Inside Money and Liquidity

Nobuhiro Kiyotaki and John Moore

Questions

Under what environment does liquidity creation arise?

When is the circulation of inside money essential for the smooth running of an economy?

How financial deepening interacts with economic development

Approach - Two forms of limited commitment:

Bilateral: Debtor may default to original creditor $\longrightarrow$ borrowing constraint

Multilateral: Debtor may default to new creditors $\longrightarrow$ limited resaleability

Framework

A homogeneous, perfectly storable good at each date

A continuum of agents (population size 3)

$$U_t = \ln c_t + \beta \ln c_{t+1} + \beta^2 \ln c_{t+2} + ...$$

Production technology:

Invest at date t : $G(y) = \gamma y^{\frac{1}{1-\lambda}} \longrightarrow y$: Harvest at date t+2

where $\lambda \in (0,1)$: share of human capital

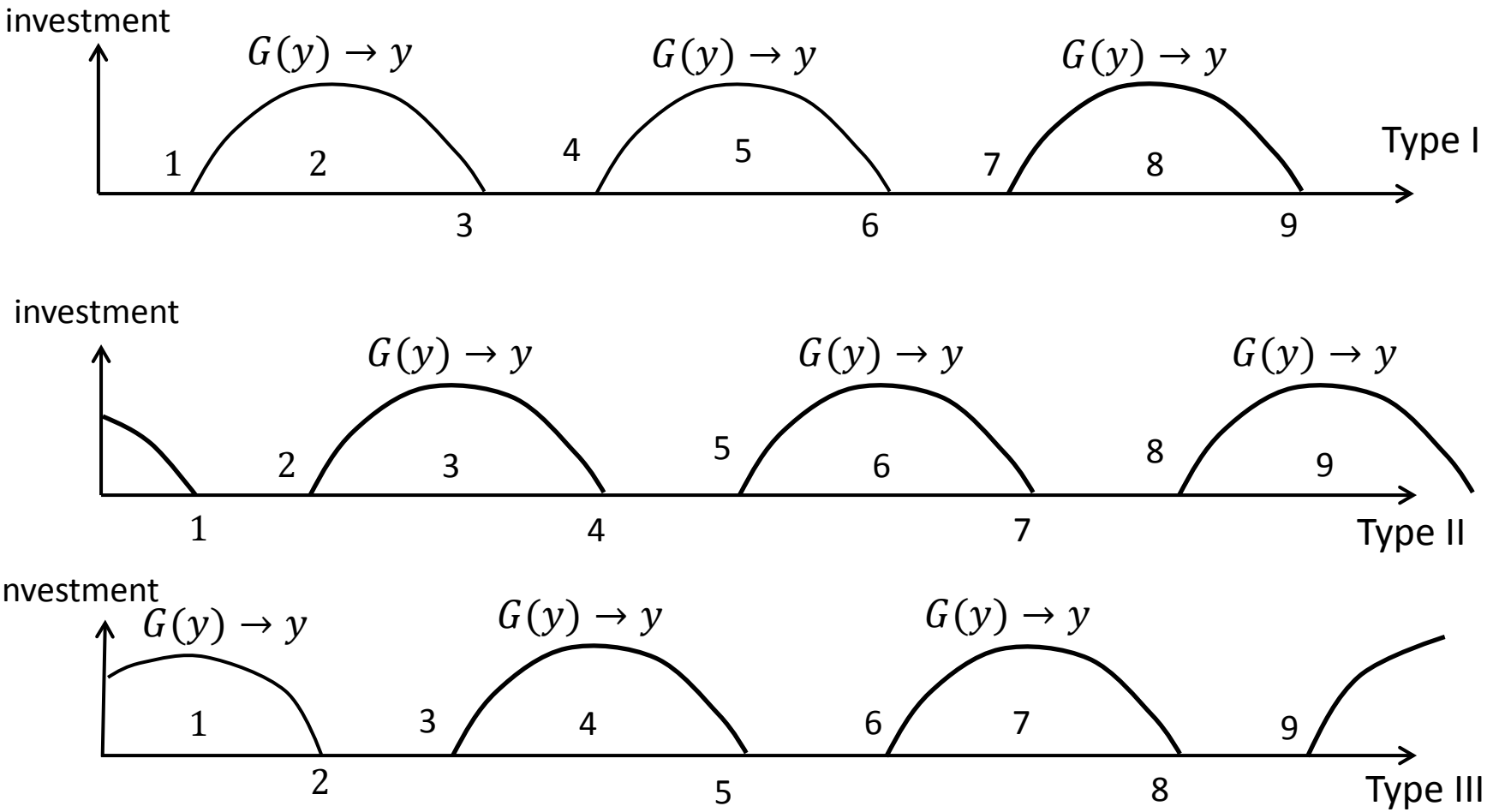
Agents are fully engaged during investing, growing, harvesting
Can handle only one project at a time

Fixed supply of fiat money

The First Best Allocation in Steady State

$$y^* = G(y^*) + 3 \cdot c^*$$

$$G'(y^*) = \beta^2$$



Borrowing constraint: the agent can commit to repay only up to a fraction θ of output from the present investment

Resaleability constraint: each project comprises large number of parts, and a fraction α will fail. After investment, the original creditor privately learns which parts will fail, and the failing parts can be separated

$\longrightarrow$ For a large enough $\alpha > \frac{1-\beta^3}{1+\beta^3}$, regular (blue) paper cannot be resold before maturity because of "lemons" problem

$z \leq y$ fraction of projects can be bundled at additional cost $[(1\text{-}\phi)/\phi]\, G(z)$, where $0 < \phi < 1 \longrightarrow$ special (red) paper backed by the bundled parts can be resold before maturity

Bundling $\equiv$ "Banking" (Liquidity Creation)

q, n : price and quantity of newly issued illiquid blue paper

p, m : price and quantity of liquid red paper (inside money) that matures in the next period

Investing agent

$$G(y)+\frac{\text{1-}\phi}{\phi}G(z)+c+pm+qn = p^2\theta z+q\theta(y-z)+m'' +n'$$

Growing agent

$$c' + pm' + qn' = m + n''$$

Harvesting agent

$$c'' + pm'' + qn'' = (1-\theta)y + m' + n$$

Goods market

$$y = c + c' + c'' + G(y) + \frac{1\text{-}\phi}{\phi} G(z)$$

Blue paper market

$$\theta(y - z) = n + n' + n''$$

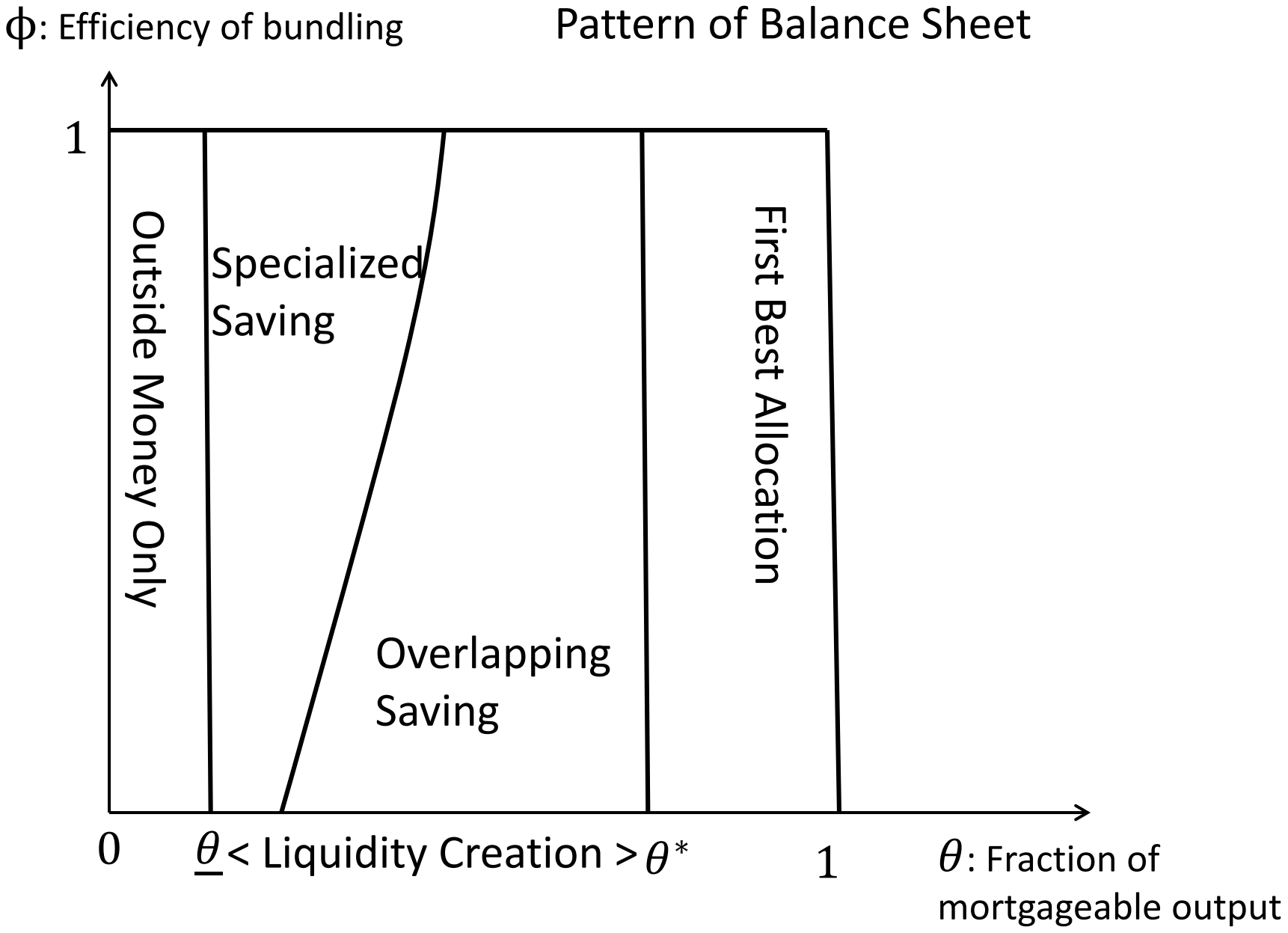
Money market

$$p\theta z + \theta z \leq m + m' + m''$$

where

equality holds and fiat money has no value if $p < 1$

fiat money may have value if $p = 1$


ϕ: Efficiency of bundling
Pattern of Balance Sheet
1
Outside Money Only
Specialized Saving
Overlapping Saving
First Best Allocation
0
$\underline{\theta}$ < Liquidity Creation > θ^*
1
θ: Fraction of mortgageable output

Proposition 1 (Outside Money Only): If $\theta \in [0, \underline{\theta}]$, then there is no inside money and

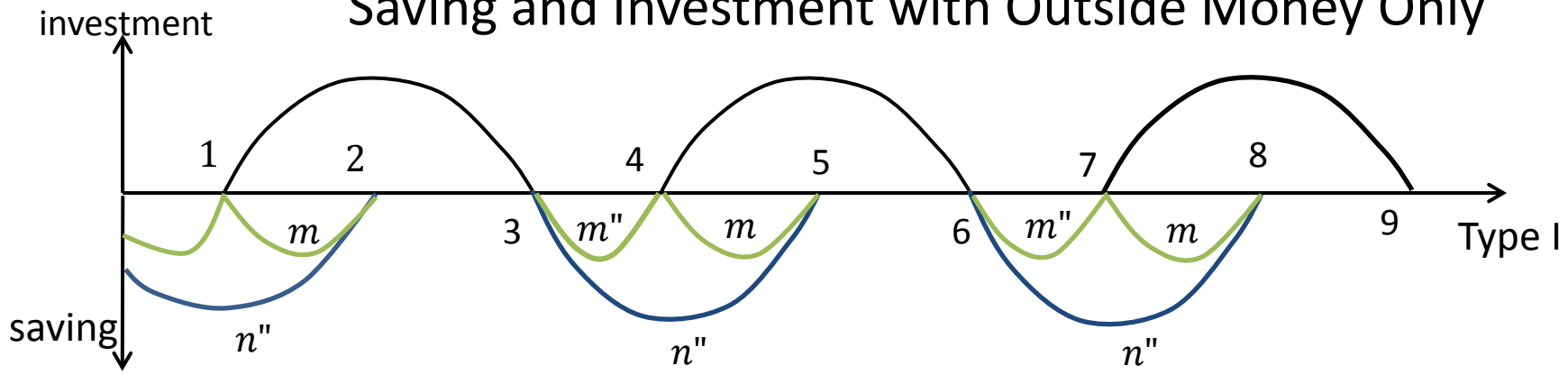
$$1 = \frac{1}{p} = \frac{1}{\sqrt{q}} < \frac{1}{\beta} < \frac{1}{\sqrt{G'(y)}}$$

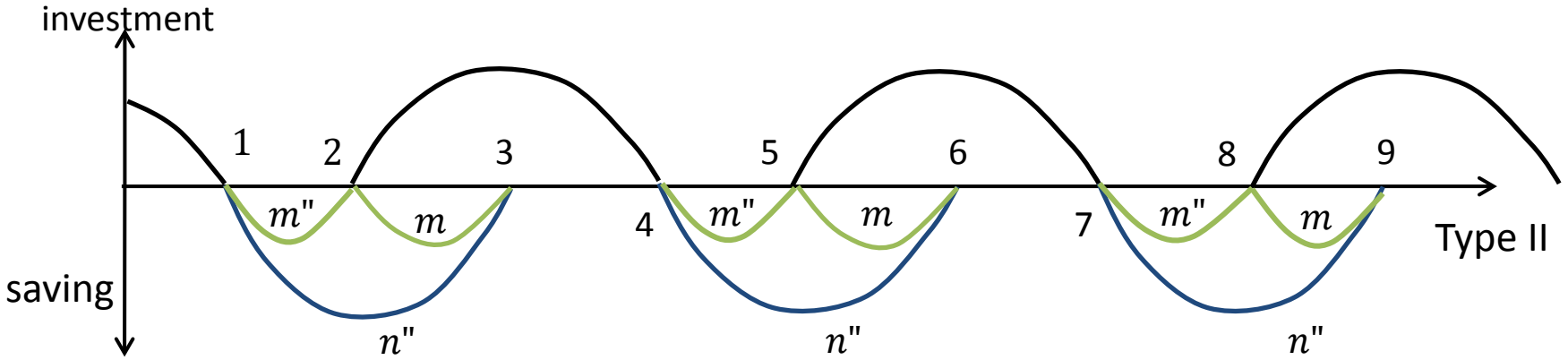
borrowing constraints bind for investing agents

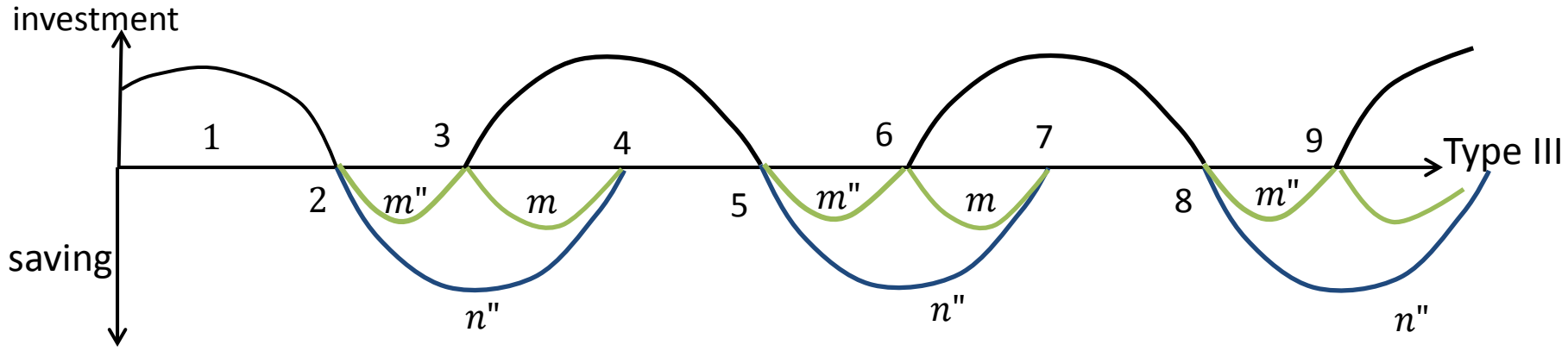
investment and output are lower than the first best

consumption is jagged: highest when harvesting and lowest when growing

Saving and Investment with Outside Money Only







Proposition 2 (Liquidity Creation): If $\theta \in (\underline{\theta}, \theta^*)$, then inside money circulates and

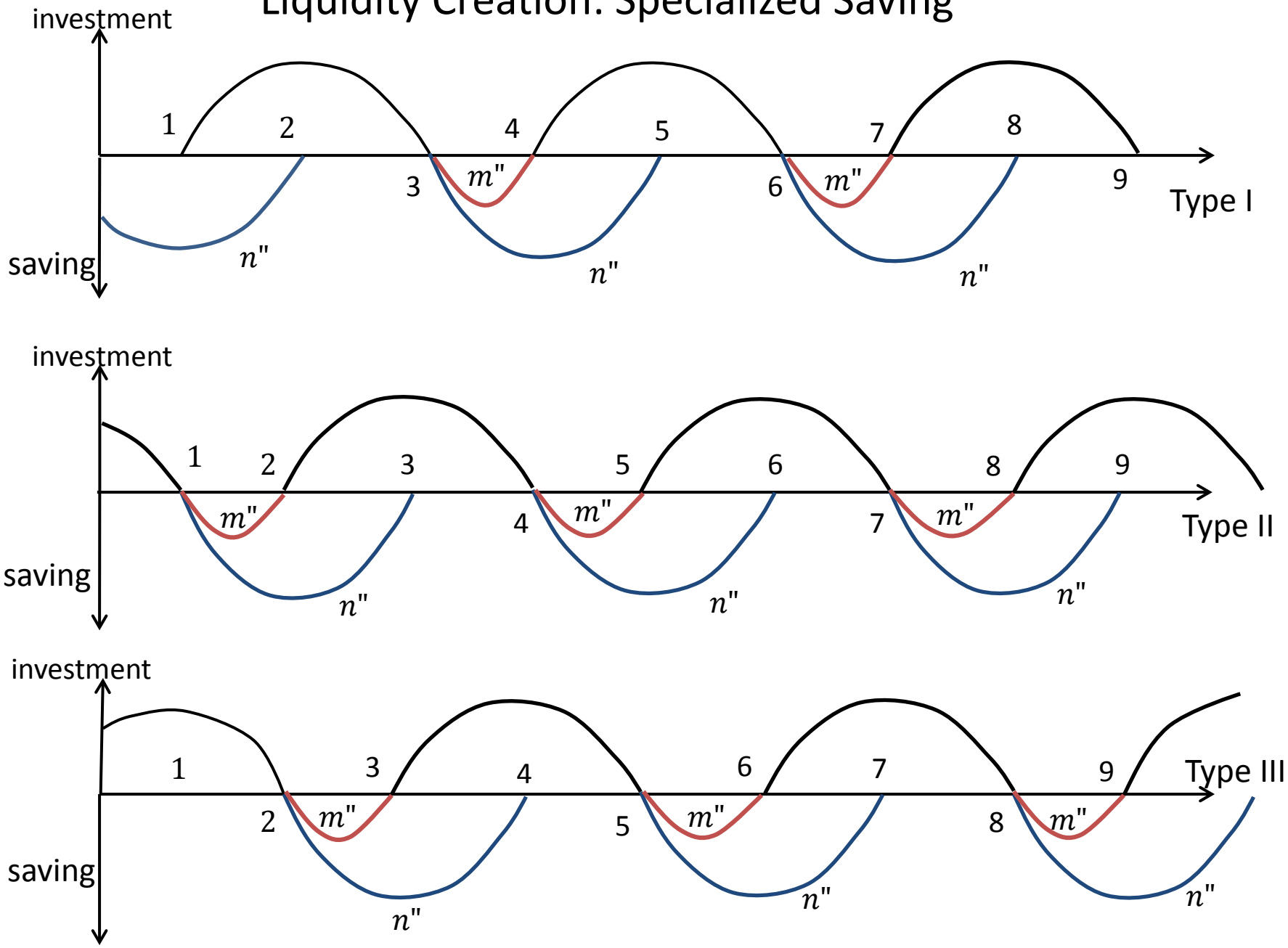
$$1 \leq \frac{1}{p} < \frac{1}{\sqrt{q}} < \frac{1}{\beta} < \frac{1}{\sqrt{G'(y)}}$$

borrowing constraints bind for investing agents

investment and output are lower than the first best

consumption is jagged: highest when harvesting and lowest when investing

Liquidity Creation: Specialized Saving



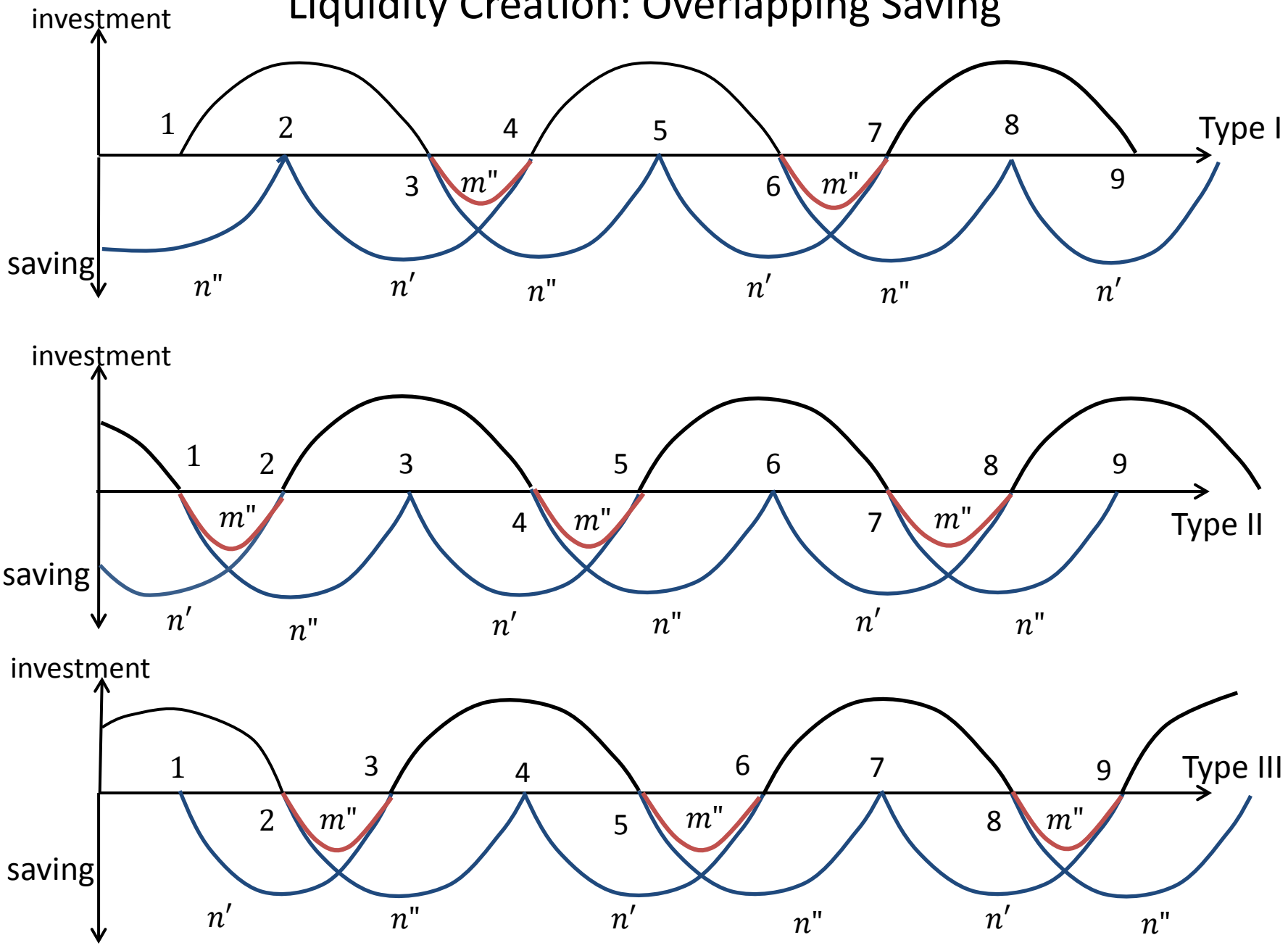
Liquidity Creation: Specialized Saving

Investing Agents	
Illiquid Paper n''	Inside Money θz
Investment $G(y)$	Illiquid Paper $\theta(y-z)$
	Net Worth

Growing Agents	
Investment y	Inside Money θz
	Illiquid Paper $\theta(y-z)$
	Net Worth

Harvesting Agents	
Money m''	Net Worth
Illiquid Paper n''	

Liquidity Creation: Overlapping Saving



Liquidity Creation: Overlapping Saving

Investing Agents	
Illiquid Paper $n"$	Inside Money θz
	Illiquid Paper $\theta(y-z)$
Investment $G(y)$	Net Worth

Growing Agents	
Illiquid Paper n'	Inside Money θz
Investment y	Illiquid Paper $\theta(y-z)$
	Net Worth

Harvesting Agents	
Money $m"$	Net Worth
Illiquid Paper $n', n"$	

Proposition 3 (First Best Allocation): If $\theta \in [\theta^*, 1]$, then no money circulates and

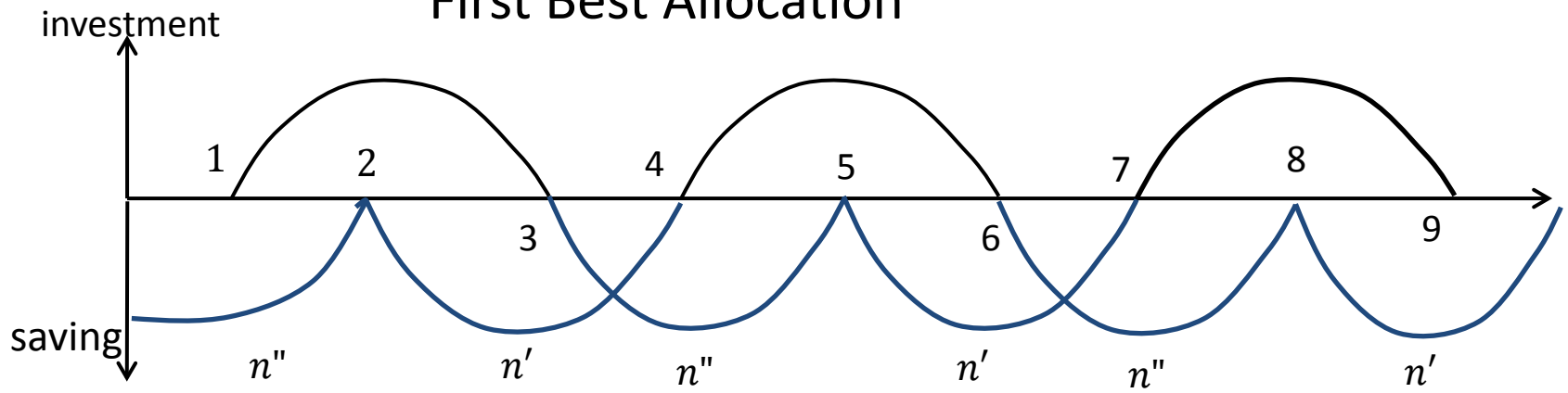
$$\frac{1}{p} = \frac{1}{\sqrt{q}} = \frac{1}{\beta} = \frac{1}{\sqrt{G'(y)}}$$

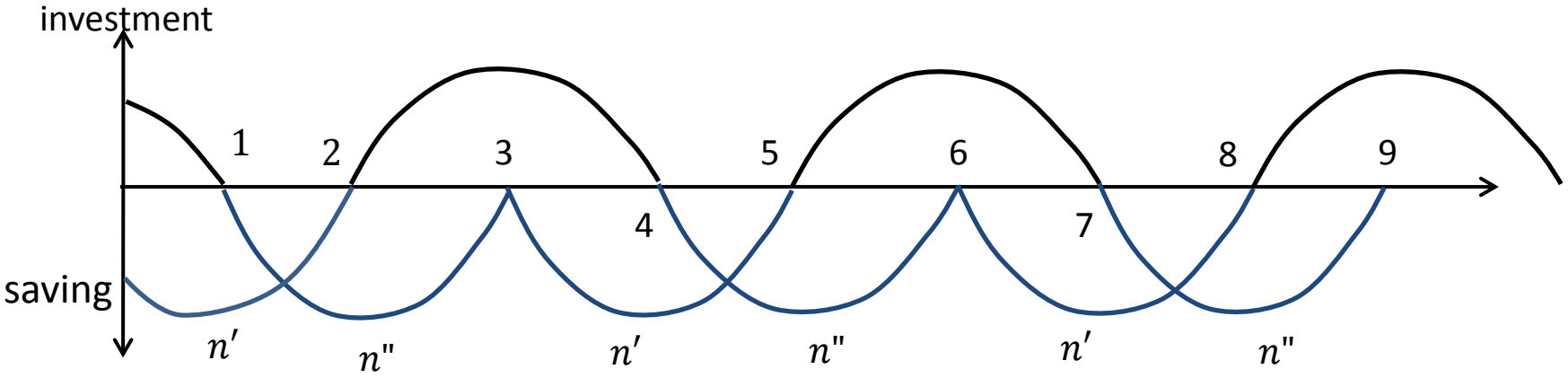
borrowing constraints do not bind for investing agents

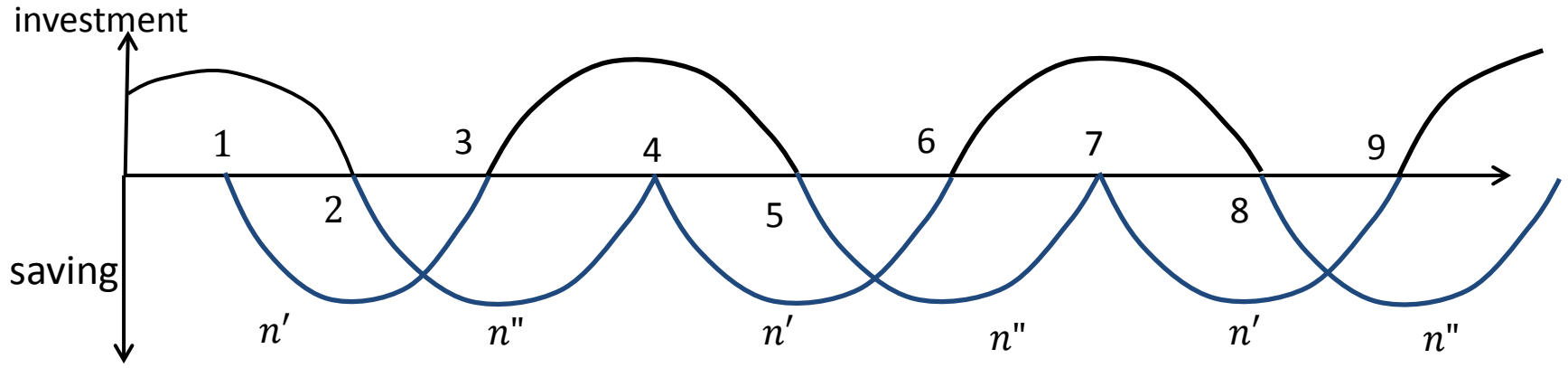
investment and output are at the first best

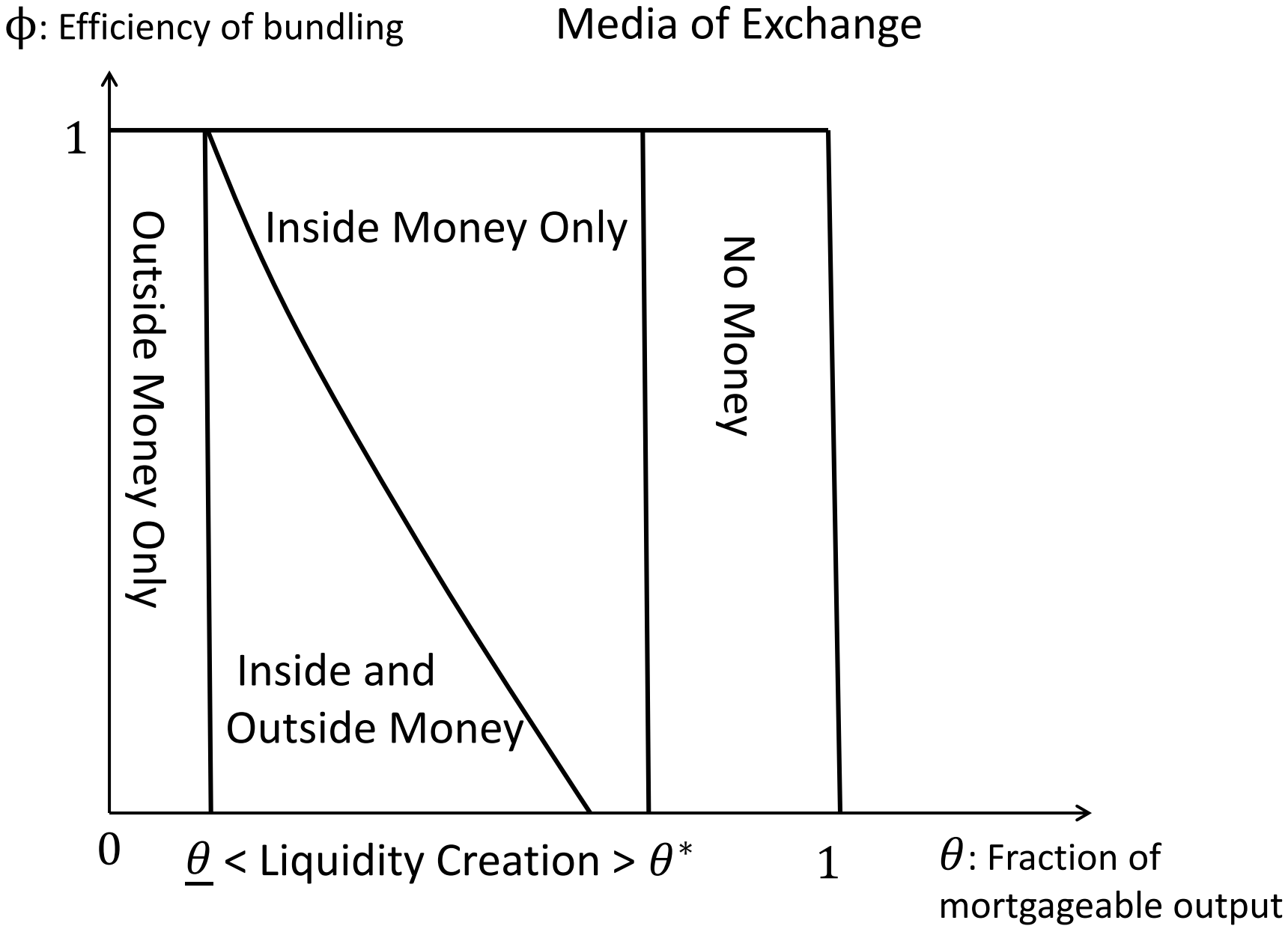
consumption is smooth

First Best Allocation








ϕ: Efficiency of bundling
Media of Exchange
1
Outside Money Only
Inside Money Only
No Money
Inside and
Outside Money
0
$\underline{\theta}$ < Liquidity Creation > θ^*
1
θ: Fraction of
mortgageable output