

Workshop on  
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Presentation to  
**“Why do prices remain stable in the bubble and bust  
period?”**



# Why Do Prices Remain Stable in the Bubble and Bust Period?

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# Facts about Japan's economy

	GDP growth	CPI inflation
Prebubble (1983-1986)	+3.5%	+1.6%
Bubble (1987-1990)	+5.2%	+1.4%
Lost decade (1991-1999)	+1.2%	+0.8%

- Unresponsiveness of prices to real economies

# Purpose of this paper

- Solve the puzzle on unresponsiveness of prices
- Provide insights on the key common elements of bubbles and financial crises in the world

BOJ Governor Shirakawa (2009) suggests:

*Many financial crises were preceded by **low inflation coupled with high growth** for an extended period of time. Such seemingly stable macro-economic environments play an important role in fostering bullish sentiment.*

# Customer market theory

- Each firm has a customer stock.
- Customers don't immediately switch to the firm with the lowest price.
- Trade-off between the benefits of charging a low price to attract first-time buyers and the gains of charging a high price to locked-in customers
- Firms invest in customer stock, which affects future profits, by keeping prices down.
- Possibility for financial factors to affect pricing decisions



# Customer market model with financial constraints

- In booms, liquidity-abundant firms invest in customer stock by keeping prices down.
- In a recession, financially constrained firms abstain from price cuts in order to maintain cash flows and pay their debts.
- The degree of financial constraints that Japanese firms faced in the bubble and bust period fluctuated significantly.
- Customer market with financial constraints may lead to price rigidity.

# 1. What this paper does

- Investigate the effects of financial positions on aggregate price changes
- Analyze pricing behavior of **manufacturing sector**, not of specific firms
- Show how pervasive those effects are on prices from macroeconomic perspective

## 2. What this paper does

- Analyze pricing behavior not only of manufacturing sector but also of **each industry** in the sector.
- Market structures differ across industries, and customer market theory can be applied only to markets in which customers respond slowly to price changes.

	Change of supplier	Price comparison
Differentiated goods (machinery industry, etc.)	More costly	More difficult
Standardized goods (pulp & paper, petroleum, etc.)	Less costly	Easier

- **Hypothesis:** Financial constraints do not affect pricing decision of firms which produce standardized goods, but that of firms which produce differentiated goods.

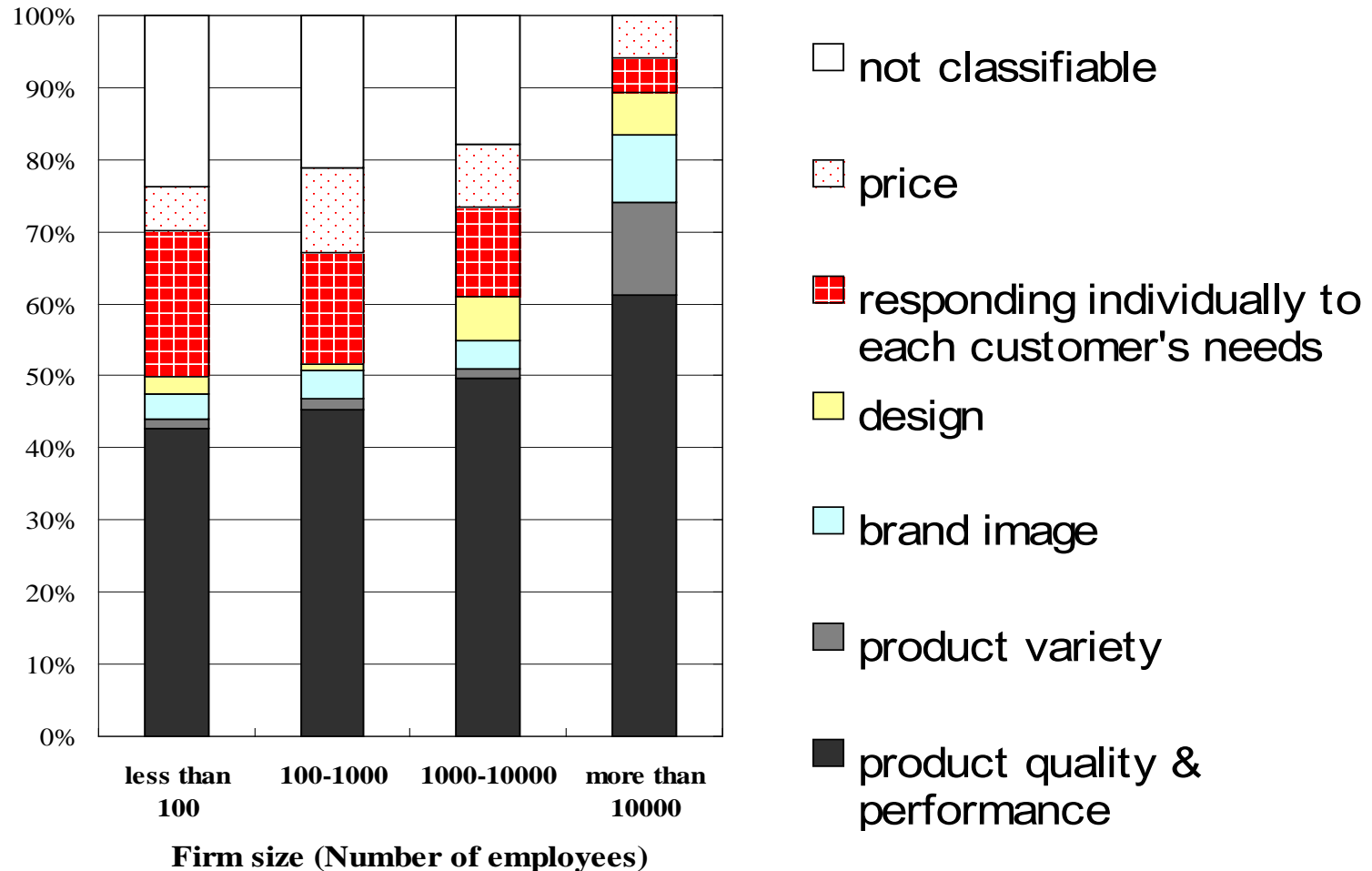


### 3. What this paper does

- Analyze pricing behavior by **firm size**
- Customer market theory may be applied only to large firms, because they provide differentiated products (and brand) in the market, and thereby can lock in customers. In contrast, it is difficult for small firms, whose brand is not well established in the market, to lock in customers.
- **Hypothesis:** Financial constraints do not affect small firms' pricing decision, but large firms' decision.

# How to differentiate your company's products from others?

## Results from questionnaire surveys of firms



# Empirical approach

## ■ Single equation

Output Price changes

Supply & Demand condition

$$OP_t = \alpha_{OP} OP_{t-1} + \underbrace{\alpha_{IP} IP_t + \alpha_{\Delta IP} \Delta IP_t}_{\text{Input Price changes}} + \underbrace{\alpha_{SD} SD_t + \alpha_{\Delta SD} \Delta SD_t}_{\text{Supply & Demand condition}} + \underbrace{\alpha_{FP} FP_{t-1}}_{\text{Financial Position}} + c + \varepsilon_t$$

Easy financial position ( $FP > 0$ ) restrains output prices from rising.

Tight financial constraint ( $FP < 0$ ) restrains output prices from falling.

Expected sign:  $\alpha_{FP} < 0$

## ■ VAR

# Data

- TANKAN and Diffusion Index
- Qualitative indices available by industry and firm size.

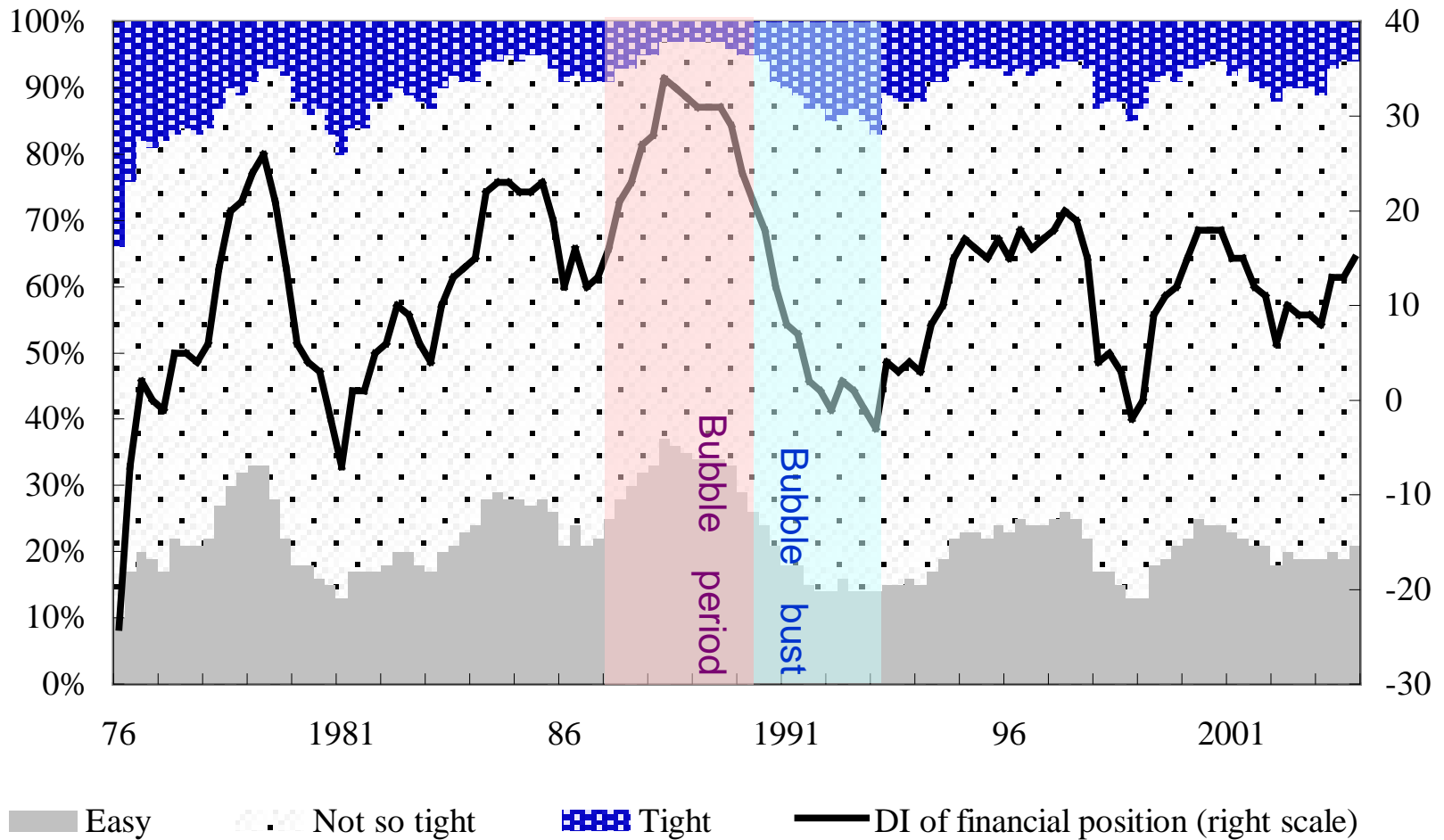
**Financial position:** judgment of the general cash position of the responding firm, taking into account the level of cash and cash equivalent, lending attitude of financial institutions, and payment and repayment terms.

[1) Easy. 2) Not so tight. 3) Tight.]

$$\text{DI (\% points)} = \left( \begin{array}{c} \text{percentage share of firms} \\ \text{responding Choice 1} \end{array} \right) - \left( \begin{array}{c} \text{percentage share of firms} \\ \text{responding Choice 3} \end{array} \right)$$

- Because of discontinuity in the DI, the end of sample period is set at 2003.

# DI of Financial Position in Large Firms



# Estimation Results by Firm Size

$$OP_t = \alpha_{OP}OP_{t-1} + \alpha_{IP}IP_t + \alpha_{\Delta IP}\Delta IP_t + \alpha_{SD}SD_t + \alpha_{\Delta SD}\Delta SD_t + \alpha_{FP}FP_{t-1} + c + \varepsilon_t$$

	$\alpha_{OP}, \alpha_{IP}, \alpha_{\Delta IP}, \alpha_{SD}, \alpha_{\Delta SD}$	$\alpha_{FP}$	adj-R <sup>2</sup>
Large firms	expected sign  &  statistically significant	-0.12 <sup>***</sup> (0.03)	0.97
Medium-sized firms		-0.06 (0.04)	0.97
Small firms		-0.03 (0.06)	0.97

Notes. Numbers in parentheses are White heteroskedasticity-consistent standard errors.

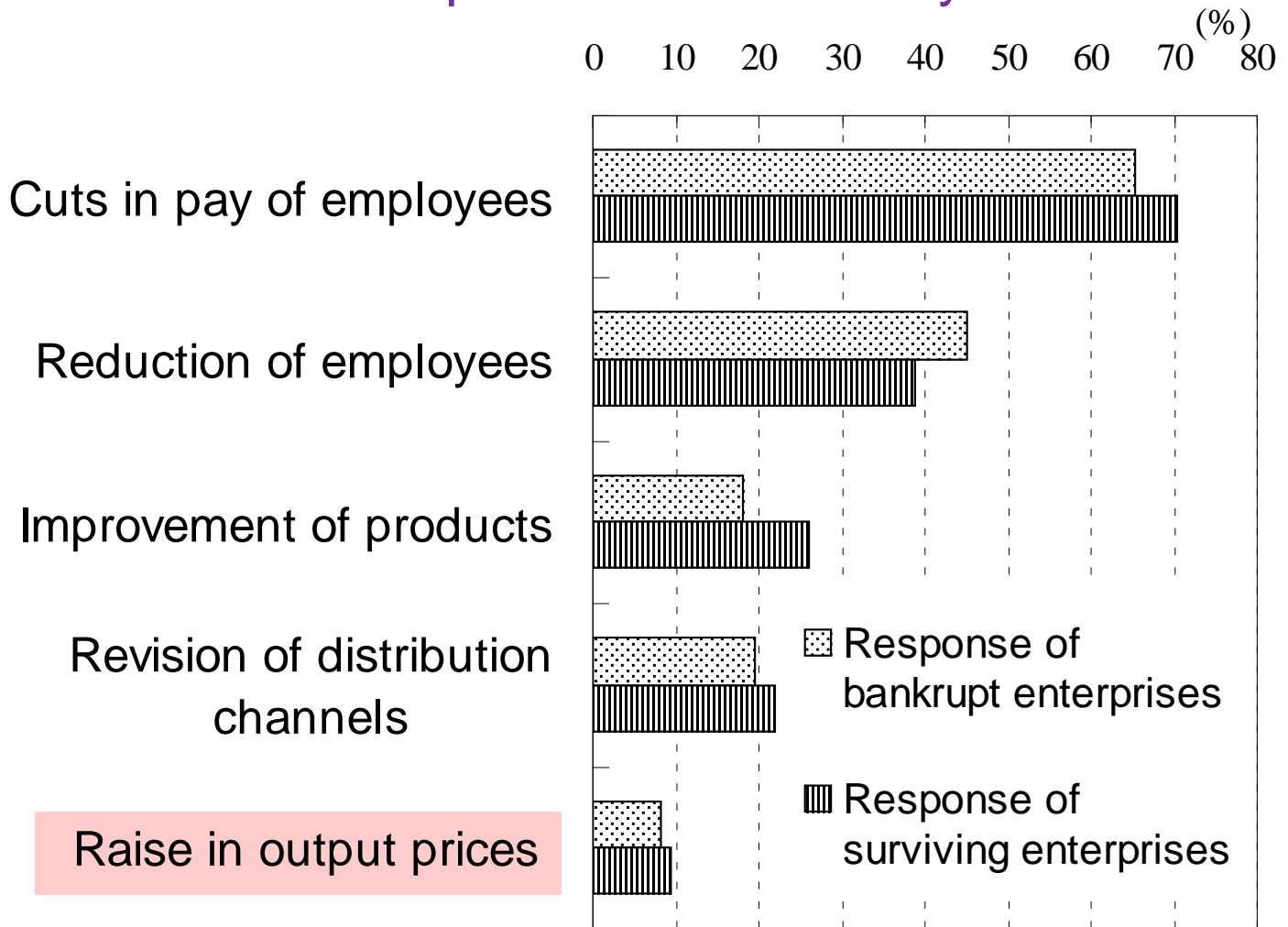
**\*\*\*/\*\*/\* denotes significance at the 1/5/10 percent level.**

Sample period is 1976:1-2003:4.

Financial position affects only the pricing behavior of large firms, but not that of small firms.

# Bankruptcy avoidance measures of small firms

## Results from questionnaire surveys of firms



# Estimation Results by Industry Level

$$OP_t = \alpha_{OP} OP_{t-1} + \alpha_{IP} IP_t + \alpha_{\Delta IP} \Delta IP_t + \alpha_{SD} SD_t + \alpha_{\Delta SD} \Delta SD_t + \alpha_{FP} FP_{t-1} + c + \varepsilon_t$$

## Standardized goods

	$\alpha_{FP}$
Pulp & paper	-0.12 (0.09)
Chemicals	-0.07 (0.06)
Petroleum & coal products	-0.13 (0.18)
Nonferrous metals	0.00 (0.06)

## Differentiated goods

	$\alpha_{FP}$
Industrial machinery	-0.13 <sup>***</sup> (0.04)
Electrical machinery	-0.10 <sup>**</sup> (0.05)
Transportation machinery	-0.09 <sup>**</sup> (0.04)
Precision machinery	-0.12 <sup>**</sup> (0.05)

Notes. Numbers in parentheses are standard errors. Sample period is 1976:1-2003:4.  
**\*\*\*/\*\*/\* denotes significance at the 1/5/10 percent level.**

A statistically significant negative effect of financial constraints on prices is only found in industries that produce differentiated goods.



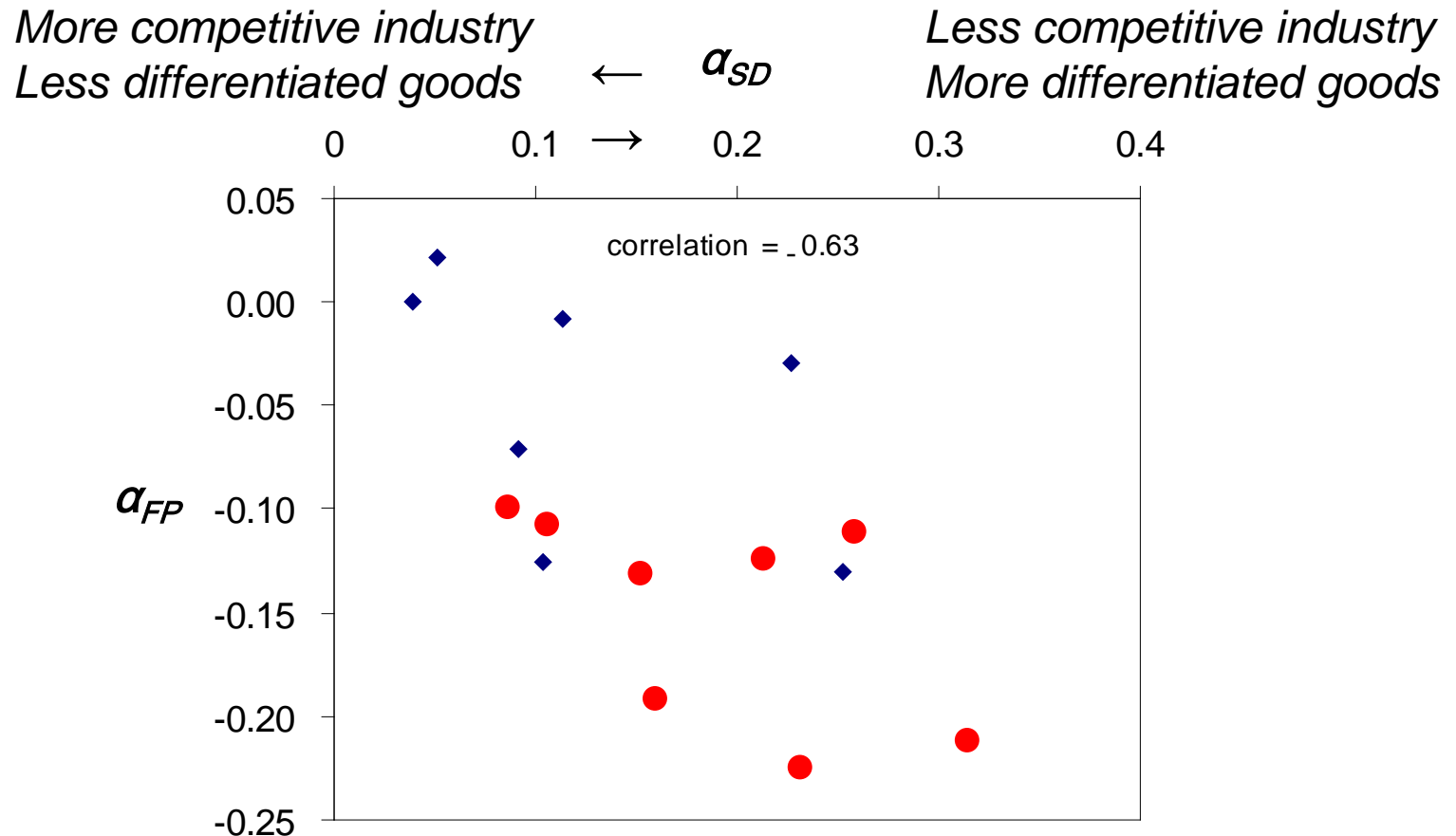
## Relation between $\alpha_{FP}$ and $\alpha_{SD}$

$$OP_t = \alpha_{OP} OP_{t-1} + \alpha_{IP} IP_t + \alpha_{\Delta IP} \Delta IP_t + \alpha_{SD} SD_t + \alpha_{\Delta SD} \Delta SD_t + \alpha_{FP} FP_{t-1} + c + \varepsilon_t$$

- The degree of competitiveness of the market is one of the important factors which affect  $\alpha_{SD}$ .
- As the industry becomes less competitive because of the higher degree of differentiation of goods, firms can shift the change in the marginal costs caused by the change in excess demand onto output prices more easily.
- The less competitive the industry, the larger the parameter  $\alpha_{SD}$ .
- $\alpha_{SD}$  : a proxy of the degree of differentiation of goods

# Cross-industry Correlation between $\alpha_{FP}$ and $\alpha_{SD}$

- The less competitive the industry (= the larger the parameter  $\alpha_{SD}$ ), the larger and more significant the impacts of financial constraints on output prices.



Note: Red circles in the figure indicate that the parameter  $\alpha_{FP}$  is statistically significant.

# Regression of CGPI Inflation on DIs of change in Output Prices

## Manufacturing Sector

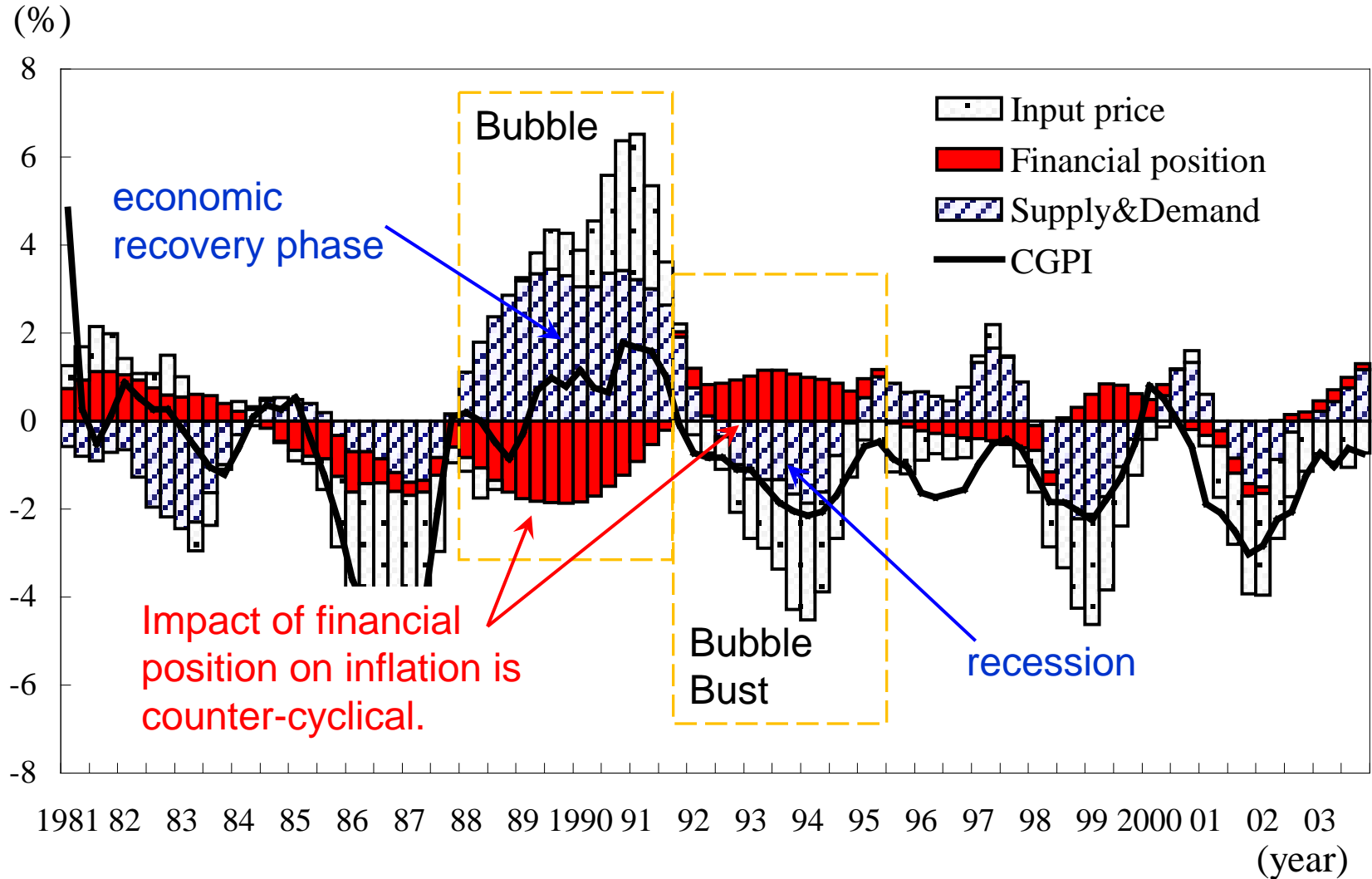
Independent variables			
DI of large firms	DI of medium-sized firms	DI of small firms	adj-R <sup>2</sup>
0.27 <sup>***</sup> (0.03)			0.76
	0.22 <sup>***</sup> (0.03)		0.61
		0.20 <sup>***</sup> (0.03)	0.54

Notes. Numbers in parentheses are standard errors.

\*\*\*/\*\*/\* denotes significance at the 1/5/10 percent level.

Sample period is 1976:1-2003:4.

# Impact of Financial Constraints on Aggregate Prices





# Policy implication

## Why are financial crises preceded by low inflation?

- Customer market theory and the empirical results of this paper imply that abundant liquidity in booms makes firms invest more in the customer stock by charging low prices, which leads to low inflation.
- If this is the case and central bank focuses narrowly on price inflation alone, especially in the short run, it may have the unintended effect of assisting the creation of bubbles when low inflation coexists with an excessive boom in economic and financial activity, which ultimately leads to financial crisis.

# How should CB conduct MP?

## Monetary policy affects firms' financial position

Dependent variable: DI of large firms' financial position

Independent variables				
Ratio of current profits to sales	Call rate	Spread between firms' borrowing rate and government bond rate	Leverage ratio	adj-R <sup>2</sup>
7.9 (0.6)				0.56
7.9 (0.4)	-3.1 (0.2)	-2.2 (0.4)		0.80
6.9 (0.5)	-2.5 (0.2)		-33.1 (6.0)	0.81

Notes. Numbers in parentheses are White heteroskedasticity-consistent standard errors.  
Sample period is 1980:1Q-2003:4Q.

- Central bank should be more careful about how monetary policy affects firms' financial positions and inflation dynamics.