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**Industry-specific REER and Pass through Effect in Economic
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**Industry-specific Exchange Rate Fluctuations,
Japanese Exports and Financial Constraints:
Evidence from Panel VAR Analysis**

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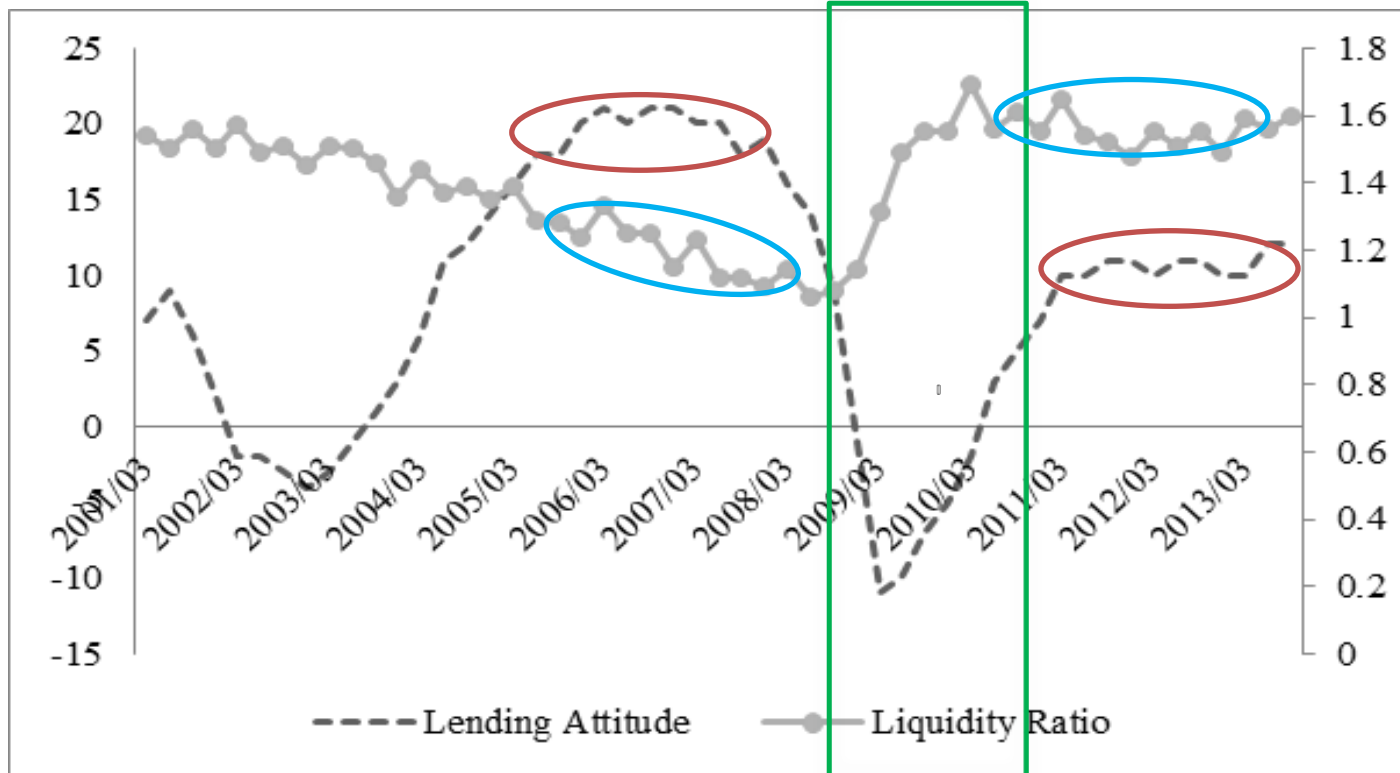
Introduction

- Growing evidence on impact of financial constraints on trade.
 - Amiti and Weinstein(2012); Manova, Wei, and Zhang (2011,NBER); Manova(2012); Feenstra, Li and Yu (2013);
- Few literature to investigate the importance of financial constraints in determining the impact of exchange rate fluctuation on exports.

Literature Review

	Dekle & Ryoo (2007)	Strasser (2013)	Hericourt & Poncet (2013)
Approach	Theoretical and Empirical	Empirical	Empirical
Data	Japanese firm level data, 105 firms	Germany firm-level survey data	Chinese firm level data
Sample Period	1982-1997	2003-2010	2000-2006
Exchange Rate	Exchange rate elasticity	Exchange rate pass-through	Exchange rate volatility
Financial Variable (External)	No hedging data: They compare the actual export elasticities with the hypothetical elasticities under the assumption that the firm hedges completely	Judgment of credit provided by Banks with three answers "accommodating", "neutral", and "restrictive"	Financial development: the share of total credit over GDP in the province; Financial vulnerability: external finance dependence, asset intangibility and the share of R&D spending in total sales
Main Results	Firms that are less financially constrained tend to have lower exchange rate elasticities.	Financially constrained firms pass through exchange rate changes to prices at almost twice the rate of unconstrained firms.	Exchange rate volatility has a negative impact on exports and its impact is magnified for financially vulnerable firms; Financial development seems to dampen this negative impact

What happens in Japan?



Data source: Bank of Japan, Tankan (Short-Term Economic Survey of Enterprises in Japan), 2001Q1-2013Q3.

Research question: how financial constraints influence the response of Japanese exports to exchange rate shock?

What I did?

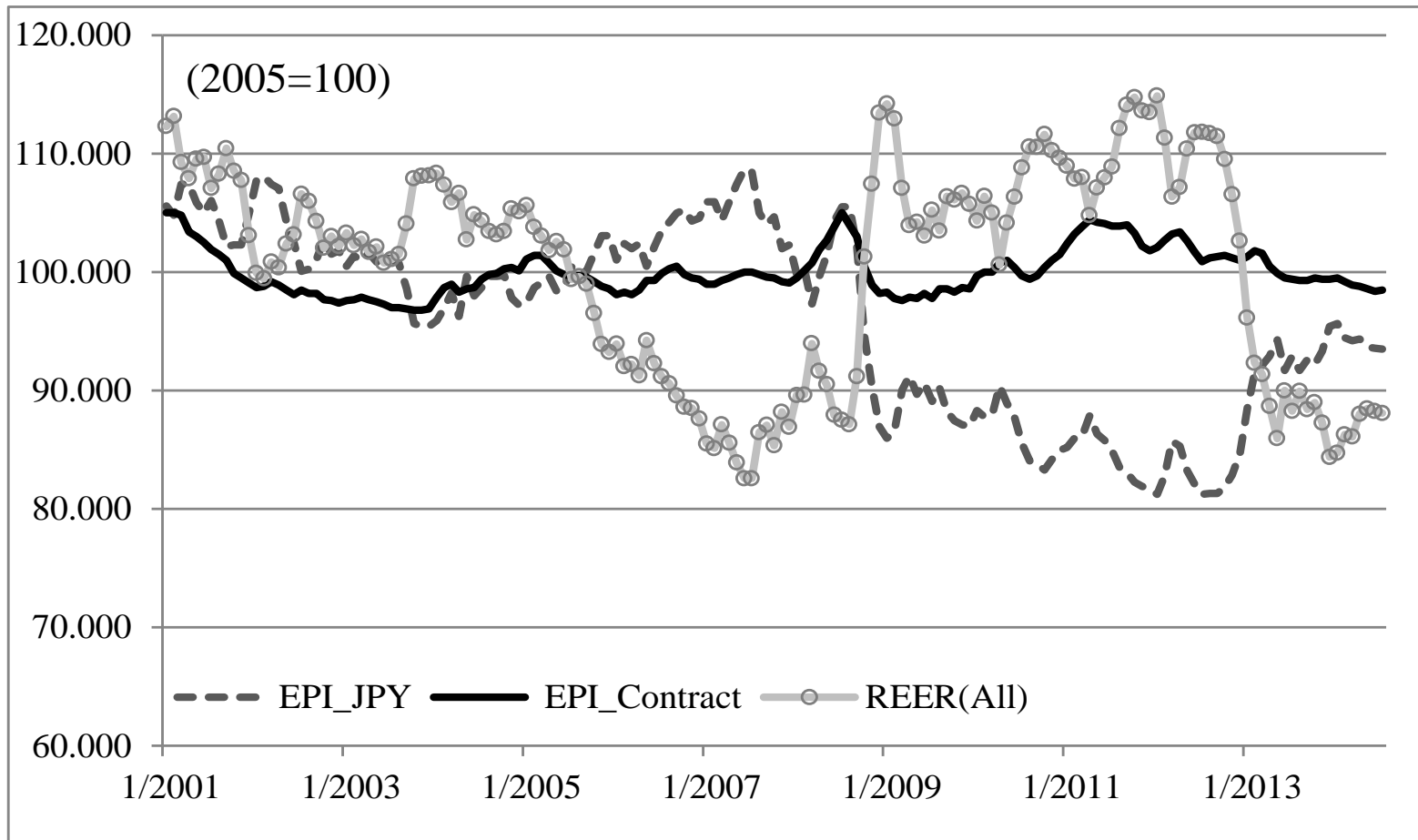
- Jointly and separately investigate the effect of internal and external financial constraint
- Compare the difference in the response of Japanese exports to exchange rate shock across different level of financial constraints.
 - Lower financial constraints and higher financial constraints (internal and external)

What I did?

- Panel VAR augmented with interaction terms that allow the VAR coefficients to vary with financial constraints (internal and external).
- Focus on the short-run effect: an exchange rate shock can have on the export.
 - Long-run effect: to what extent the financial constraints can affect the impact of exchange rate fluctuation on exports.

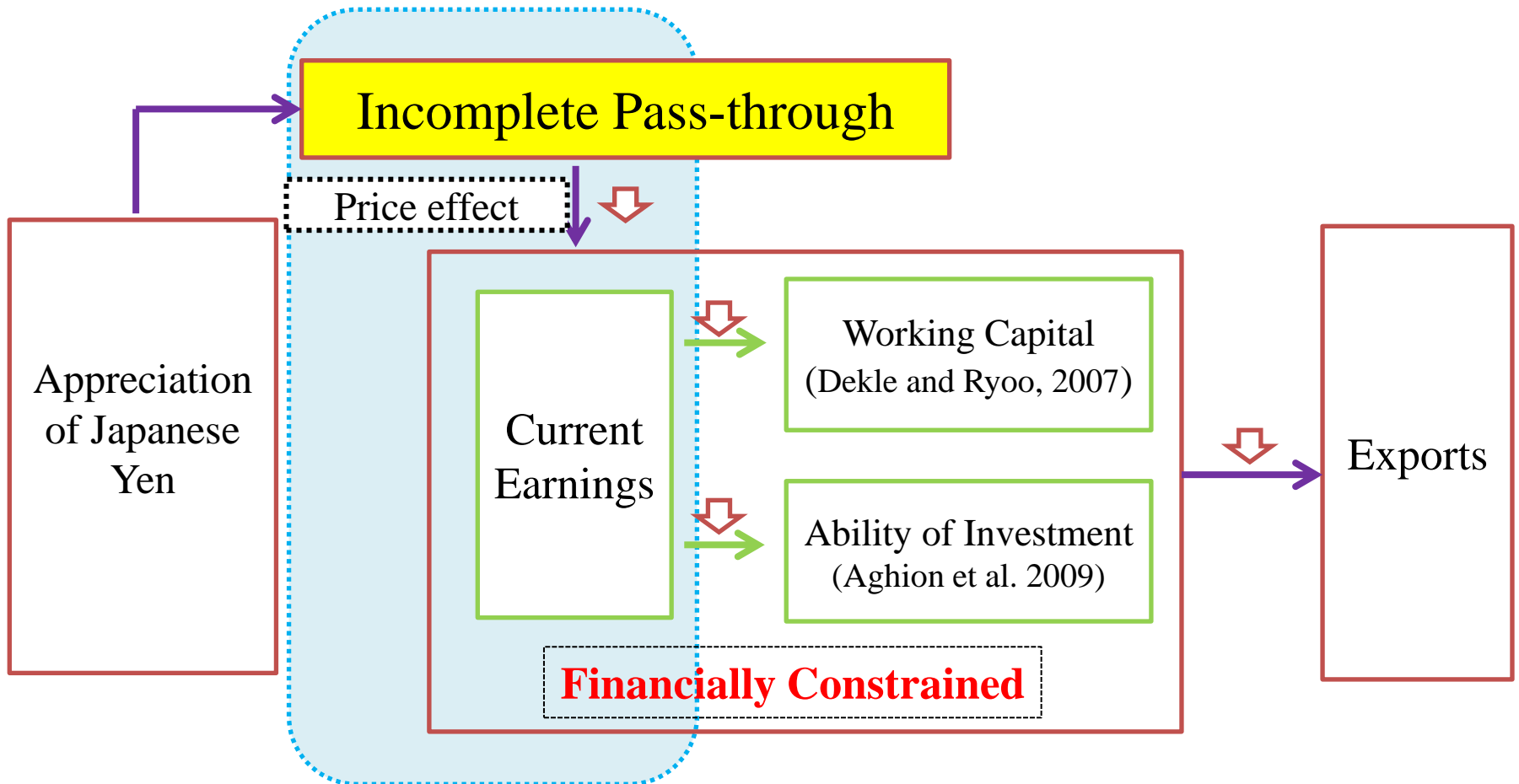
PTM in Japanese Exports

Export Price Index for All Industries



Data source: Bank of Japan

How financial constraints affect?



Correlations between Changes in Exchange Rate and Current Profits

Industry	Description	Nominal Effective Exchange Rate	Real Effective Exchange rate
All	Including From Industry 1 to Industry 13	-0.227	-0.233
1	Food, Beverage, Tobacco	-0.030	-0.022
2	Textiles, Textile Products, Leather and Footwear	-0.162	-0.222
3	Wood Products(excl. furniture)	-0.260	-0.006
4	Paper, Paper Products, Printing and Publishing	-0.135	-0.202
5	Coke, Refined Petroleum Products, Nuclear Fuel	0.017	-0.134
6	Chemicals and Chemical Products	-0.247	-0.337
8	Non-metallic Mineral Products	-0.419	-0.390
9	Basic Metals and Fabricated Metal Products	-0.291	-0.418
10	Machinery and Equipment n.e.c.	-0.364	-0.359
11	Electrical Industry	-0.344	-0.324
12	Optical Instruments	0.088	0.074
13	Transport Equipment	-0.268	-0.289

Note: All variables entered in the first difference of log terms. Current profits is half yearly data from Tankan Database, Bank of Japan. (2001h1-2013h1)

Expectations

- Exchange rate appreciations have negative effect on exports. (Balance sheet effect)
- Exporters with higher financial constraints (internal and external) will response more to exchange rate shock
- Joint effect of external financial constraints and internal financial constraints
 - With higher internal (lower) financial constraints, exporters facing lower external (higher) financial constraints response less to exchange rate shock .

Empirical Methodology

Data Issues

- Japanese industry-level data: Quarterly, from 2001 to 2013.
- Internal financial constraints:
 - Ratio of Liquidity = (Quarter-end balance of cash, deposits, and securities listed as liquid assets)/(Monthly average sales during the fiscal year, which includes the related quarter)
- External financial constraints:
 - Lending Attitude of Financial institutions (Diffusion index of Accommodative minus Severe): Judgment of financial institutions' attitude towards lending as perceived by the responding enterprise. Judgment requested only for "at the time of the survey".
[1) Accommodative. 2) Not so severe. 3) Severe.] (From BOJ)
- All financial data are from *Tankan (Short-Term Economic Survey of Enterprises in Japan)* database, Bank of Japan.
- **The higher value of financial variables means lower financial constraints.**

Data Issues

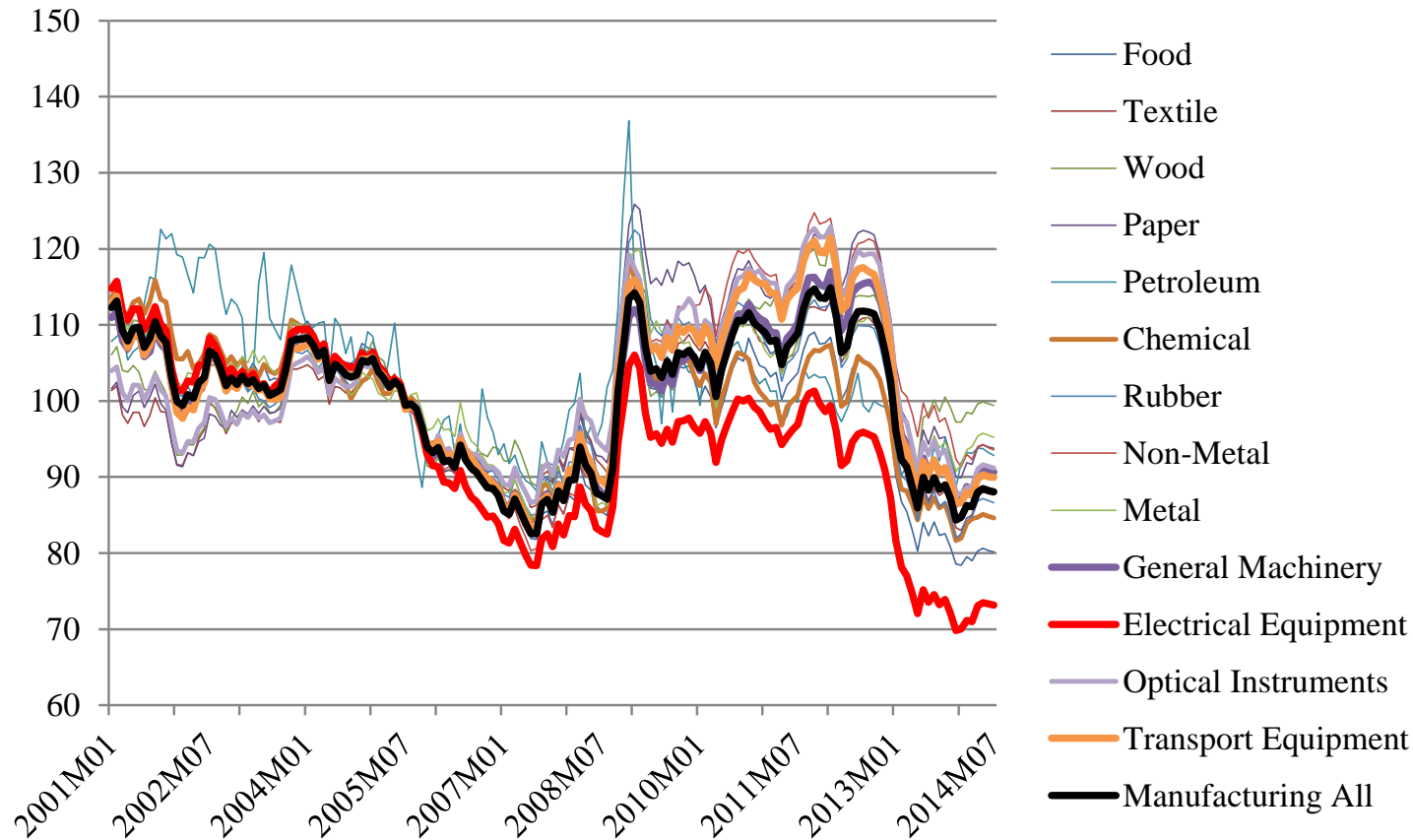
- Exchange rate: Industry-specific real effective exchange rate (I-REER) (Sato et al. , 2013)
 - Sectoral studies maybe biased by using aggregated exchange rate data. (Byrne et al., 2008)
 - Aggregated exchange rate cannot capture the heterogeneity across industries.
- World real income
 - Use industry breakdown trade weight to calculate the trade-weighted average of the partners' real GDP for each industry as a proxy for [world real income](#)
- Export data is from Trade Statistics of Japan Ministry of Finance
 - Convert 9 digit HS industry to ISIC rev3 2 digit
- **All variables seasonally adjusted and taken the first difference of log-terms**

Industry classification

Industry Classification

Code	ISIC.rev3	Industry Name	Description
1	15-16	Food	Food, Beverage, Tobabcoo
2	17-19	Textile	Textiles, Textile Products, Leather and Footwe
3	20	Wood	Wood Products(excl. furniture)
4	21-22	Paper	Paper, Paper Products, Printing and Publishing
5	23	Petroleum	Coke, Refined Petroleum Products,Nuclear Fuel
6	24	Chemical	Chemicals and Chemical Products
7	25	Rubber	Rubber and Plastics Products
8	26	Non-Metal	Non-metallic Mineral Products
9	27-28	Metal	Basic Metals and Fabricated Metal Products
10	29	General Machinery	Machinery and Equipment n.e.c.
11	30-32	Electric Machinery	Electrical Machinery and Apparatus n.e.c.
12	33	Optical Instruments	
13	34-35	Transport Equipment	Transport Equipment

Industry-specific Real Effective Exchange Rates for Japan (2005=100)



Source: Research Institute of Economy, Trade & Industry (RIETI)
Reference: Sato, Kiyotaka, Junko Shimizu, Nagendra Shrestha and Shajuan Zhang (2012) "Industry-specific Real Effective Exchange Rates for Japan," RIETI Discussion Paper Series 12-E-044.

Theoretical framework

- Export demand function (Goldstein and Khan, 1985 survey) augmented by adding interaction terms of financial constraints

- Panel VAR:

$$A_{i,t,0}Y_{i,t} = \sum_{l=1}^q A_{i,t,l}Y_{i,t-l} + \beta X_{i,t} + \varepsilon_{it}$$

- i , industry; t , time and q , number of lags (AIC: 2)
- Vector $Y_{i,t}$: world real income, Japanese export volumes and I-REER
- $X_{i,t}$: industry-specific effects, dummy of finance crisis and *other control (single term of financial constraints)*
- $A_{i,t,l}$: time varying coefficients defined as $\alpha_{i,t,l}^{jk}$, potentially as a function of financial constraints
- ε_{it} : structural errors

Identification Strategy

External Variable

World Income
(Δy_t^W)

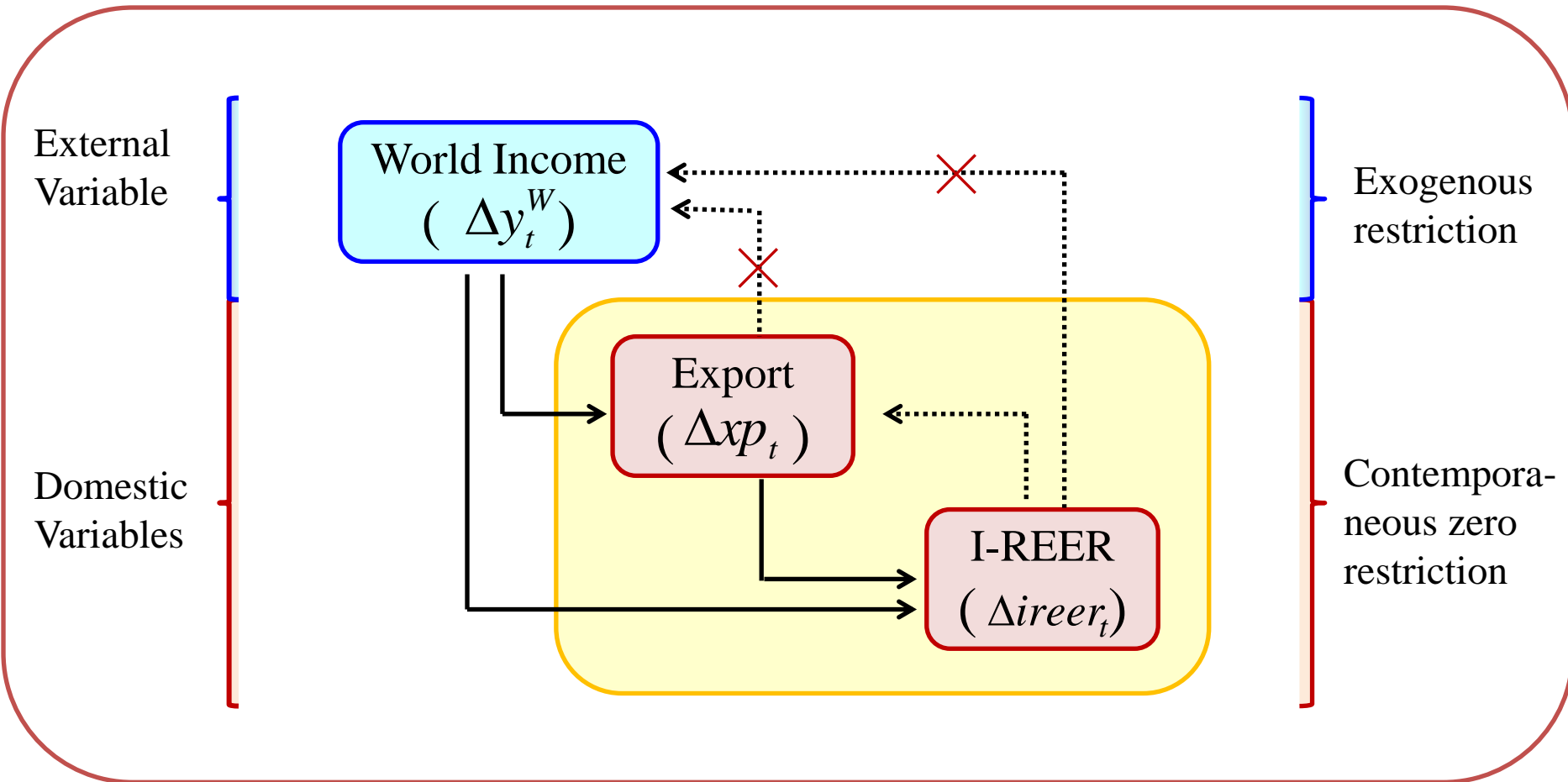
Exogenous restriction

Domestic Variables

Export
(Δxp_t)

I-REER
($\Delta ireer_t$)

Contemporaneous zero restriction



Identification strategy

- These assumptions are equivalent to imposing the following structures:

$$A_{i,t,0} = \begin{bmatrix} 1 & 0 & 0 \\ a_{i,t,0}^{21} & 1 & 0 \\ a_{i,t,0}^{31} & a_{i,t,0}^{32} & 1 \end{bmatrix}$$

$$A_{i,t,l} = \begin{bmatrix} a_{i,l}^{11} & 0 & 0 \\ a_{i,t,l}^{21} & a_{i,t,l}^{22} & a_{i,t,l}^{23} \\ a_{i,t,l}^{31} & a_{i,t,l}^{32} & a_{i,t,l}^{33} \end{bmatrix}, \quad l = 1,2$$

Interaction Terms

- Interaction terms with financial variables is included to In order to allow exporters to response to exchange rate shock vary with the level of financial constraints.  Domestic variable

$$a_{i,t,l}^{jk} = \beta_{l,0}^{jk} + \beta_{l,1}^{jk} InF_{it} + \beta_{l,2}^{jk} ExF_{it} + \beta_{l,3}^{jk} InF_{it} * ExF_{it}$$

- InF_{it} : internal financial constraints
- ExF_{it} : external financial constraints

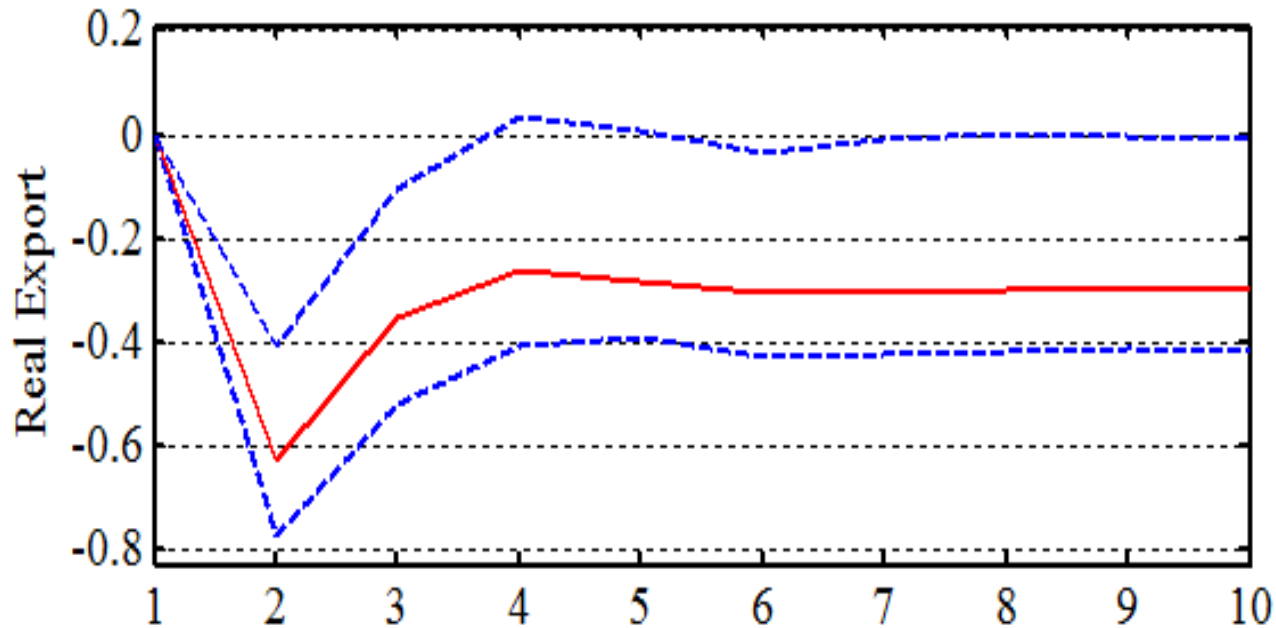
- Implementation:

- Compare the difference in the response across high financial constraints and low financial constraints
 - Low financial constraints (internal & external): 75 percentile point ¹⁹
 - High financial constraints (internal & external): 25 percentile point

Results of F test

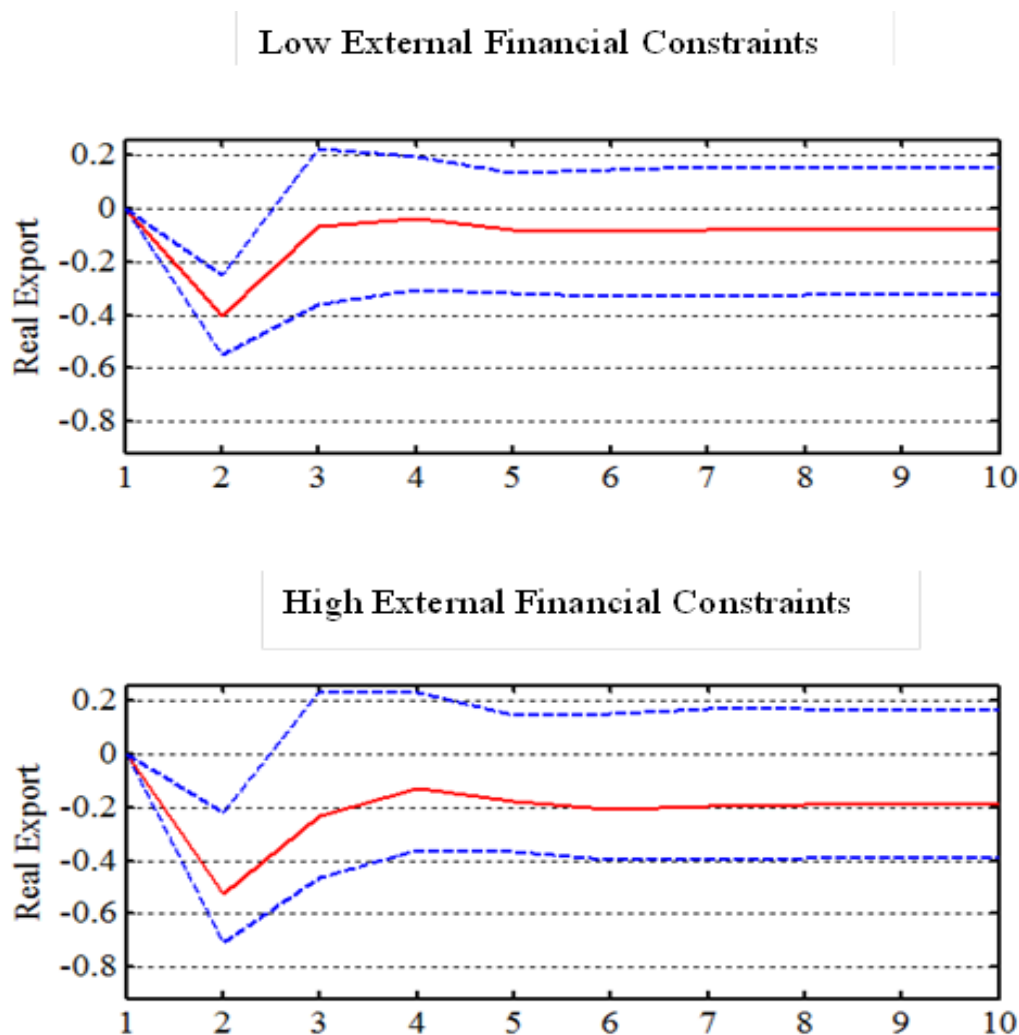
	Null hypothesis	Results of F test
External Financial Constraints:	$H_0 : \beta_{l,2}^{jk} = \beta_{l,3}^{jk} = 0, l = 1, 2, \dots, p$	4.89***
Internal Financial Constraints:	$H_0 : \beta_{l,1}^{jk} = \beta_{l,3}^{jk} = 0, l = 1, 2, \dots, p$	4.88***
External & Internal Financial Constraints:	$H_0 : \beta_{l,1}^{jk} = \beta_{l,2}^{jk} = \beta_{l,3}^{jk} = 0, l = 1, 2, \dots, p$	4.50***

Results(1): Without Interactions



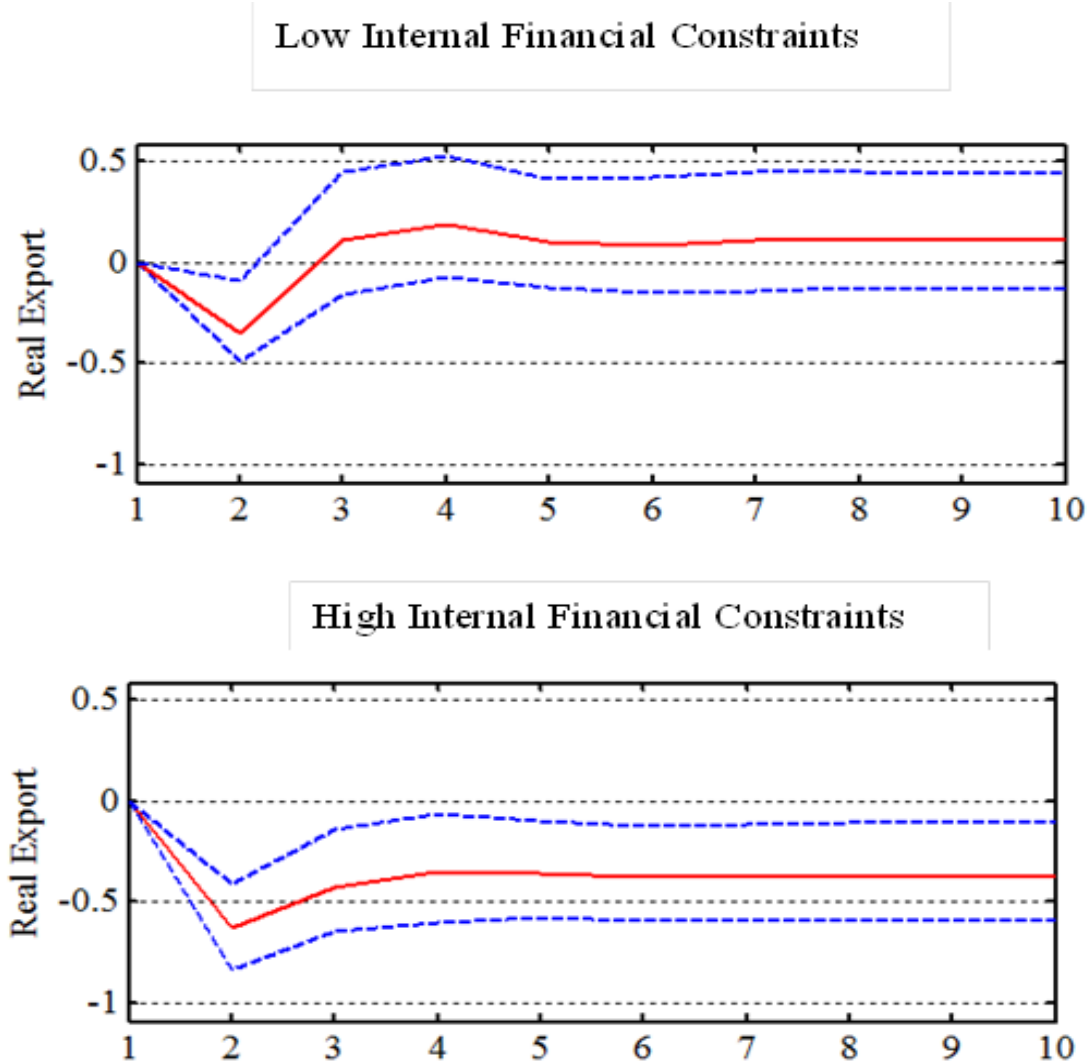
Note: Response To Exchange Rate Shock. Bands are 90 percent confidence intervals computed by bootstrapping.

Results(2): External Financial Constraints



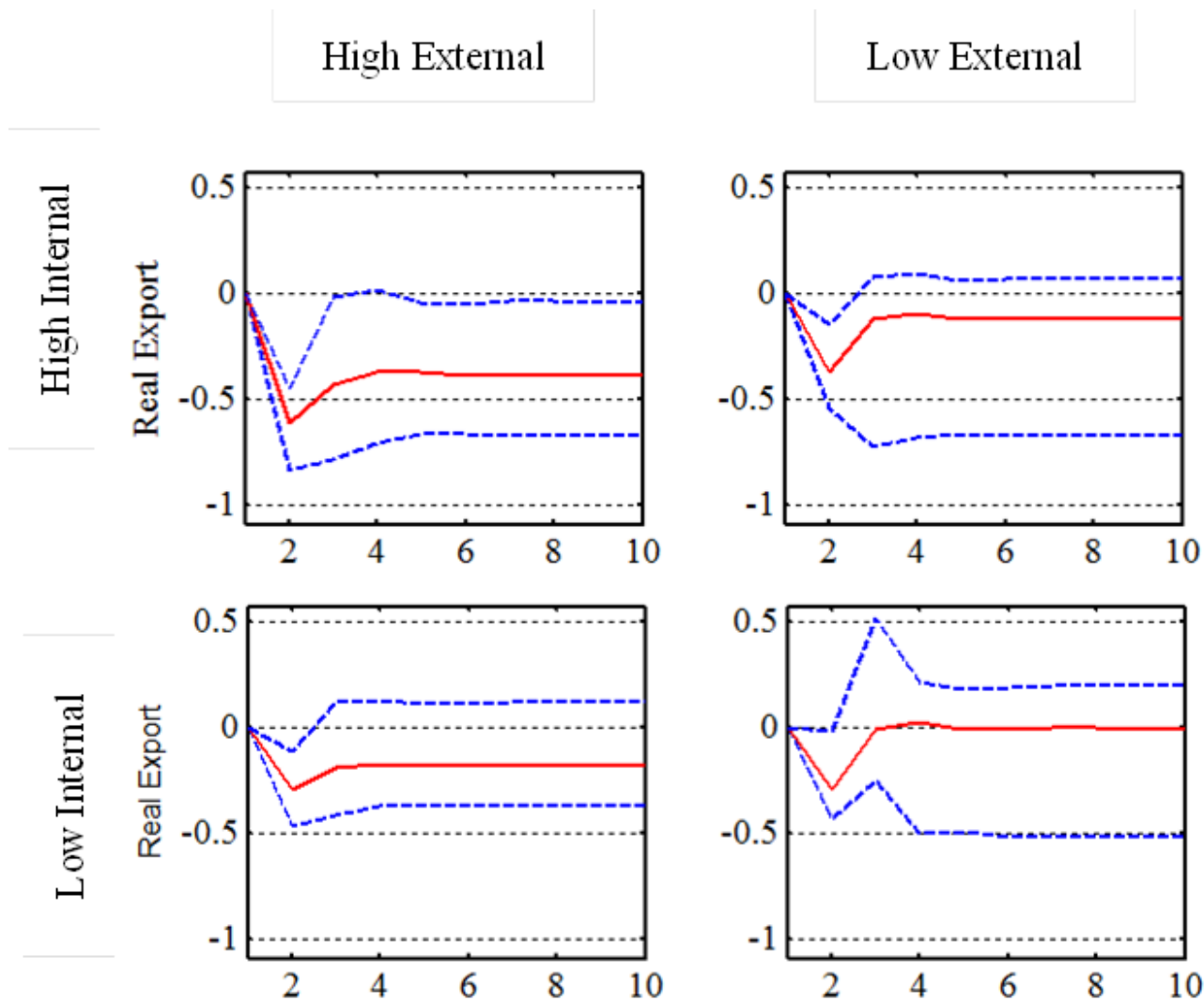
Note: Response To Exchange Rate Shock. Bands are 90 percent confidence intervals computed by bootstrapping.

Results(3): Internal Financial Constraints



Note: Response To Exchange Rate Shock. Bands are 90 percent confidence intervals computed by bootstrapping.

Results(4): Internal & External Financial Constraints



Note: Response To Exchange Rate Shock. Bands are 90 percent confidence intervals computed by bootstrapping.

Conclusions

- Negative impact of exchange rate shock
- The response to exchange rate shock varies with financial constraints (internal and external)

	Higher External Financial Constraints	Lower External Financial Constraints
Higher Internal Financial Constraints	Big	Medium
lower Internal Financial Constraints	Medium	No Impact

- Accommodative financial environment can help firms with higher internal financial constraints alleviate the impact of yen appreciation on its exports.

Thank you for your attention!

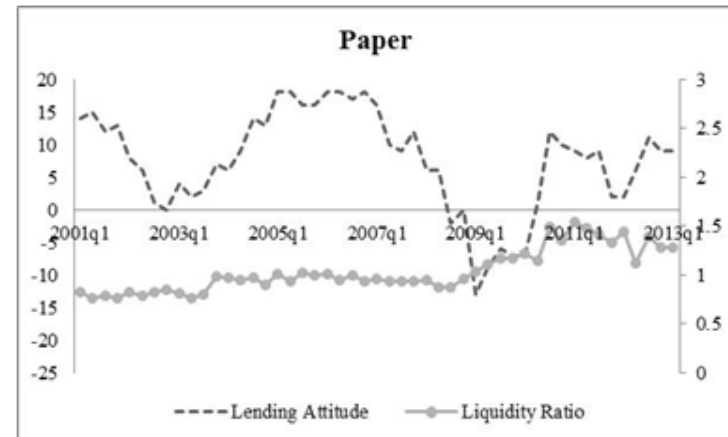
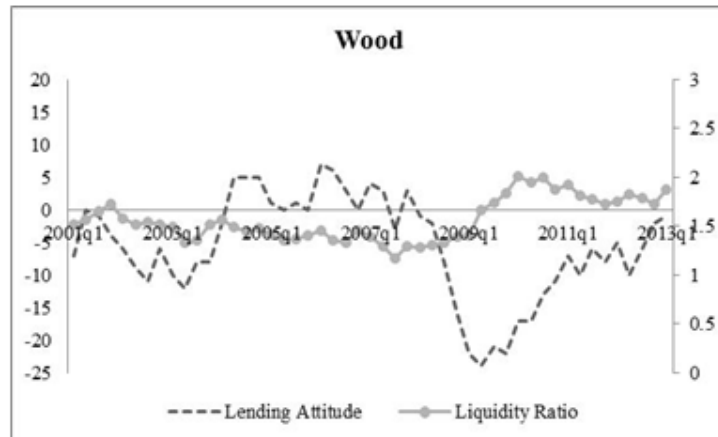
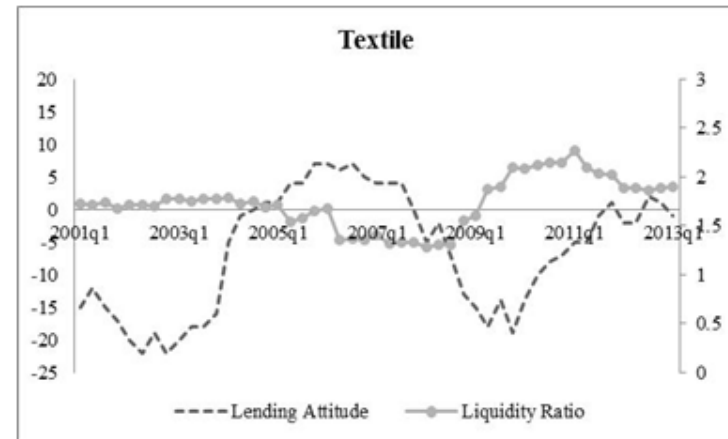
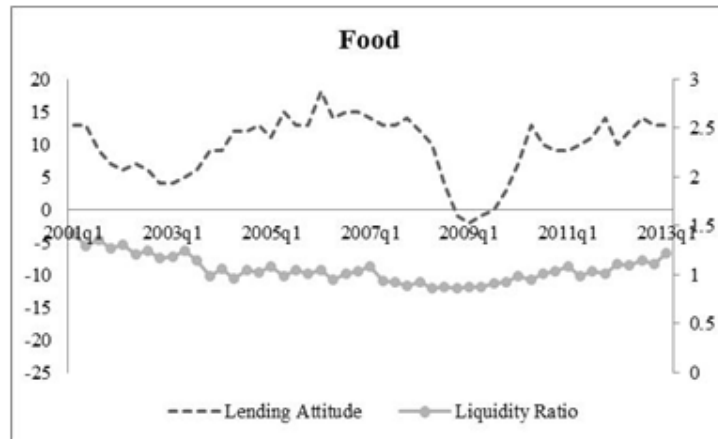
Conclusions

- Japanese exports negatively and significantly response to exchange rate shock.
- Financial constraints have significant influences on the exporter's behavior in response to the exchange rate changes.
 - With either lower internal or external financial constraints less affected by the exchange rate shock.

Conclusions

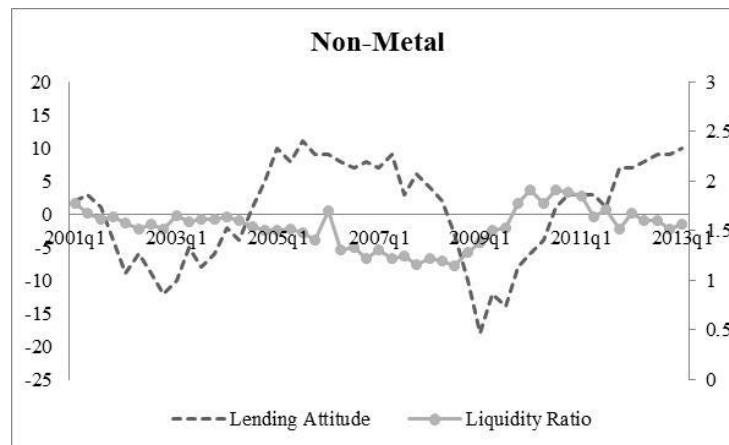
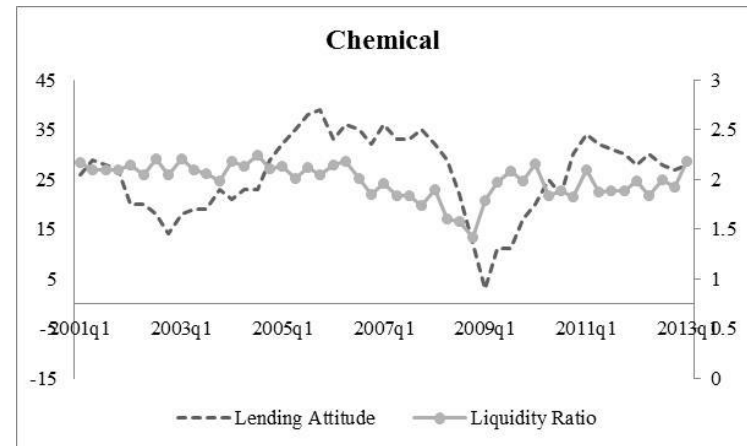
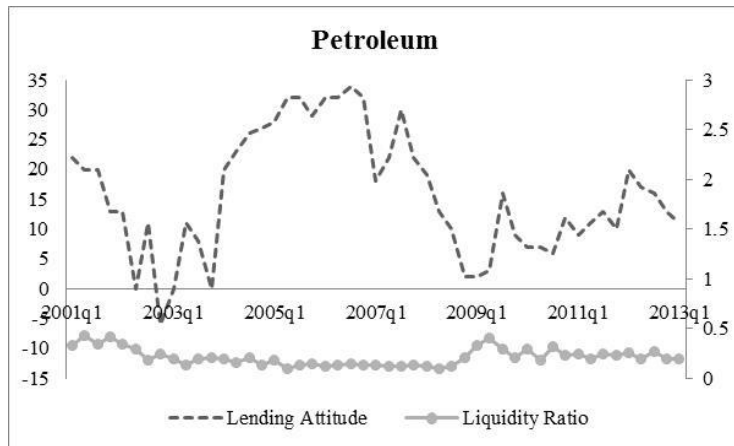
- Firms under an environment where it is difficult to finance externally increase liquidity ratio can help buffer the exchange rate shock.
- Accommodative financial environment can help firms with higher internal financial constraints alleviate the impact of yen appreciation on its exports.

Lending Attitude of Financial Institution and Liquidity Ratio for Each Industry



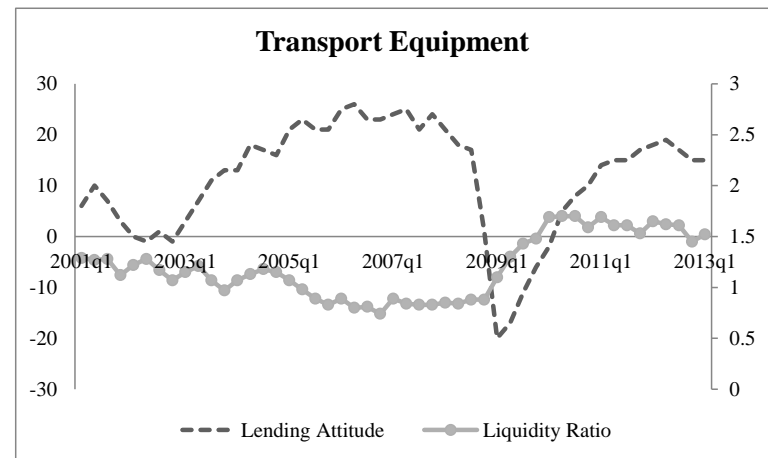
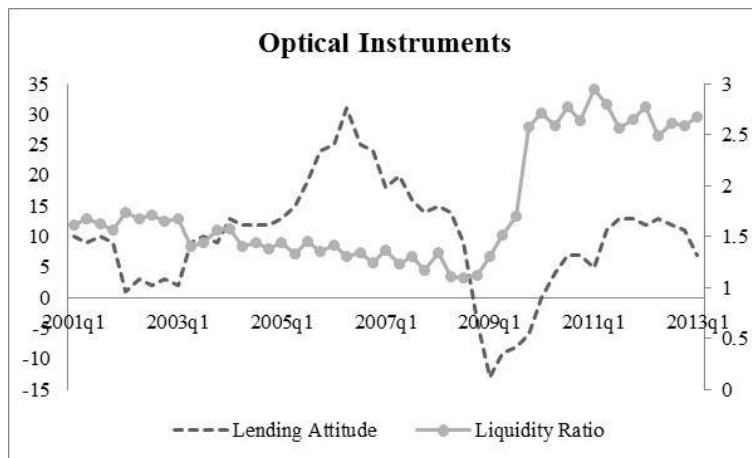
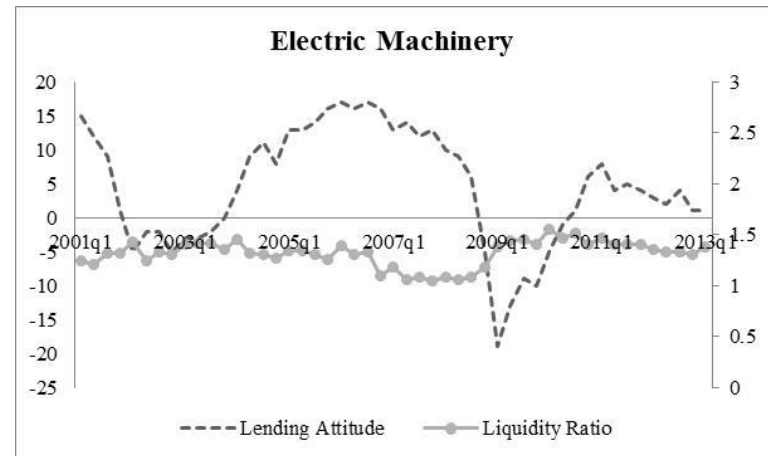
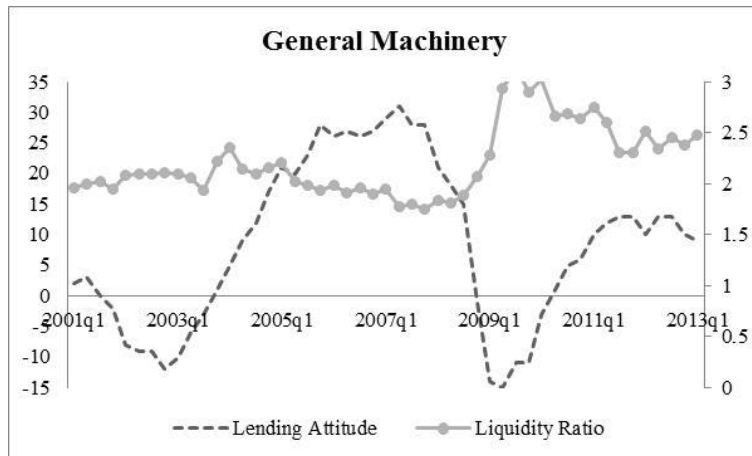
Data source: Bank of Japan, Tankan (Short-Term Economic Survey of Enterprises in Japan), 2001Q1-2013Q3.

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