- $\lambda^{i,i} > \lambda^{i,g} \geq \lambda^{i,u}$ implies $\alpha^{i,i} > \alpha^{i,g} \geq \alpha^{i,u}$ (home bias in bonds)
- Results hold in the 'bondless limit' where $\lambda^s \to 0$ and $\lambda^{i,j} \to 0$ but $\lambda^{i,j}/\bar{\lambda}^i$ remains constant

Default & Bailout at $t = 1$

- i can strategically default (*pari passu*)
- g can unilaterally offer a bailout $\tau_1 \geq 0$ to avoid default, financed by lumpsum taxes
- Cost of default to $i: \Phi y_1^i + \tau_1$
  - Φy_1^i: disruption cost of default/exit
  - No bailout
- Benefit to $i: (b_1^{i,i} - \rho y_1^i)(1 - \alpha^{i,i})$
  - $0 \leq \rho \leq 1$: recovery rate
  - $1 - \alpha^{i,i}$: debt held externally (in g and u).
- Cost to g: $(b_1^i - \rho y_1^i)\alpha^{i,g} + \kappa y_1^g$
  - direct portfolio exposure: $(b_1^i - \rho y_1^i)\alpha^{i,g}$;
  - collateral damage κy_1^g (monetary union)
- Benefit to g: economizes on bailout τ_1

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Default & Bailout at $t = 1$

- *i decision on default* : given τ_1, repay if cost $\geq$ benefit
  minimum transfer/bailout to avoid default:

$$\tau_1 \geq b_1^i(1-\alpha^{i,i}) - y_1^i\left[\Phi + \rho(1-\alpha^{i,i})\right] \equiv \underline{\tau}_1$$

  - Threshold for no default without bailout ($\tau_1 = 0$):

$$\bar{\epsilon}(b_1^i) \equiv \frac{(1-\alpha^{i,i})b_1^i/\bar{y}_1^i}{\Phi + \rho(1-\alpha^{i,i})} \leq \epsilon_1^i$$

Default & Bailout at $t = 1$

- g decision to bailout: given b_1^i and $\epsilon_1^i < \bar{\epsilon}$, g prefers bailout (at $\underline{\tau}_1$) if :

$$\Phi y_1^i + \kappa y_1^g \geq \alpha_1^{i,u}(b_1^i - \rho y_1^i)$$

overall loss of default $\geq$ overall gain of default

- Threshold for bailout:

$$\underline{\epsilon}(b_1^i) \equiv \frac{\alpha^{i,u} b_1^i / \bar{y}_1^i - \kappa y_1^g / \bar{y}_1^i}{\Phi + \rho \alpha^{i,u}} \leq \epsilon_1^i < \bar{\epsilon}(b_1^i)$$

- If $\epsilon_1^i < \underline{\epsilon}(b_1^i)$, g prefers to let i default.

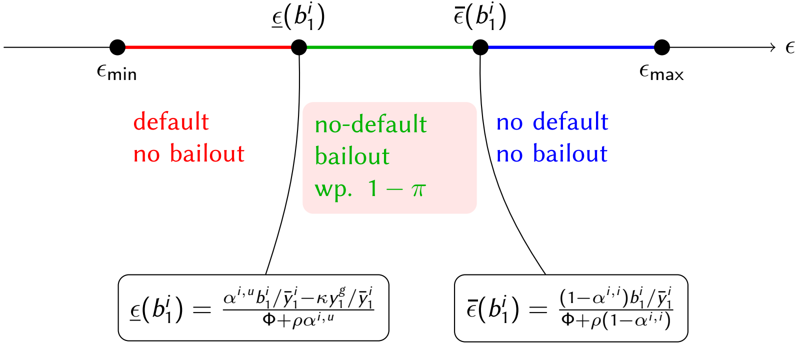
- Bailout is *ex-post* efficient for i and g jointly
- g makes minimum bailout & captures all the surplus: Southern view
- If bailout conditional on reforms that improve i output: again, all surplus captured by g

Institutions, no-bailout clauses and political uncertainty

- Legality of bailouts has been questionned (article 125 of European Treaty) with Karlsruhe court or ECJ
- Political controversy on bailouts in Germany: transfers are uncertain
- Ex-ante commitment to make transfers impossible/more uncertain
- Exogenous parameter π: probability that ex-post transfers **cannnot** be implemented

Optimal Ex-Post Bailout Policy

Political uncertainty/commitment: probability π that bailout cannot be implemented.



Probability of default:

$$\pi_d = G(\underline{\epsilon}) + \pi\left(G(\bar{\epsilon}) - G(\underline{\epsilon})\right)$$

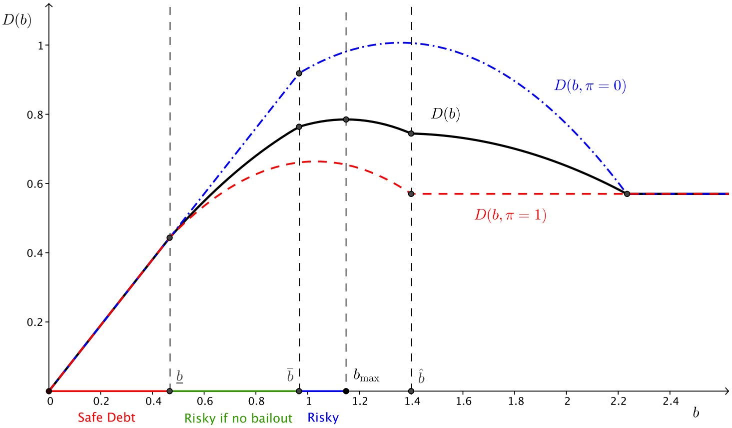
Debt rollover problem at $t = 0$

Fiscal revenues $D(b_1^i) = b_1^i / R^i$ raised by the government of country i in period $t = 0$:

$$D(b_1^i) = \beta b_1^i \left(1 - \pi_d\right) + \beta \rho \bar{y}_1^i \left(\int_{\epsilon_{\min}}^{\underline{\epsilon}} \epsilon dG\left(\epsilon\right) + \pi \int_{\underline{\epsilon}}^{\bar{\epsilon}} \epsilon dG\left(\epsilon\right) \right) + \overline{\lambda}^i$$

- $D(b)$ defines a *debt-Laffer curve*
- ex-post bailout likelihood affects the shape of the debt-Laffer curve
- under some regularity assumptions, debt-Laffer curve is well behaved (convex over the relevant range) although not continuously differentiable.

The Debt-Laffer Curve: $D(b)$



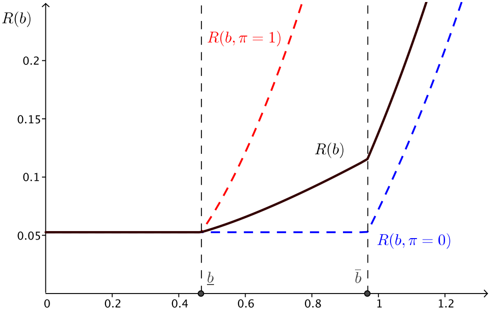
$D(b)$ for $\pi = 0$ (max bailout), $\pi = 0.5$ and $\pi = 1$ (no bailout).

[Uniform distribution with $\rho = 0.6$, $\Phi = 0.2$, $\kappa = 0.05$, $\epsilon_{\text{min}} = 0.5$, $\beta = 0.95$, $\bar{y}_1^i = 1$, $y_1^g = 2$, $\alpha^{i,i} = 0.4$, $\alpha^{i,g} = \alpha^{i,u} = 0.3$. $\underline{b} = 0.47$, $\overline{b} = 0.97$ and $\hat{b} = 1.4$]

$\underline{b}$: max debt level, full repayment w/o bailout; $\overline{b}$:max debt level, full repayment with bailout

$\hat{b}$: min debt level above which default occurs with certainty w/o bailout

Yields: a Deauville effect (October 2010)?



Yields for $\pi = 0$ (expected bailout), $\pi = 1$ (no expected bailout) and $\pi = 0.2$

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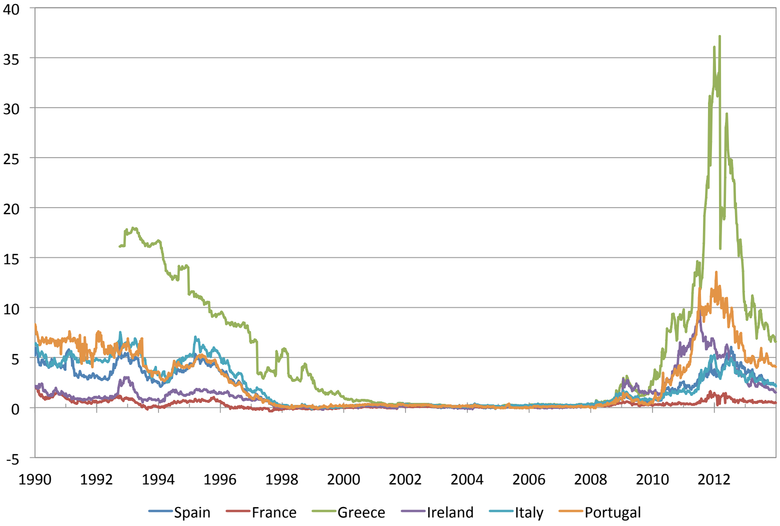
10-year spread against Germany 1990-2014 (percent)



Source: Global Financial Database

Optimal Debt

First-order condition for i (bondless limit, interior solution):

$$D'(b_1^i) = \beta(1 - G(\bar{\epsilon}))$$

Interpretation: marginal gain of issuing debt equals discounted probability of repayment without transfer:

- If default: repayment proportional to output
- If bailout: marginal debt is repaid by g

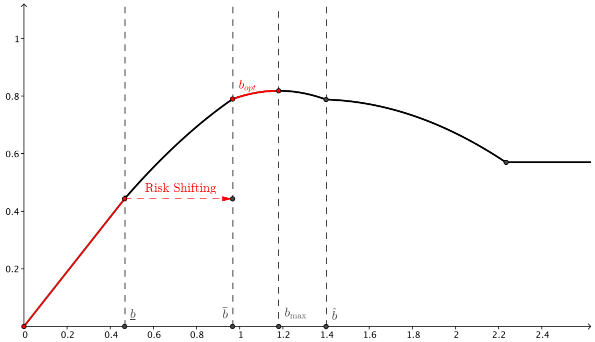
Optimal Debt

Rewrite first-order condition:

$$(G(\bar{\epsilon}) - G(\underline{\epsilon}))\,(1-\pi) = (b_1^i - \rho\bar{y}_1^i\underline{\epsilon})(1-\pi)g(\underline{\epsilon})\frac{d\underline{\epsilon}}{db} + (b_1^i - \rho\bar{y}_1^i\bar{\epsilon})\pi g(\bar{\epsilon})\frac{d\bar{\epsilon}}{db}$$

- Gain: probability that marginal debt paid by transfer from g
- Costs: increases $\underline{\epsilon}$ (outright default more likely) and $\bar{\epsilon}$ (default due to political uncertainty more likely)
- With bailouts, i trades off increased riskiness of the debt (higher yields) against the likelihood of a bailout (risk shifting): $0 \leq b_1^i \leq \underline{b}$ or $b_1^i = b_{opt} > \underline{b}$ (Northern view)
- Characterize the extent of risk shifting
- If $\pi = 1$ (commitment for no bailout): $g(\bar{\epsilon}) = 0$ or $\bar{\epsilon} \leq \epsilon_{min}$ so no incentive to issue excessive debt

Optimal Debt Issuance: Risk Shifting



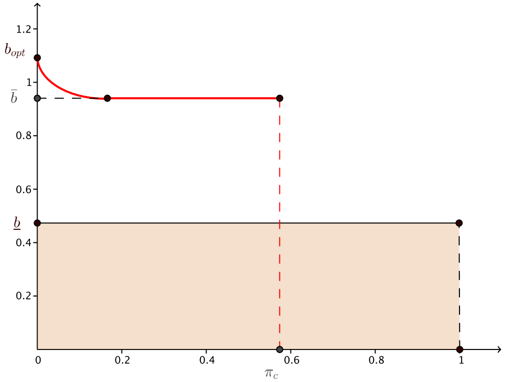
Optimal Debt Issuance for $\pi = 0.5$.
Uniform distribution with $\rho = 0.6$, $\Phi = 0.2$, $\kappa = 0.05$, $\epsilon_{\text{min}} = 0.5$, $\beta = 0.95$, $\bar{y}_1^i = 1$, $y_1^g = 2$, $\alpha^{i,i} = 0.4$, $\alpha_1^{i,g} = \alpha^{i,u} = 0.3$. $\underline{b} = 0.47$, $\bar{b} = 0.97$ and $\hat{b} = 1.4$

Choose safe debt if π high and if $\alpha^{i,i}$ high

Risk shifting and no bailout clauses

- Risk shifting increases with probability of bailout $1-\pi$: if π very low, $b_{opt} > \overline{b}$
- i chooses risky debt, even if it can avoid rollover risk: risk shifting is maximal.
- Reconciles the 'Northern' and 'Southern' views: two sides of the same coin.
- The possibility of a transfer induces risk shifting by i but g captures all the surplus from the transfer.

The Effect of No-Bailout Clauses



Plot of the set of unconstrained solutions $0 \leq b \leq \underline{b}$ and b_{opt} as a function of π. There is a critical value π_c above which risk shifting disappears.

Choosing No-Bailout Clauses Commitment level

- Legal institutions, international treaties... may increase π
- b_{opt} decreases with π: g can eliminate risk-shifting by choosing $\pi \geq \pi_c$
- Will g always choose high π (strong no bailout clause)?
- Not necessarily: higher π could force i to default in period 0 because it reduces resources available in period 0 if high initial debt in $t = 0$
- Option value to wait or "kicking the can down the road" by g: what if ε_1^i high?
- Optimal choice of $\pi < \pi_c$ if i has high initial level of debt

The Time Line of Greek Transfers

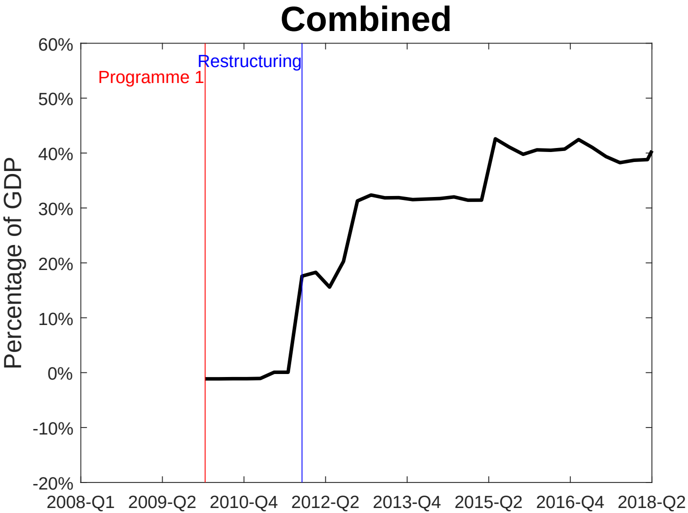


Figure reports combined Net Transfers (as a fraction of 2010 Greek GDP)

Default vs. Exit

- Greece defaulted in 2012, received a transfer and did not exit
- Extension: differentiate
  - default:
    - i: cost : $\Phi_d y_1^i$
    - g: cost : $\kappa_d y_1^g$
  - exit :
    - i: cost : $\Phi_e y_1^i$ and extra benefit: $\Delta b_1^i (1 - \alpha^{ii})$
    - g: cost: $\kappa_e y_1^g$ and extra cost: $\Delta b_1^i \alpha^{ig}$
- Transfer: to avoid default ($\underline{\tau}_1^d$), exit ($\underline{\tau}_1^e$) or both ($\underline{\tau}_1^d + \underline{\tau}_1^e$)
- Exit before Default: $\Delta / \Phi_e < 1/(\Phi_d + \rho)$
- In the absence of transfers, default threshold $\bar{\epsilon}^d > \bar{\epsilon}^e$ exit threshold

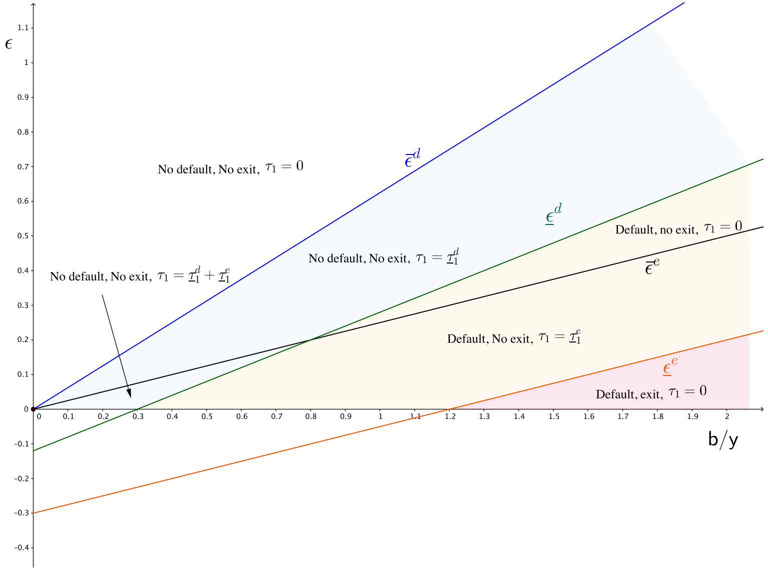


Figure: Optimal Ex-Post Bailout and Default vs. Exit Decisions: Ireland and Greece

Debt monetization

- Debt monetization $\neq$ transfers
- with $\rho = 0$ and either $\pi = 0$ or 1
- inflation rate z with distortion cost $\delta z y_1^i$ for i and $\delta z y_1^g$ for g
- maximum inflation rate $\bar{z}$

Overburdened Central Bank

Transfers are not possible ($\pi = 1$):

default
no inflation

no-default
inflation

no default
no bailout
no inflation

- Debt monetization without transfers (stronger commitment for no bailout)
  - generates distortion costs
  - increases likelihood of default

Conclusion

- Reconcile ”Northern” and ”Southern” views of crisis: two sides of the same coin
  - Incentive to overborrow by fiscally fragile countries because of imperfect commitment of no bailout clause
  - Efficiency gains of transfers and debt monetization to prevent default entirely captured by creditor country (no solidarity)
  - In our model, very large transfer to Greece (more than 40% of GDP) did not improve Greece welfare
- Current policy discussions
  - Strengthening the no-bailout commitment should be done with prudence especially for high debt countries:
    - may precipitate immediate insolvency
    - may overburden ECB (debt monetization less efficient than transfers)
  - COVID-19 transfers to fiscally fragile countries through European recovery plan + debt monetization