

Sovereign Debt Markets in Turbulent Times: Creditor Discrimination and Crowding-Out Effects

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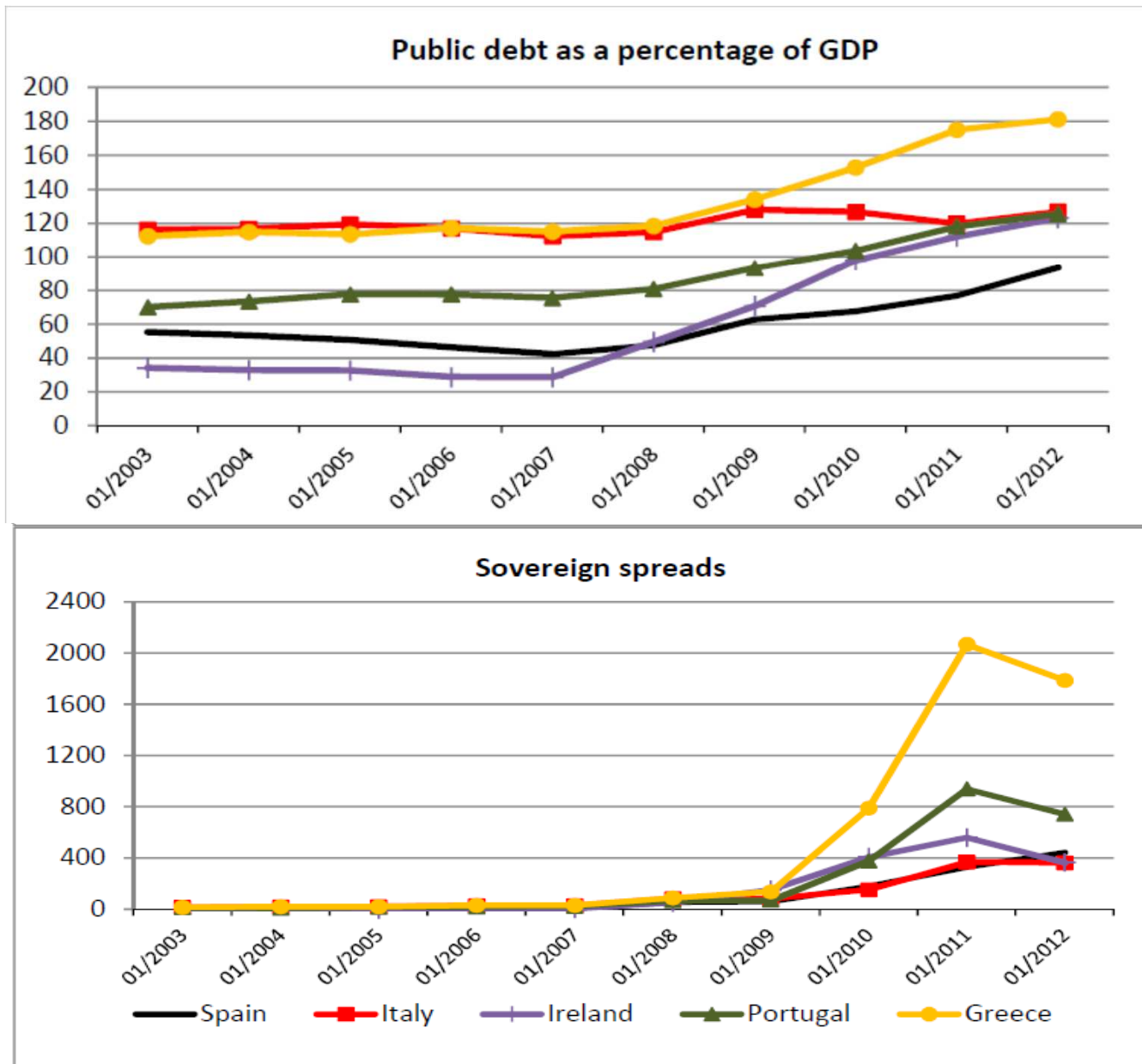
[^]ESM, Bank of Spain

June 2014

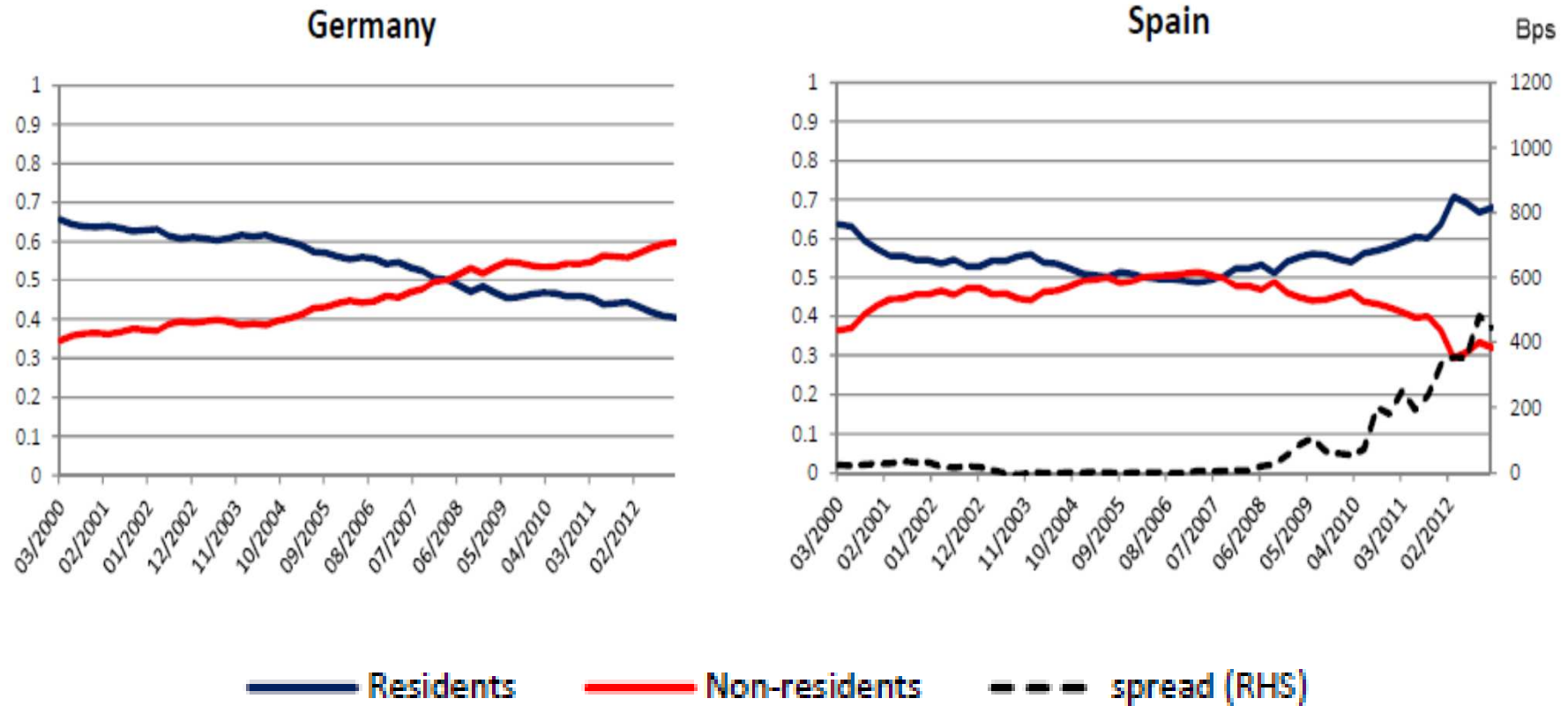
Background

- In 2007, Greece, Ireland, Italy, Portugal, and Spain looked very solid
 - growth: 3.7% (Germany and France 2.8%)
 - fiscal deficit/GDP: 1.8% (Germany and France 2.0%)
 - sovereign spreads: 0.15%
 - public debt/GDP: 77% (Germany and France 71%)
 - maturity: 6.4 years (Germany and France 6.6 years)
- By 2010, GIIPS were facing
 - major sovereign debt problems
 - deep recessions

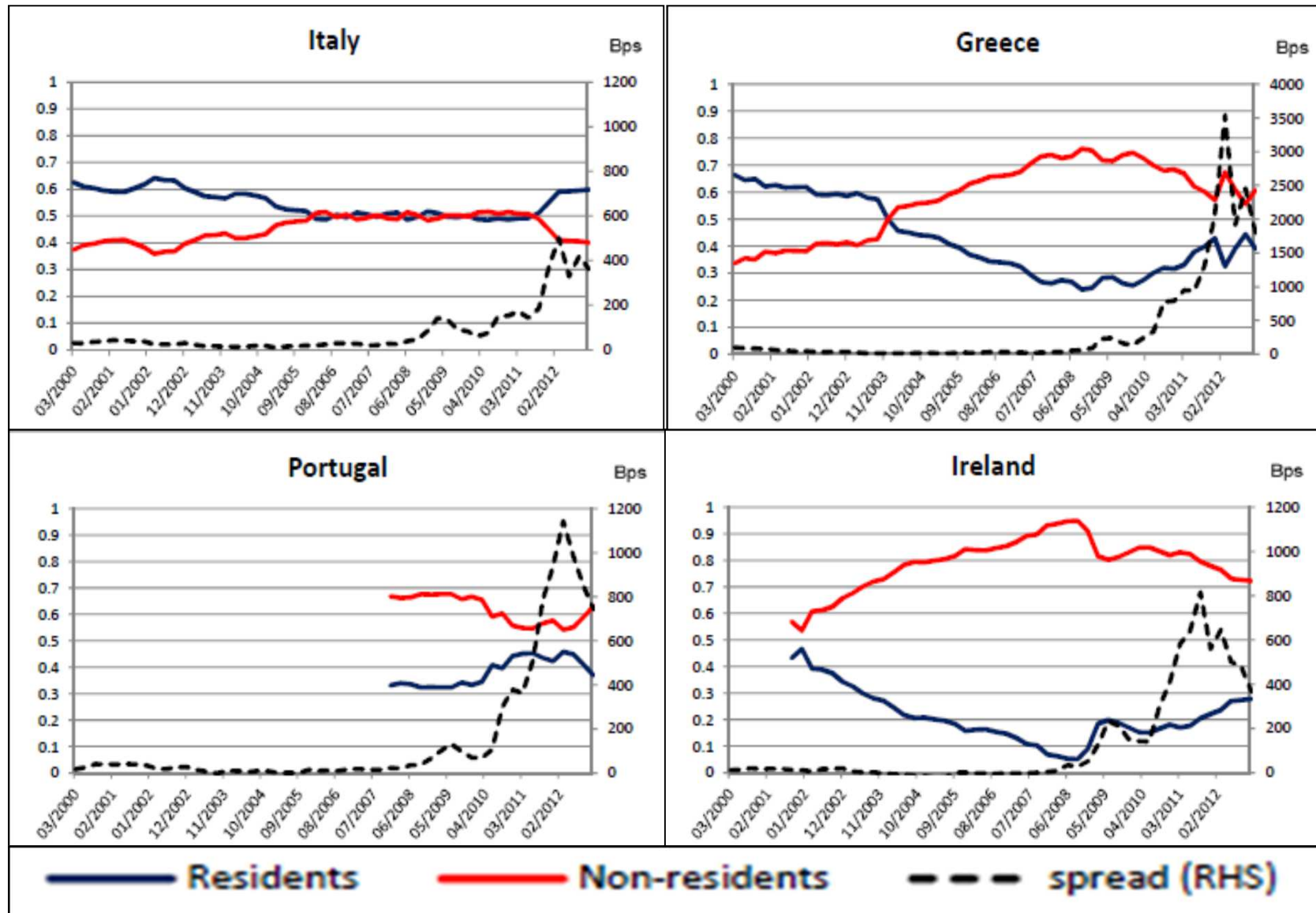
Public debt and spreads: A bird's eye view



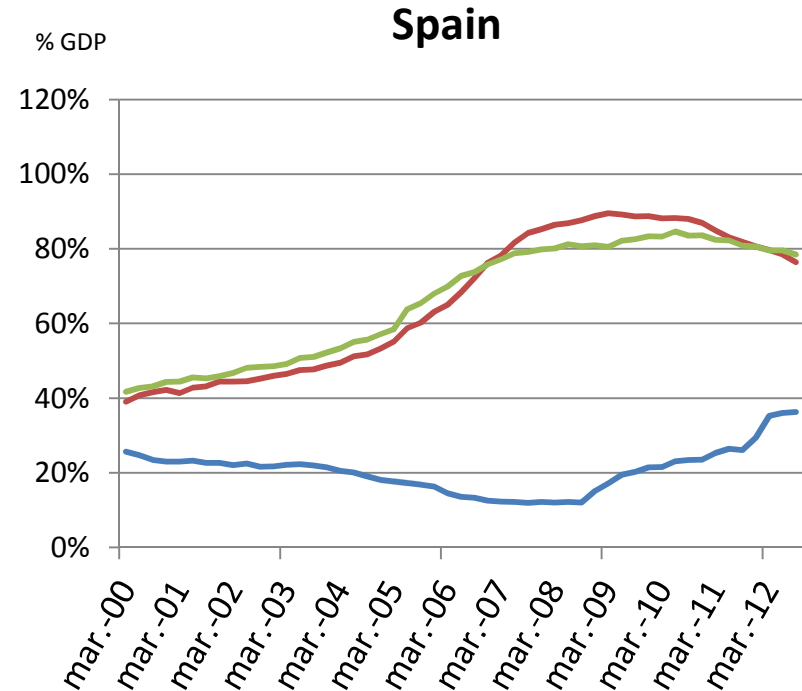
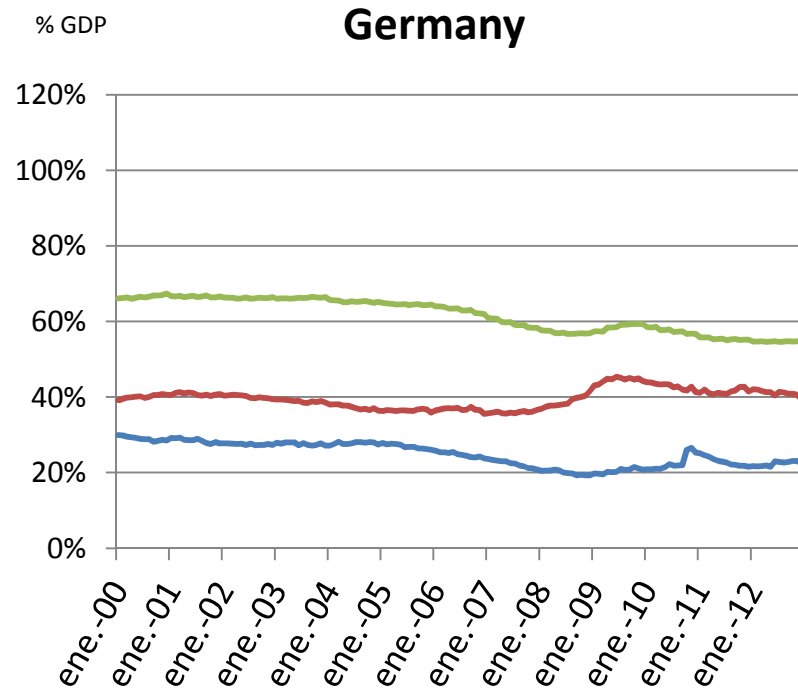
Sovereign debt holders: Germany vs. Spain



Sovereign debt holders in the periphery

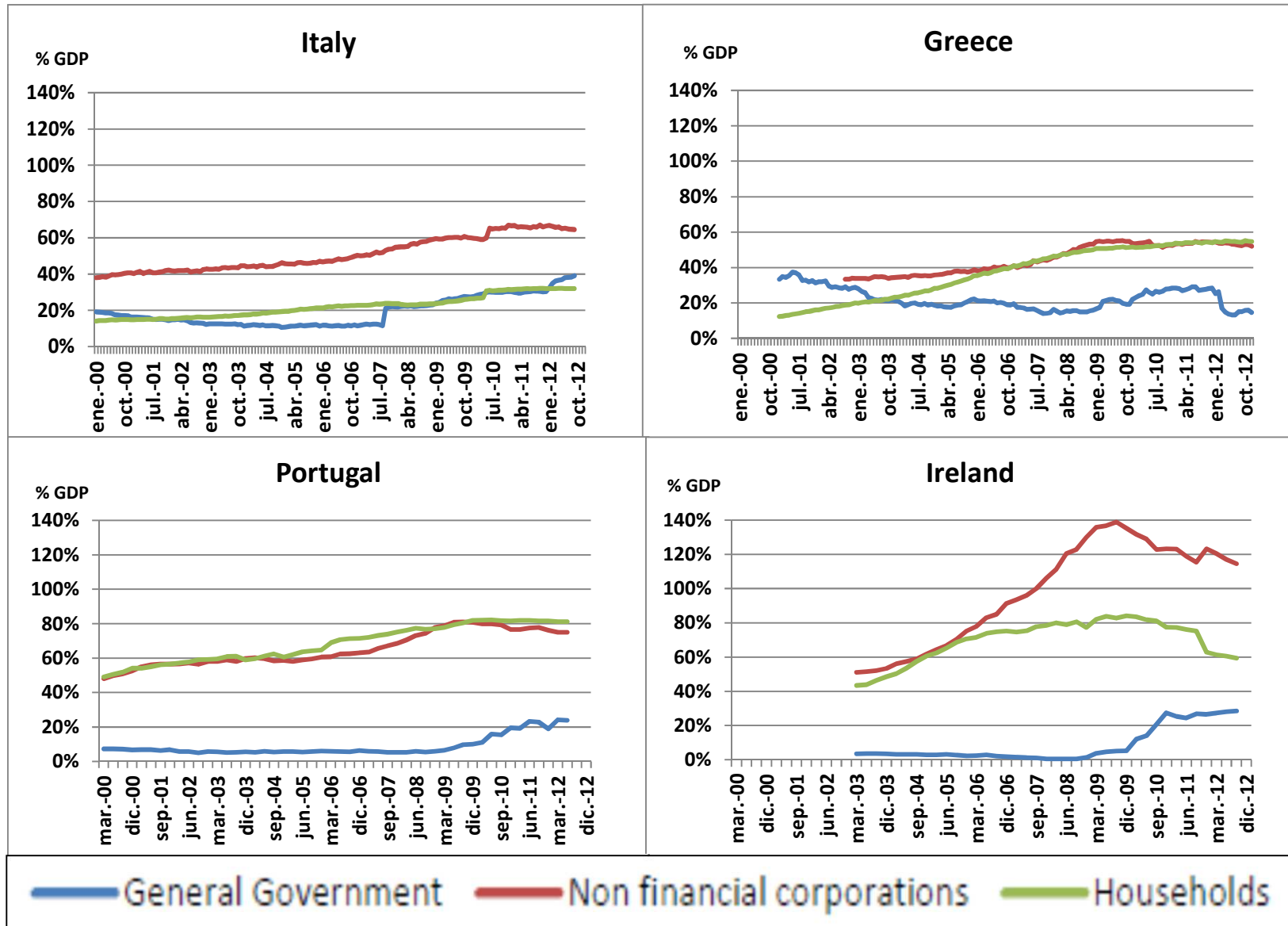


Sectorial credit: Germany vs. Spain

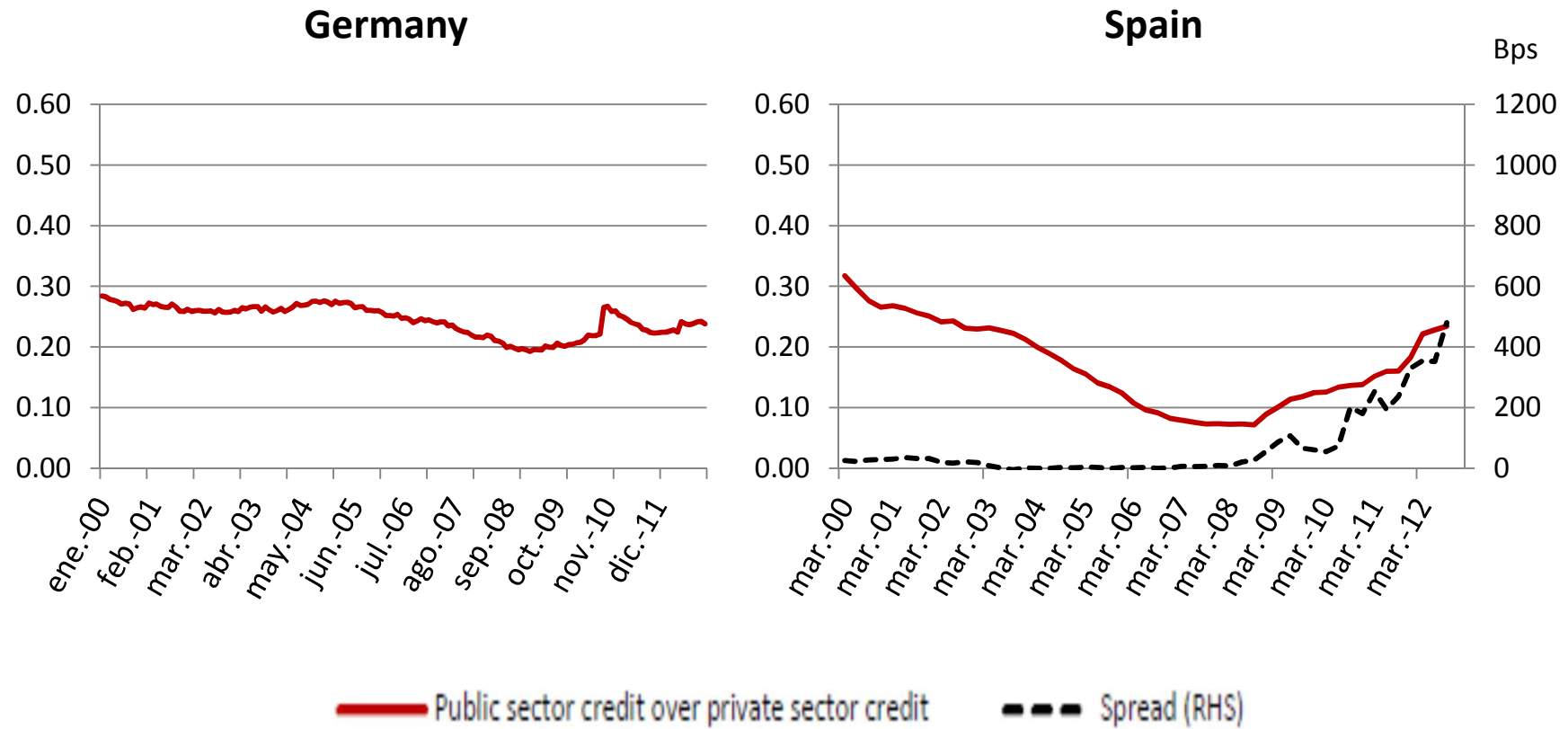


— General Government — Non financial corporations — Households

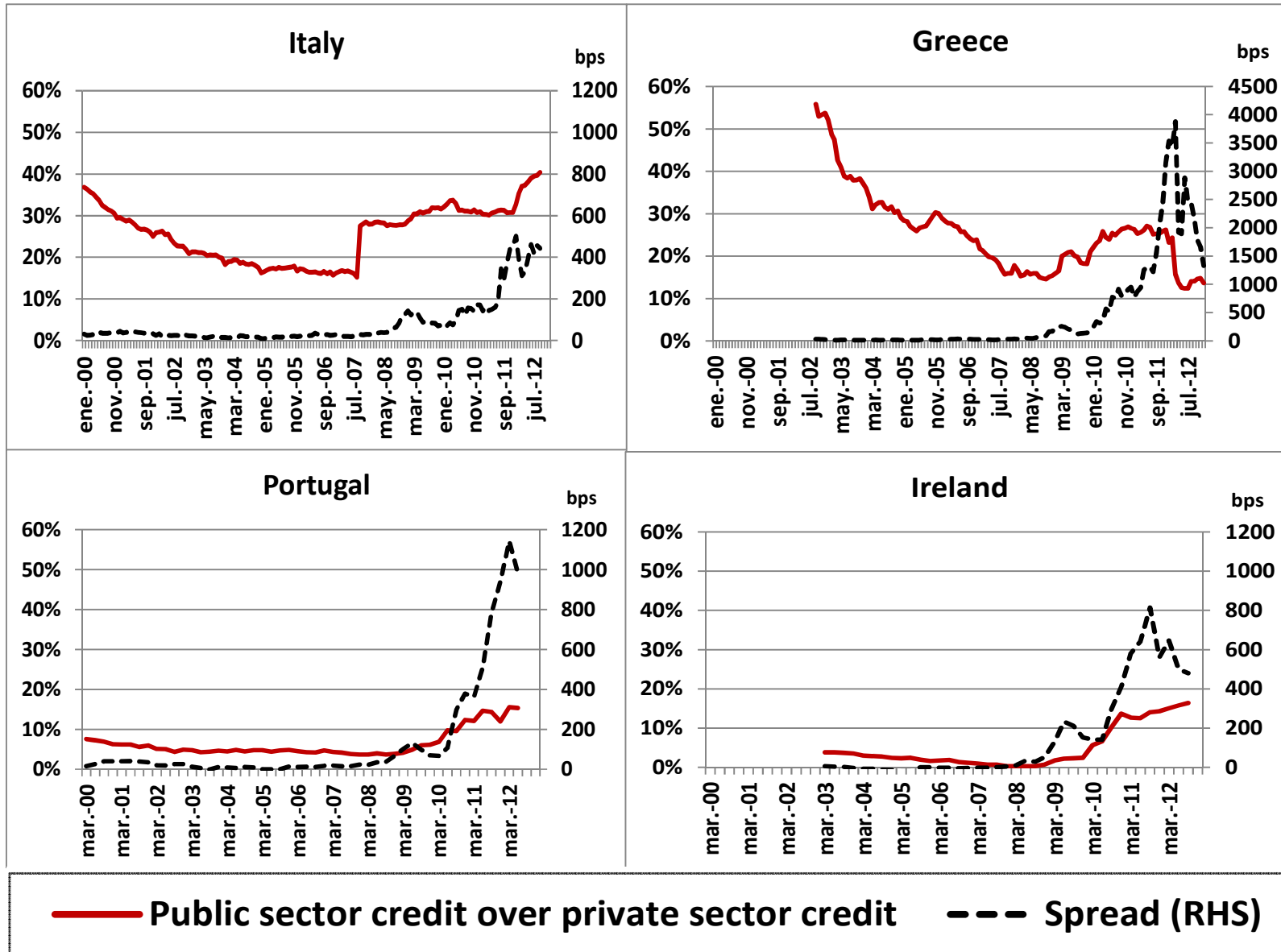
Sectorial credit in the periphery



Public credit, private credit & sovereign spreads



Public credit, private credit & sovereign spreads



Questions

- Why have sovereign spreads increased so much?
- Why have the private sectors of GIIPS purchased the debts of their sovereigns?
- What are the economic consequences of these domestic purchases of debt?
- What are the key inefficiencies that these purchases generate?
- What is the right set of policies to address them?
- What difference does it make that GIIPS belong to the euro zone?
- Is there a role for euro zone-wide policy?

Plan

- A model of sovereign debt, investment and growth
- Crucial ingredients
 - governments (sometimes) discriminate in favor of domestic residents
 - sovereign debt is traded in secondary markets
 - financial frictions
- Emphasize crowding-out effects
 - various inefficiencies
 - multiple steady states and poverty traps
 - multiple equilibria and self-fulfilling crises
- Spillovers across an economic union
 - exporting crowding-out effects
 - role for transfers and broken unions

Related literature

- Sovereign defaults and economic activity
 - Aguiar-Amador-Gopinath (2009), Aguiar-Amador (2011), Brutti (2011), Erce (2012), Mendoza-Yue (2012), Mengus (2012), Gennaioli-Martin-Rossi (2013)
- Self-fulfilling debt crises
 - Calvo (1988), Cole-Kehoe (2000), Conesa-Kehoe (2012), Aguiar-Amador-Farhi-Gopinath (2013)
- Secondary markets and sovereign risk
 - Broner-Martin-Ventura (2008, 2010), Broner-Ventura (2010, 2011), Lanau (2011), Bai-Zhang (2012), Pitchford-Wright (forth.)
- Gross capital flows during crises
 - Broner-Didier-Erce-Schmukler (2013), Brutti-Saure (2013)
- Sovereign debt and growth
 - Reinhart-Rogoff (2010, 2012)

Model without sovereign debt - Setup

- OLG: young and old, measure one
- Preferences: $1 - \mu$ consume when young and μ maximizes expected consumption when old

$$U_t = E_t \{c_{t+1}\}$$

- Labor: young supplies one unit of labor inelastically
- Technology: Cobb-Douglas production function

$$f(k_t) = k_t^\alpha$$

- Factor markets

$$w_t = (1 - \alpha) \cdot k_t^\alpha \quad \text{and} \quad r_t = \alpha \cdot k_t^{\alpha-1} + 1 - \delta$$

- Small open economy

- international financial market (IFM) willing to borrow and lend at expected rate ρ
- domestic residents save in capital and borrow from or lend to IFM

- Financial markets: domestic residents can pledge fraction $\phi \in (0, \rho)$ of capital stock

$$f_t \leq \frac{\phi \cdot k_{t+1}}{\rho}$$

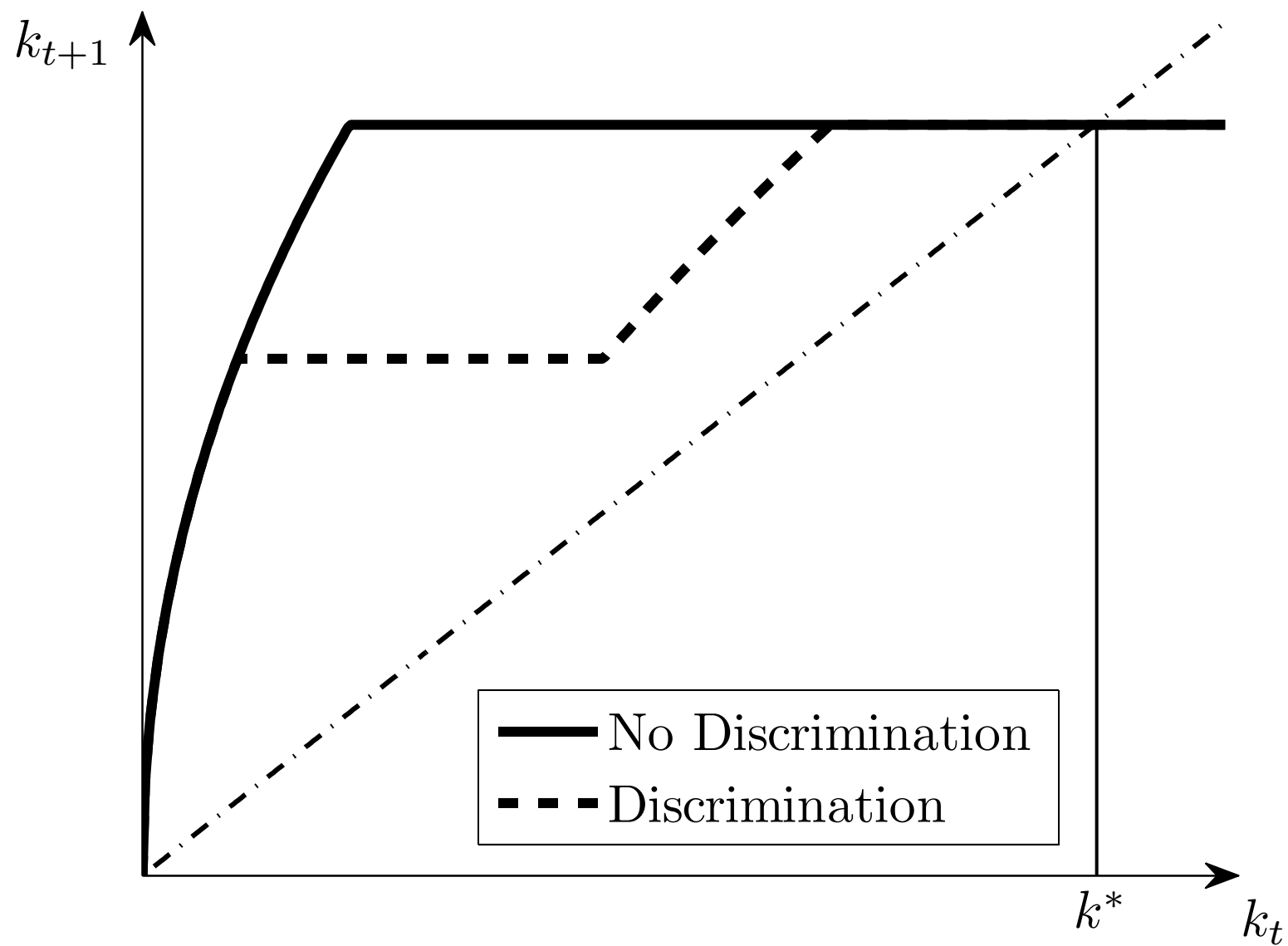
Model without sovereign debt - Equilibrium

- Young save fraction $s \equiv \mu \cdot (1 - \alpha)$ of output
- Borrowing constraint binds for low levels of capital, wages, and savings
- Law of motion of capital stock

$$k_{t+1} = \min \left\{ \frac{\rho}{\rho - \phi} \cdot s \cdot k_t^\alpha, \left(\frac{\alpha}{\rho + \delta - 1} \right)^{\frac{1}{1-\alpha}} \right\}$$

– old receive return on capital, repay their foreign debts, and consume

The law of motion with and without discrimination



Model with sovereign debt - Setup

- Government

- inherits amount of debt d_t
- taxes consumption x_t
- defaults with probability $1 - p_t$
- permanent exclusion after default

- Thus

$$d_{t+1} = \begin{cases} R_t \cdot d_t - x_t & \text{with prob. } p_t \\ 0 & \text{with prob. } 1 - p_t \end{cases}$$

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- For this presentation, I will usually assume

$$d_t \equiv d \text{ and } p_t \equiv p$$

- Sovereign debt is traded in secondary markets

- no segmentation between domestic and foreign creditors!

- Key question for evolution of economy: Who buys this debt?

- depends on probability of default and who is affected by it

Model with sovereign debt - Equilibrium

- Assume first foreigners and domestics are both defaulted with probability $1 - p$

- Contractual interest rate

$$R_{t+1} = \frac{\rho}{p}$$

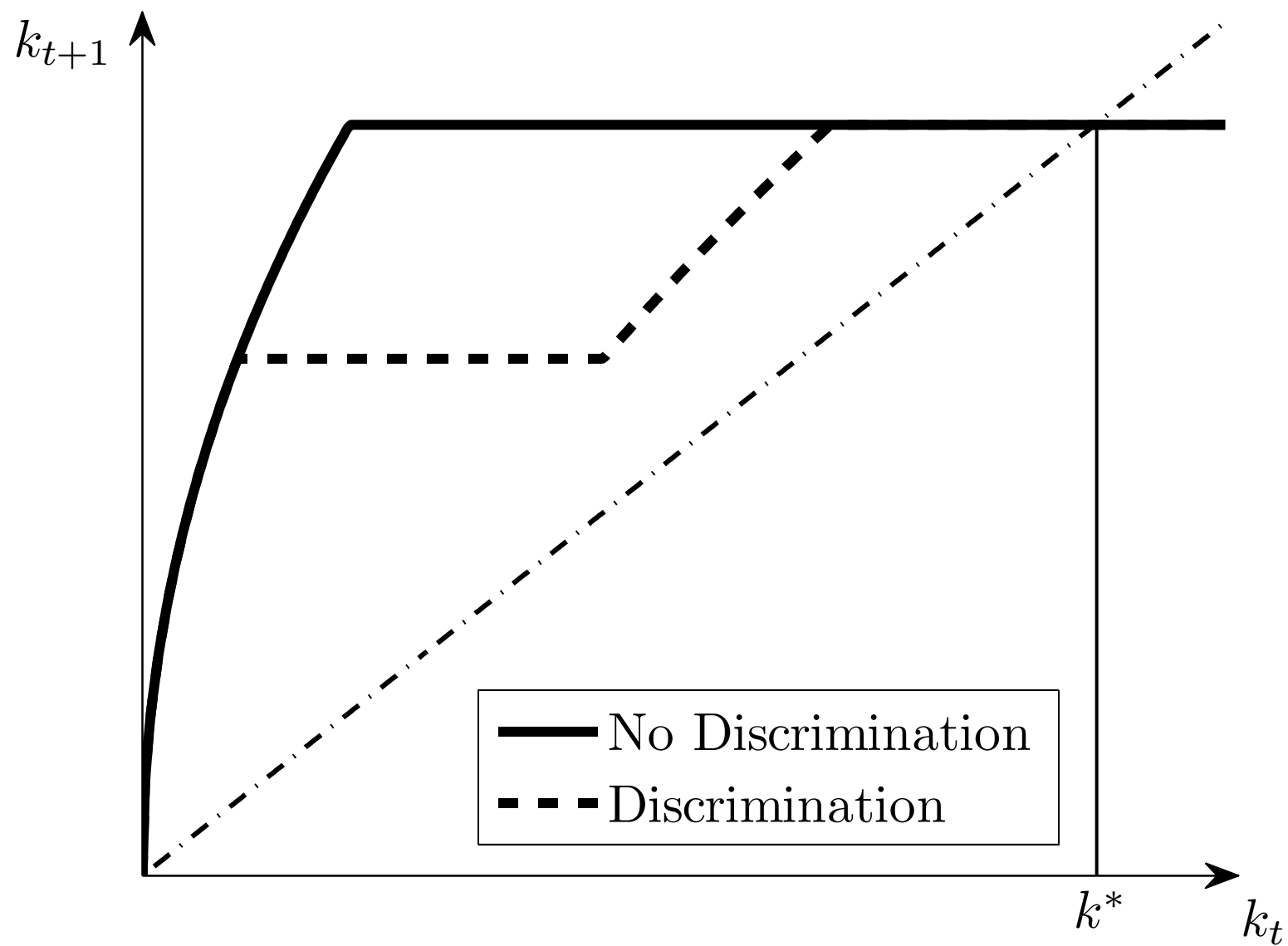
- Foreigners buy all government debt and young invest solely in domestic capital (if constraint binds)

- Law of motion of capital stock is not affected

$$k_{t+1} = \min \left\{ \frac{\rho}{\rho - \phi} \cdot s \cdot k_t^\alpha, \left(\frac{\alpha}{\rho + \delta - 1} \right)^{\frac{1}{1-\alpha}} \right\}$$

- Old receive return on capital, are taxed to pay government debt, repay their foreign debts, and consume
- Sovereign debt reduces consumption, but it does not affect the law of motion

The law of motion with and without discrimination



Model with sovereign debt - Equilibrium

- Assume foreigners are defaulted with probability $1 - p$ but domestics are never defaulted on
- This creates a wedge between return to domestics R_{t+1} and return to foreigners $R_{t+1} \cdot p$
- Contractual interest rate depends on identity of marginal buyer

– foreigners hold government debt if compensated for risk of default

$$R_{t+1} \geq \frac{\rho}{p}$$

– domestics hold government debt if compensated for foregone investment

$$R_{t+1} \geq (\alpha \cdot k_{t+1}^{\alpha-1} + 1 - \delta - \phi) \cdot \frac{\rho}{\rho - \phi}$$

- For low (high) levels of capital stock foreigners (domestics) buy sovereign debt

Model with sovereign debt - Equilibrium

- Equilibrium contractual interest rate depends on marginal buyer

$$R_{t+1} = \min \left\{ \frac{\rho}{p}, (\alpha \cdot k_{t+1}^{\alpha-1} + 1 - \delta - \phi) \cdot \frac{\rho}{\rho - \phi} \right\}$$

- Law of motion of capital stock

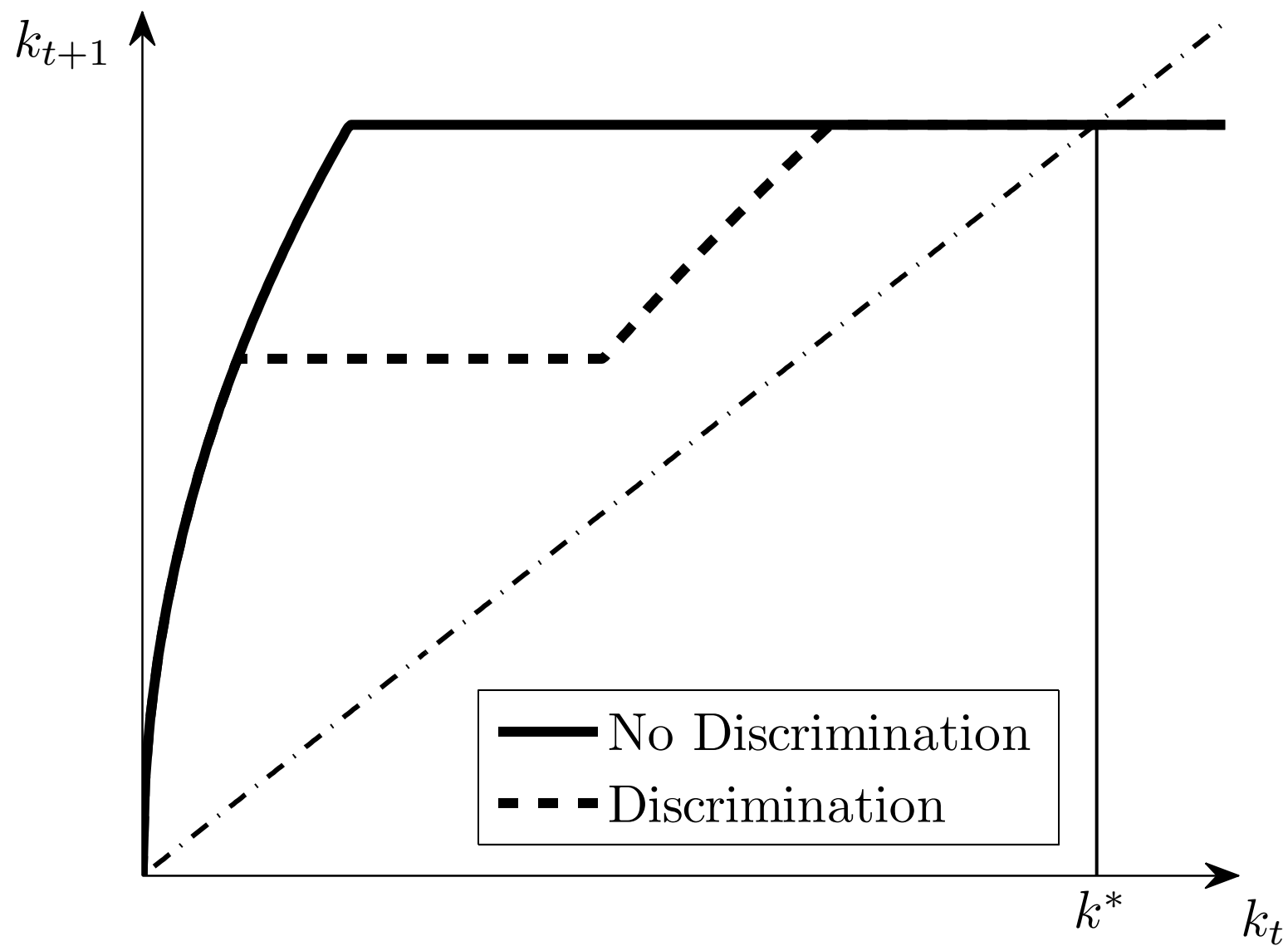
$$k_{t+1} = \begin{cases} \min \left\{ \frac{\rho}{\rho - \phi} \cdot s \cdot k_t^\alpha, \left(\frac{\alpha}{(\rho - \phi) / p + \phi + \delta - 1} \right)^{\frac{1}{1-\alpha}} \right\} & \text{if } k_t \leq \bar{k} \\ \min \left\{ \frac{\rho}{\rho - \phi} \cdot (s \cdot k_t^\alpha - d), \left(\frac{\alpha}{\rho + \delta - 1} \right)^{\frac{1}{1-\alpha}} \right\} & \text{if } k_t > \bar{k} \end{cases}$$

where \bar{k} is capital stock at which marginal buyer shifts from foreign to domestic

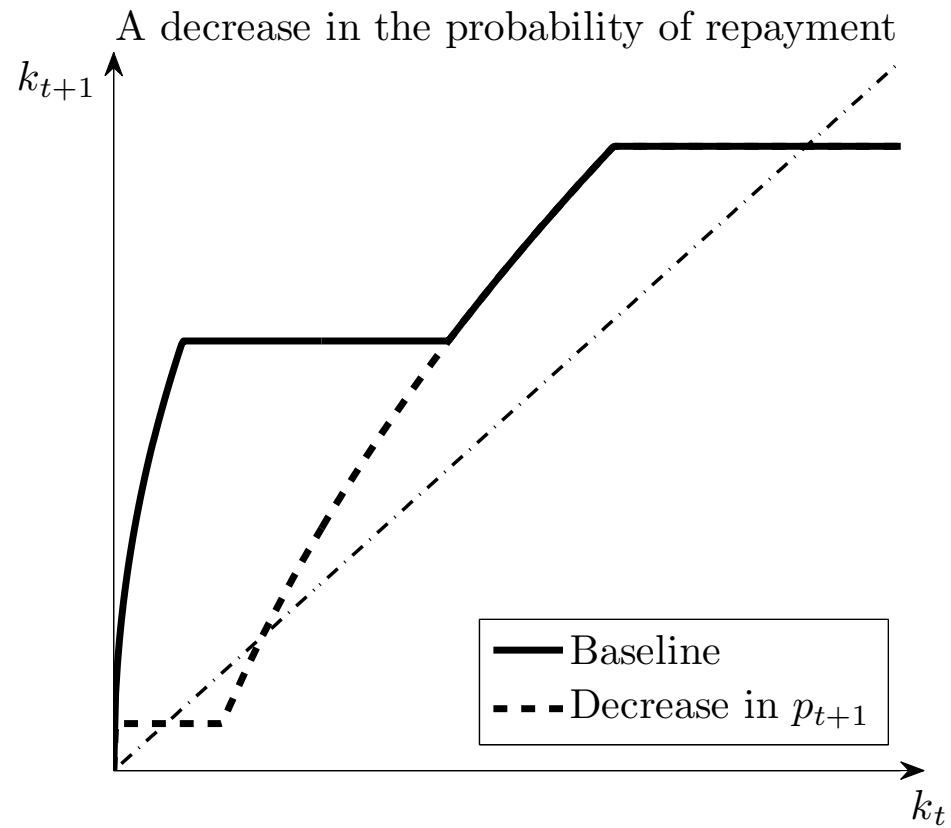
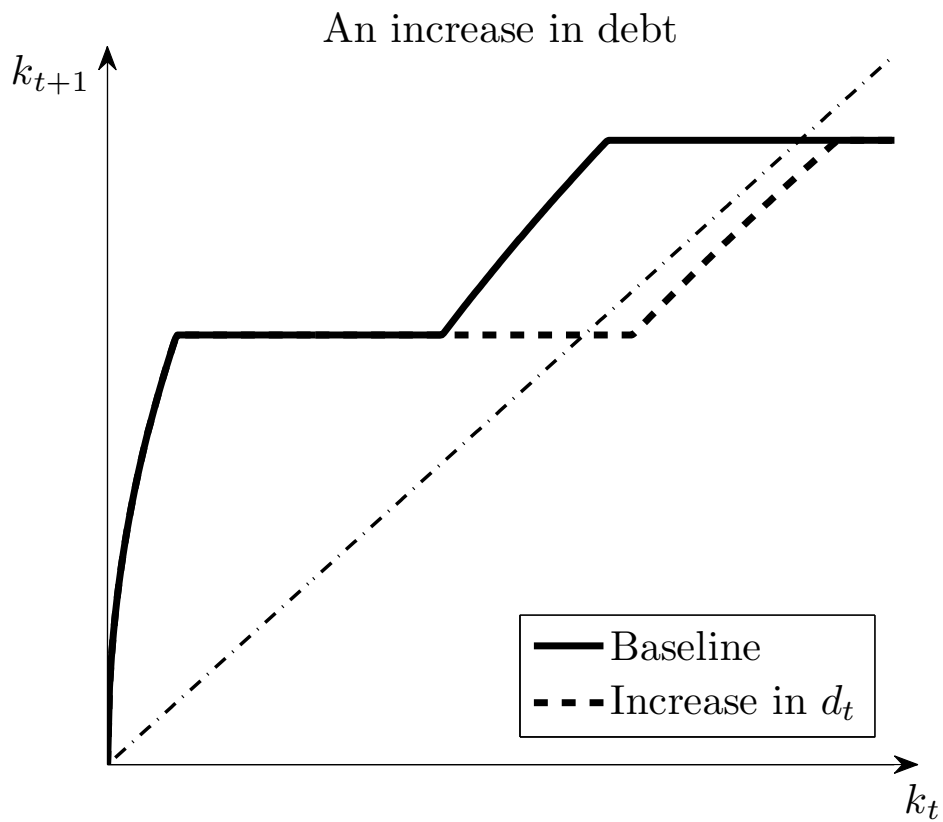
$$\frac{\rho}{\rho - \phi} \cdot (s \cdot \bar{k}^\alpha - d) = \left(\frac{\alpha}{(\rho - \phi) / p + \phi + \delta - 1} \right)^{\frac{1}{1-\alpha}}$$

- Old receive return on capital, are taxed to pay government debt, repay their foreign debts, and consume
- Sovereign debt reduces consumption, and it does affect the law of motion

The law of motion with and without discrimination



The effects of changes in debt and repayment probability



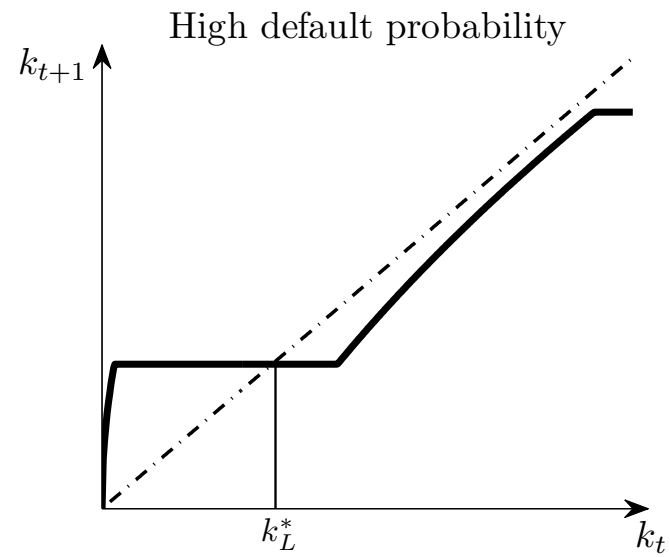
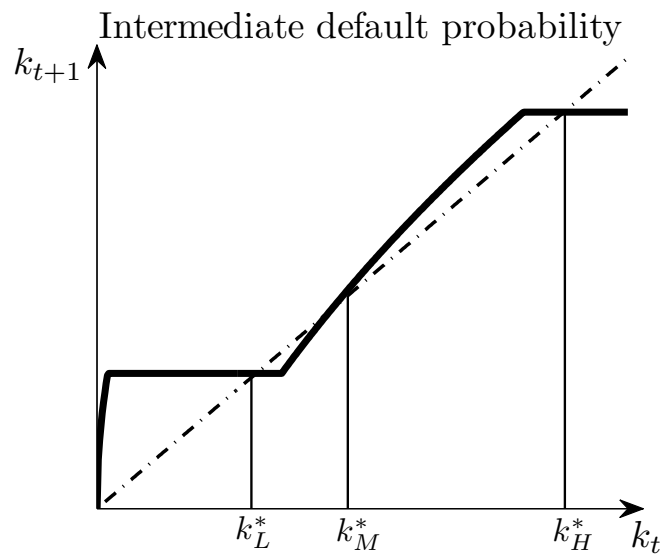
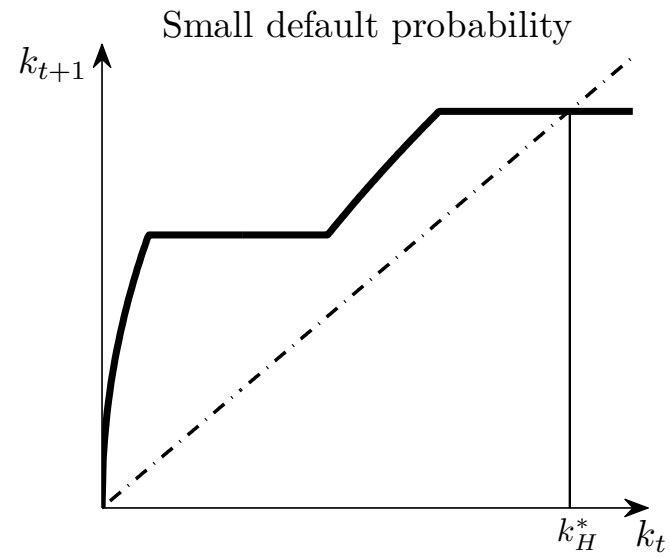
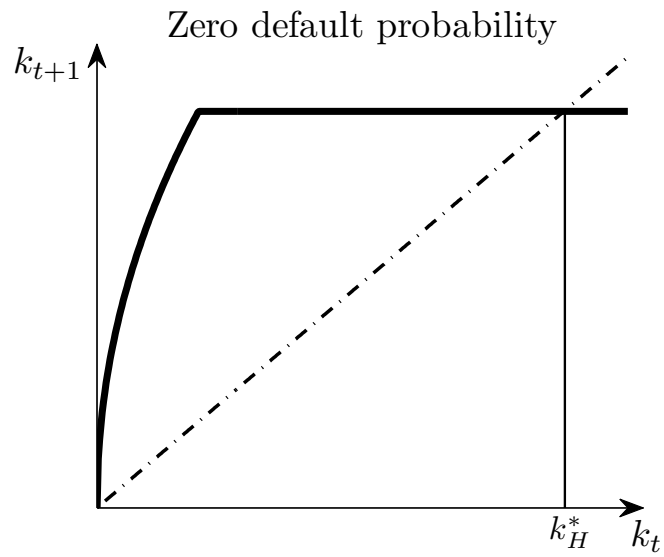
Model with sovereign debt - Discrimination

- Secondary markets provide a link between domestic and foreign default, but may not always work
 - leading to defaults and discrimination ex post
 - transaction costs, imperfect competition, capital controls, default before maturity, compensate losers, etc...
- Discrimination can also take place before default
 - tax treatment, regulations, financial repression
- For our mechanism
 - source of discrimination is not important
 - robust to discrimination taking place only sometimes

Model with sovereign debt - Dynamics and efficiency

- Crowding-out region generates non-standard dynamics and multiple steady states

Crowding-out effects and dynamics



Model with sovereign debt - Dynamics and efficiency

- Crowding-out region generates non-standard dynamics and multiple steady states
- Crowding-out region generates inefficiencies
 - substitute domestic investment for foreign borrowing
 - return to investment exceeds interest rate
- A Pareto improvement is possible, but it requires a transfer from future young to present young
 - future young benefit from higher k , but current young lose from lower return to savings

Model with endogenous default - Setup

- Until now there was no cost of default
 - in reality: loss of reputation, sanctions, disruption of financial markets
- We now introduce cost of default
 - if government defaults on foreigners, old generation suffers a loss
- Deadweight loss
 - increases with capital stock: disruptions are more costly in absolute terms in a larger economy
 - increases with size of default: more effort undertaken to impose penalty
- In particular, we assume

$$\text{cost of default} = \lambda \cdot R_{t+1} \cdot d_{t+1}^F \cdot k_{t+1}$$

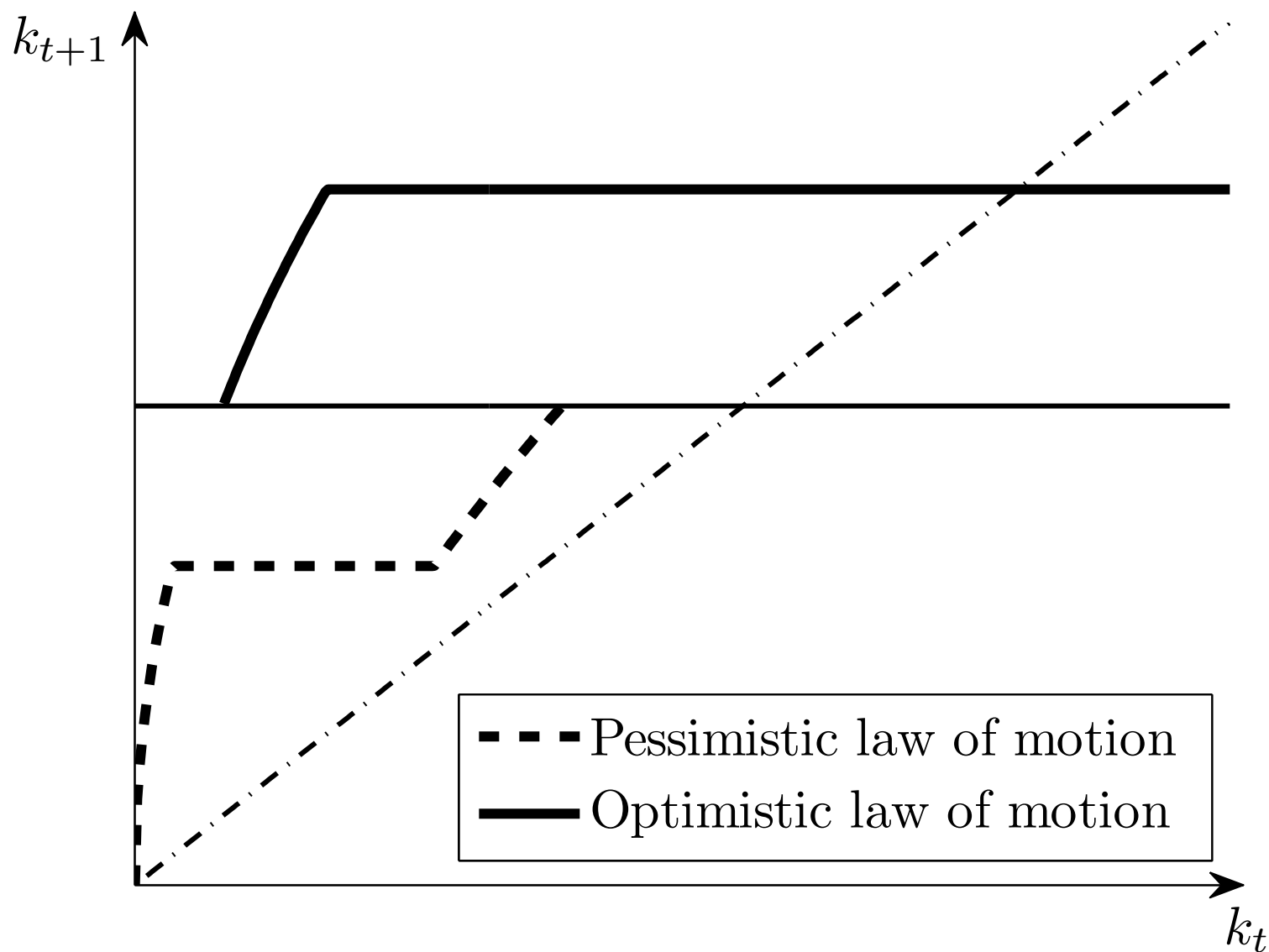
Model with endogenous default - Equilibrium

- Cost of default may sustain “optimistic equilibrium”
 - if $\lambda \cdot R_{t+1} \cdot d_{t+1}^F \cdot k_{t+1} \geq R_{t+1} \cdot d_{t+1}^F \Leftrightarrow k_{t+1} \geq 1/\lambda$ government repays foreigners
- In this equilibrium
 - expect repayment \rightarrow debt not attractive to domestic residents \rightarrow high investment \rightarrow
 \rightarrow high capital stock \rightarrow repayment takes place

Model with endogenous default - Equilibrium

- Cost of default may sustain “optimistic equilibrium”
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- In this equilibrium
 - expect repayment \rightarrow debt not attractive to domestic residents \rightarrow high investment \rightarrow
 \rightarrow high capital stock \rightarrow repayment takes place
- Despite cost of default there may be a “pessimistic equilibrium”
 - if $\lambda \cdot R_{t+1} \cdot d_{t+1}^F \cdot k_{t+1} \leq R_{t+1} \cdot d_{t+1}^F \Leftrightarrow k_{t+1} \leq 1/\lambda$ government defaults on foreigners
- In this equilibrium
 - expect default \rightarrow debt attractive to domestic residents \rightarrow low investment \rightarrow
 \rightarrow low capital stock \rightarrow default takes place

The law of motion with multiple equilibria



Model with endogenous default - Equilibrium

- Since $k_{+1}^{pess}(k) \leq k_{+1}^{opt}(k)$ for all k , it follows that

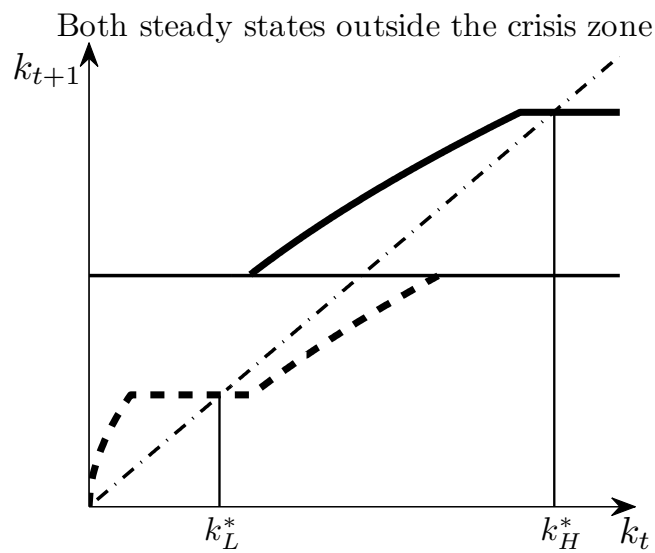
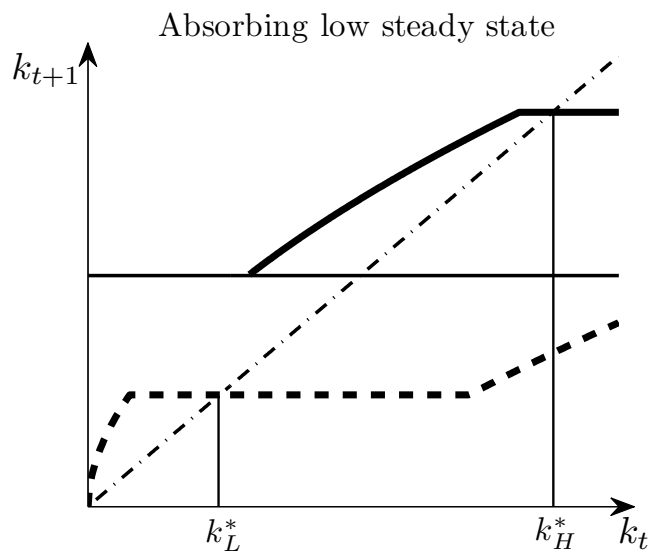
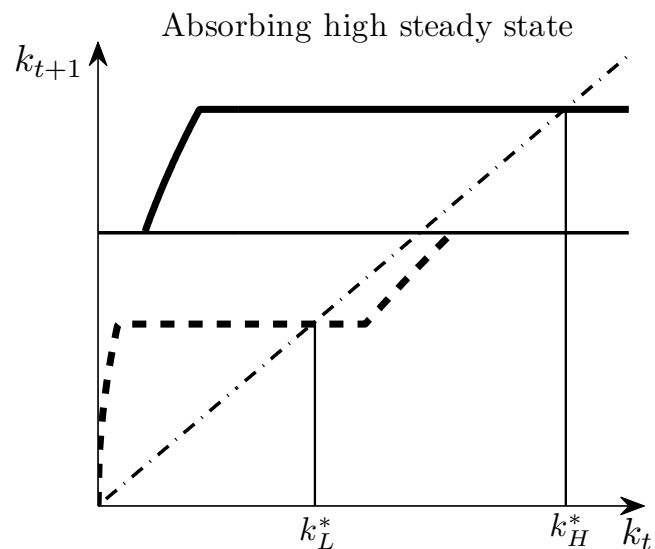
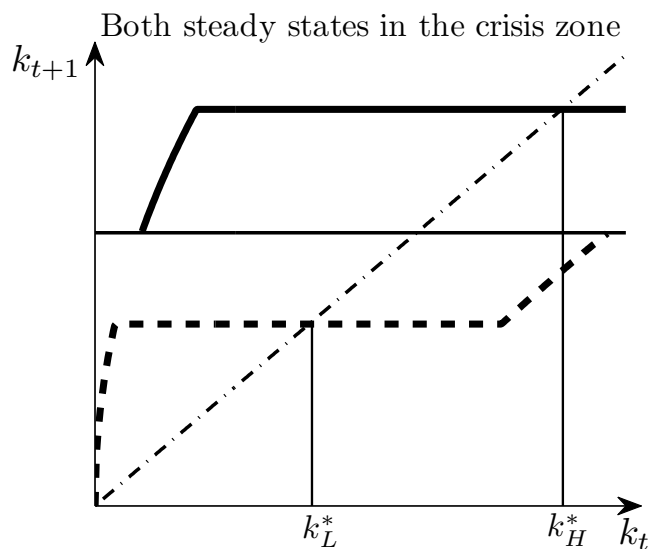
$$k^P \geq k^O$$

- Both optimistic and pessimistic equilibria exist if

$$k_t \in [k^O, k^P]$$

- A self-fulfilling crisis leads to
 - higher sovereign spreads
 - fraction of debt held domestically increases
 - domestic resources shift from investment to government debt
 - lower investment and growth
- Note: crisis zone does not depend on debt maturity
 - different from standard models in the literature (e.g. Cole and Kehoe, 2000)

Dynamics with crisis zones



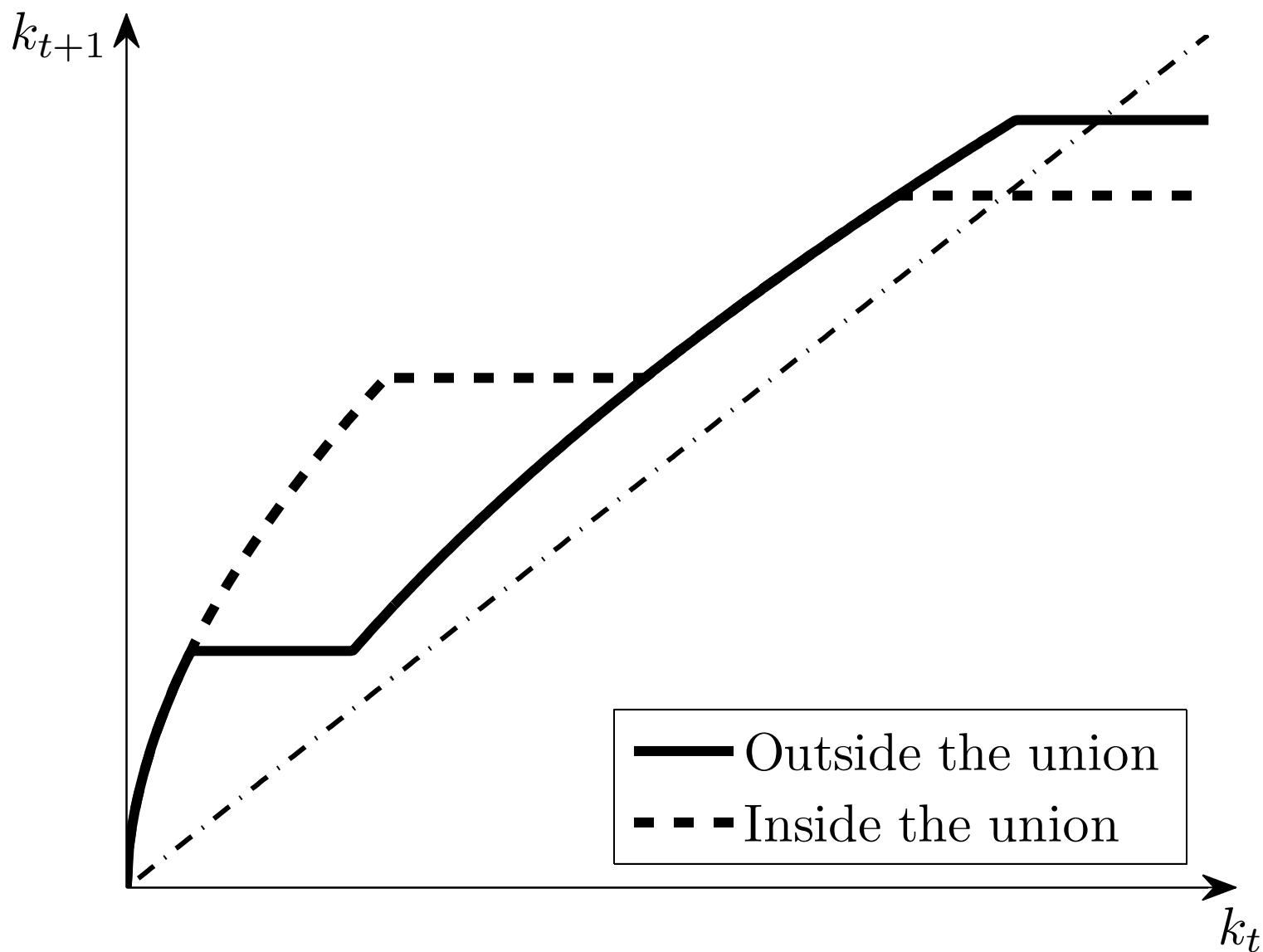
Model with economic union - Setup

- Probability of repayment to
 - domestic creditors: 1
 - creditors in the rest of the union: p_U
 - creditors outside the union: p

$$1 \geq p_U \geq p \geq 0$$

- Then
 - $1 - p_U$ is probability that there is a default and country exits the union
 - $p_U - p$ is probability that there is a default and country stays in the union
- Poor countries with high sovereign debt export crowding-out effects to rich countries with low debt

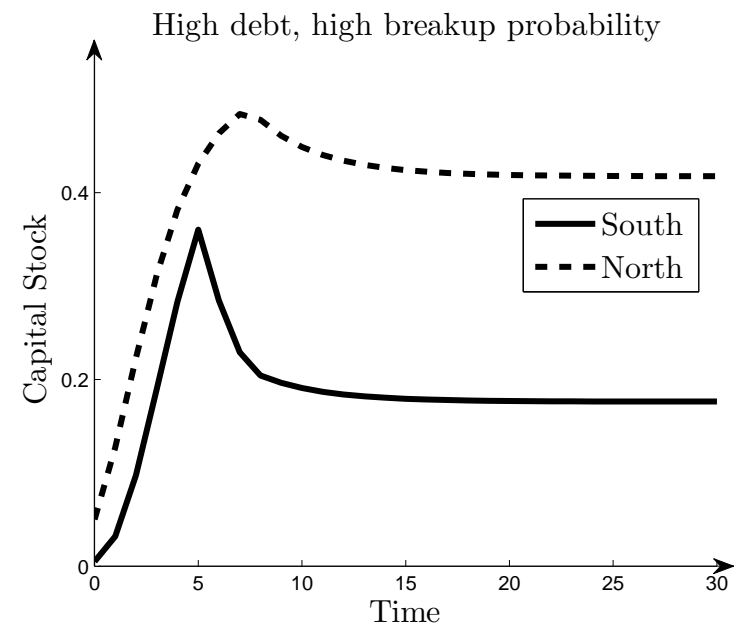
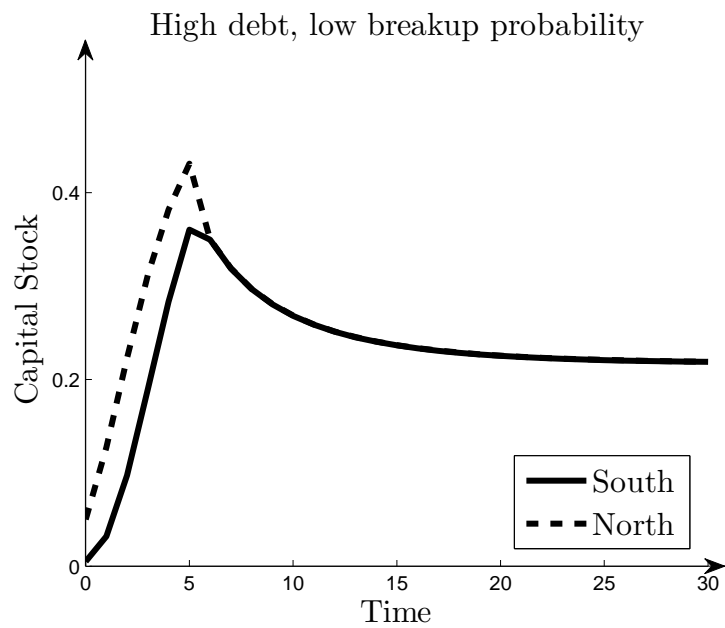
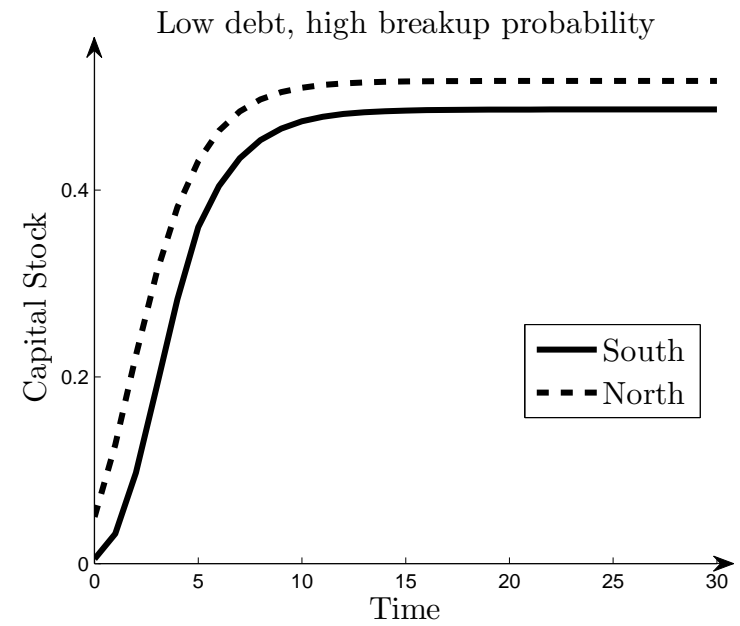
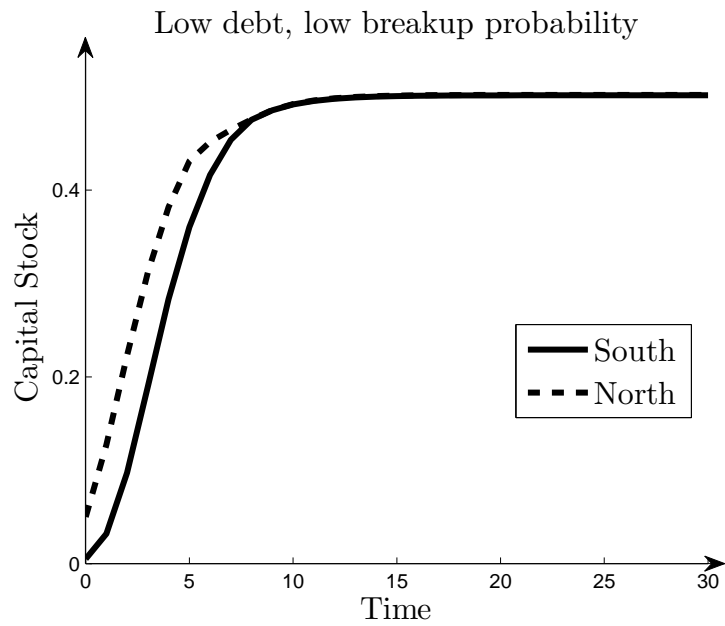
The effects of joining an economic union



Model with economic union - Example

- Growth and convergence within union with a North-South example

Dynamics of an economic union



Model with economic union - Example

- Growth and convergence within union with a North-South example
- Debt in union slows down growth and fosters/hampers convergence depending on breakup probability
- If p varies across members of union, there are gains from intermediation. Members with high p
 - issue debt to international financial market at low cost
 - purchase debt from members with low p at a premium
 - Eurobonds? European Stability Mechanism?
- This policy minimizes crowding-out effects and raises income of the union

What have we learned?

- Why have sovereign spreads increased so much?
 - increase in default probability due to worse institutions (fall in p) or shift in investor sentiment
- Why have the private sectors of GIIPS purchased the debts of their sovereigns?
 - as risk increases sovereign debt offers relatively higher return to domestic creditors
- What are the economic consequences of these domestic purchases of debt?
 - crowding out of investment and lower growth
- What are the key inefficiencies that these purchases generate?
 - too little investment: return to investment exceeds cost of borrowing from foreigners
- What is the right set of policies to address them?
 - reduce discrimination (difficult) or reduce debt burden (nonlinear benefits)
- What difference does it make that GIIPS belong to the Eurozone?
 - provides larger market for debt (reversal after 2009?)
- Is there a role for Europe zone-wide policy?
 - intermediation between IFM and distressed members, creditor coordination

Taking a step back

- Importance of secondary markets
 - reflects shift in institutional arrangements over past decades
- Past work focused on how secondary markets restrict actions of governments ex post
 - this can increase welfare as governments are time inconsistent
 - higher probability of repayment to foreigners but also higher probability of default on domestics
 - domestic effects of default
- In this paper secondary markets restrict actions of governments ex ante
 - this lowers welfare
 - expectation of discrimination leads foreigners to sell non-maturing assets to domestics
 - purchases crowd out investment, reduce growth, and can raise likelihood of default