

*CESSA-wiiw Joint International Workshop*  
**New Industry-Level Analysis in Asia and Europe:  
Integration, Value Chains and Competitiveness**  
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# **Global Chains for Value-Added and Intermediate Goods in Asia**

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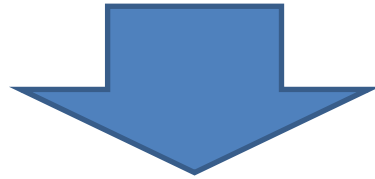
Yokohama National University

# Contents

- Background
- Global chains
  - Trade in intermediate goods
  - Trade in value-added
- New approach to compute Global chains
  - Trade in value-added and intermediate goods
- YNU-GIO tables
- Results
- Conclusions

# Background

- More than half of the World's gross trade is intermediate goods trade
- Multi-country production chains
- Embodied trade patterns underlying export are different than direct trade patterns observed in conventional gross trade statistics



**Computation of Global chains**

# Global Chains underlying Export: Analytical approach

**Export**



Direct trade

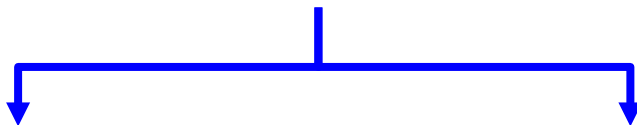


Conventional trade statistics



Embodied trade

→ Global Input-Output Tables



Embodied trade in  
Value-added

Embodied trade in  
intermediates

- Double counting
- Ignore embodied trade
- Overstate domestic contents

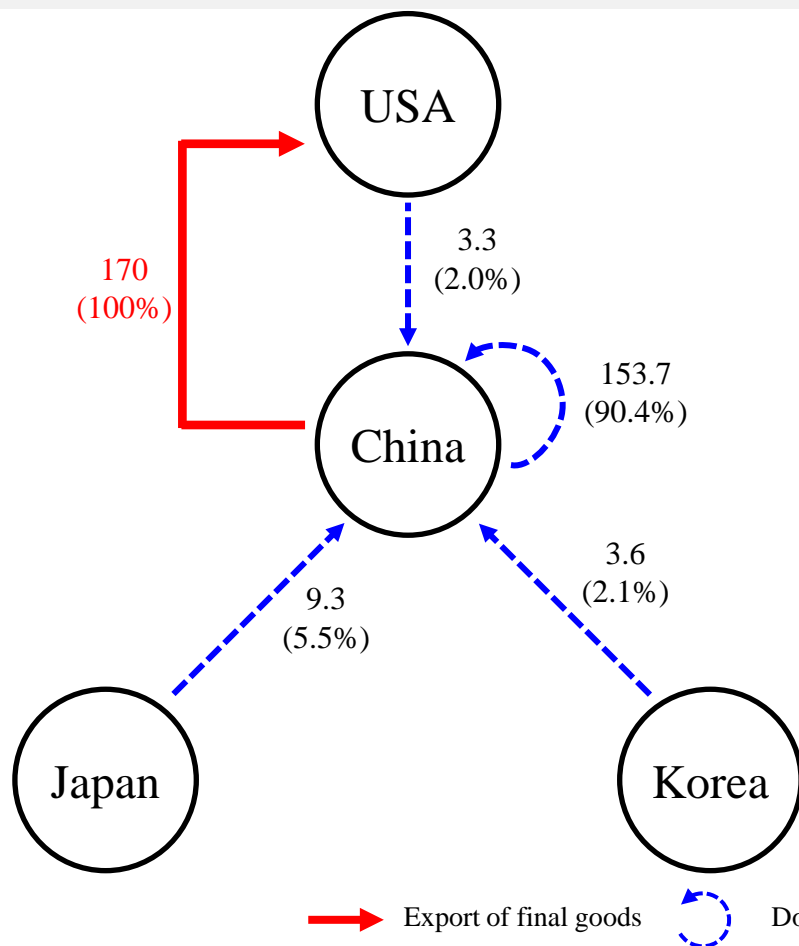
Johnson and Nogeura (2012)  
Koopman *et al.* (2012)  
OECD-WTO etc.

Hummels *et al.* (2001)  
Hasebe and shrestha (2006)  
Ng (2010)

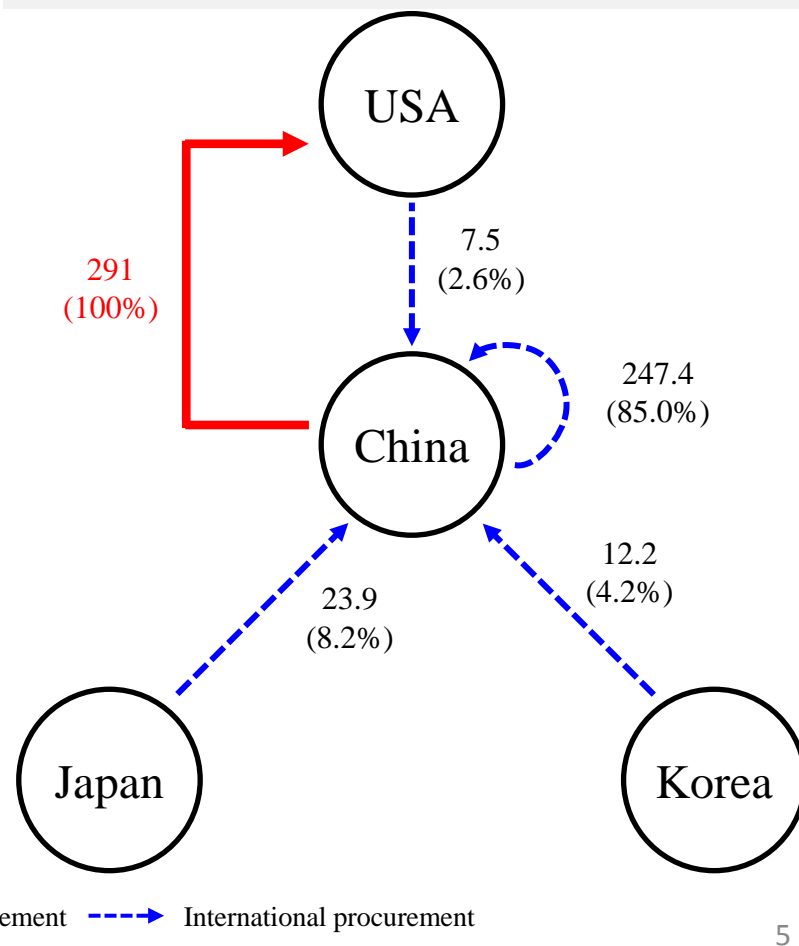
# Embodied Contents in export

Example: Chinese export to US in billion dollar (2005, four-country model)

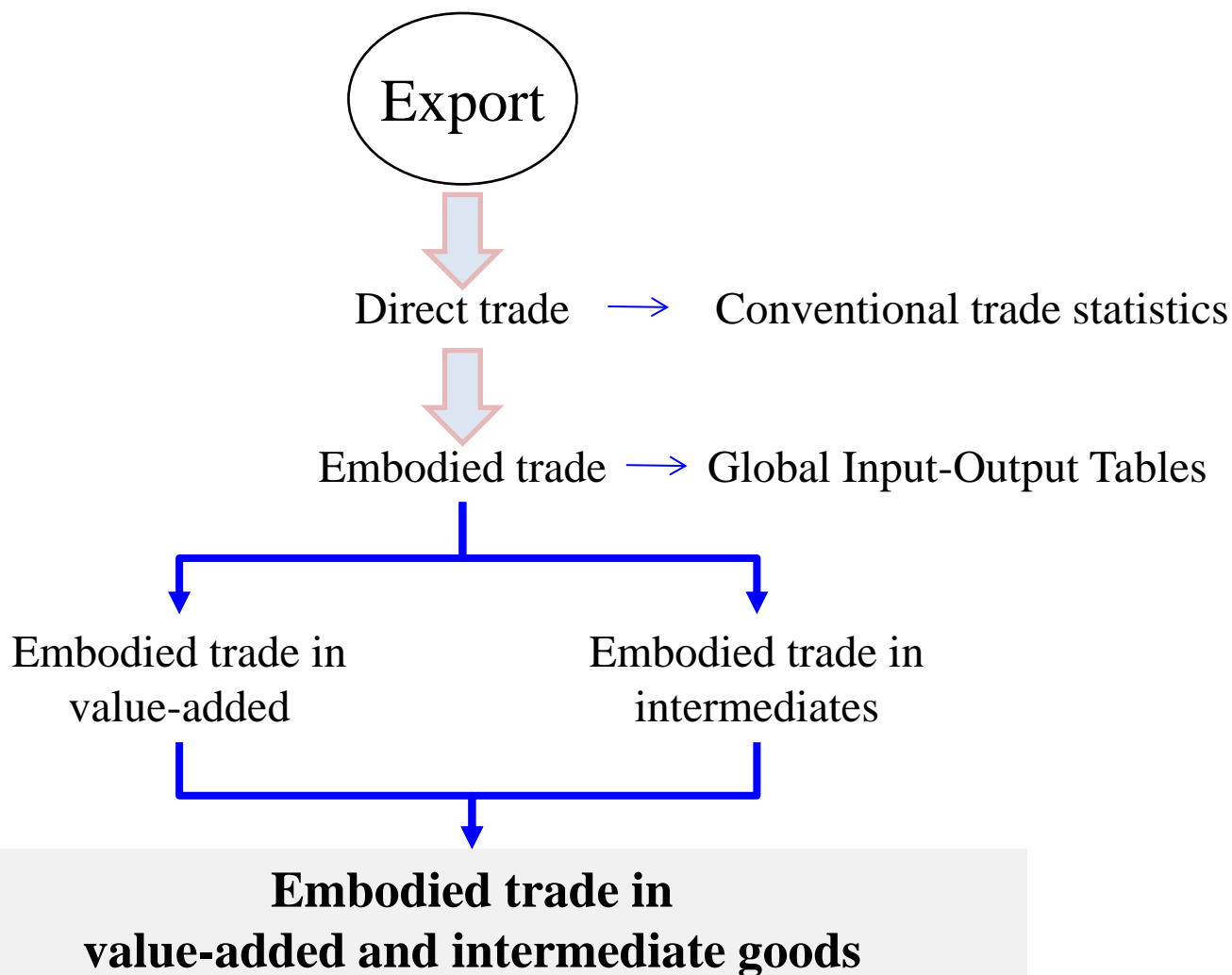
Existing method  
(embodied value-added contents)



Existing method  
(embodied intermediate goods contents)



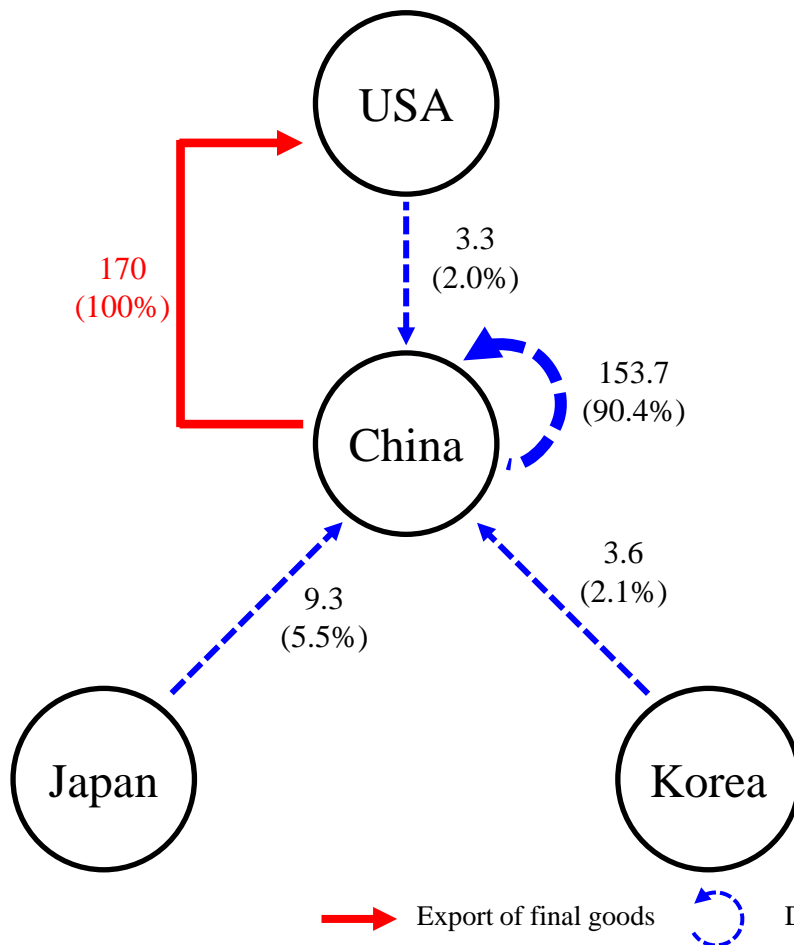
# Global Chains underlying Export: New analytical approach



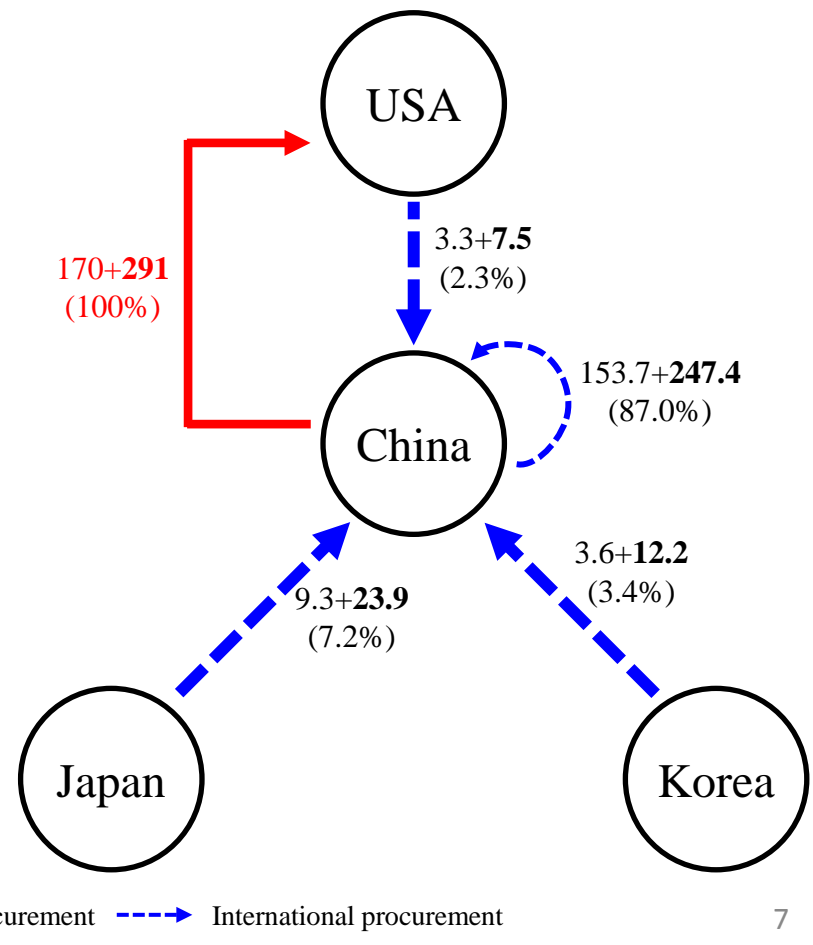
# Embodied Contents in export

Example: Chinese export to US in billion dollar (2005, four-country model)

Existing method  
(embodied value-added contents)



**New method** (embodied intermediate goods and value-added contents)

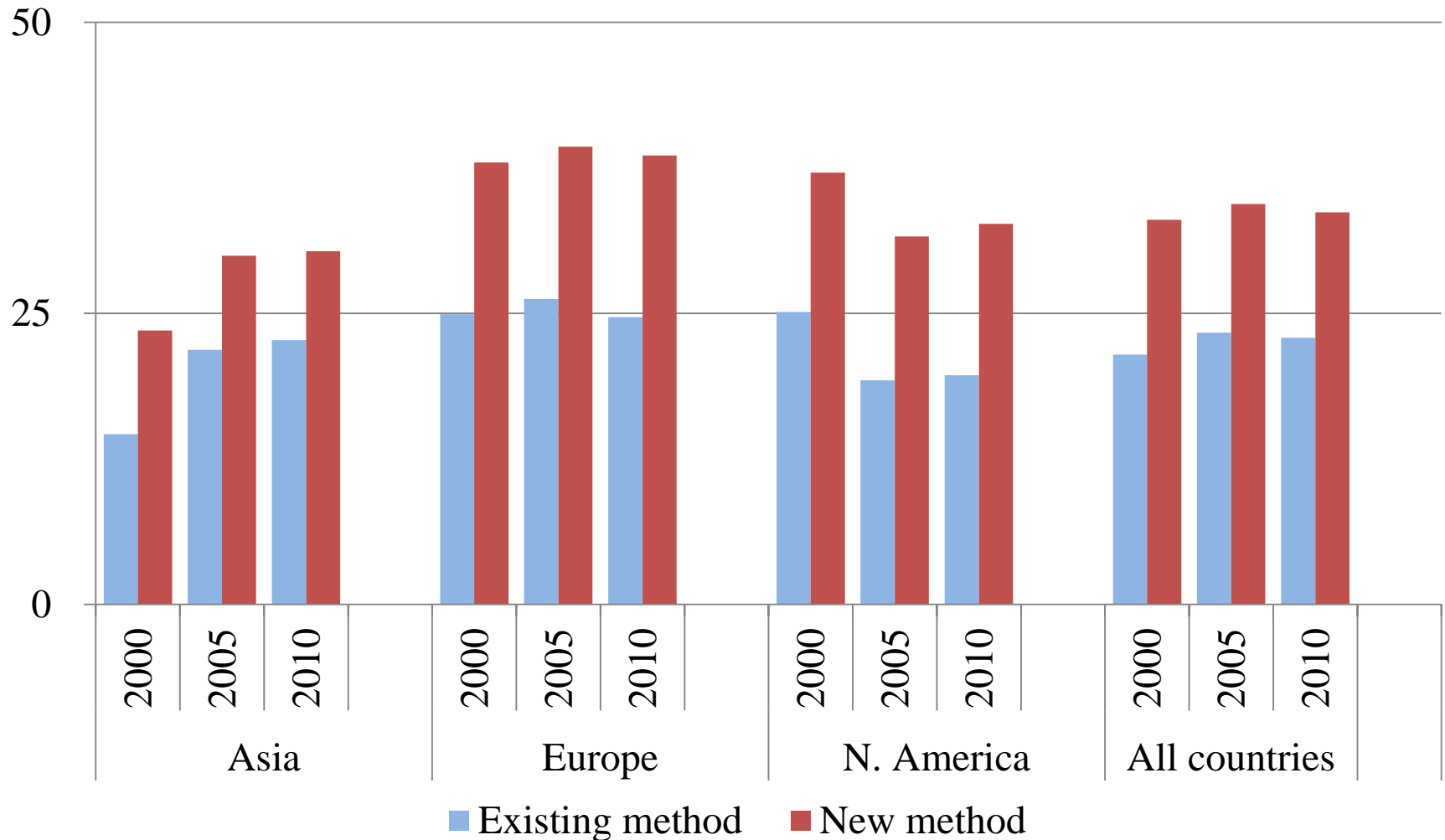


# Existing approaches...

- Embodied trade in intermediate goods
  - does not account embodied trade in value-added
    - misses GDP (value-added) related aspect of economy
- Embodied trade in value-added
  - does not account embodied trade in intermediate goods
    - so that existing approach still understates the foreign contents of export



# Foreign Contents in Export



# Embodied trade in intermediate goods

- Cannot be overseen, because
  - more than half of the World's trade is intermediate goods trade
  - extent of embodied trade in intermediate goods is not negligible

And most importantly,

- value-added trade and intermediate goods trade structures are entirely different



**both trade structures should be addressed in the model to explain the global chain**

# Global chain for value-added and intermediate goods

$$G = G_{int} + G_v = AL\hat{E} + \hat{A}_v L\hat{E}$$

or equivalently,

$$G = G_L - \hat{E} + G_v = L\hat{E} - \hat{E} + \hat{A}_v L\hat{E}$$

where

$$G_L = \begin{bmatrix} L^{11}E^1 & L^{12}E^2 & L^{13}E^3 \\ L^{21}E^1 & L^{22}E^2 & L^{23}E^3 \\ L^{31}E^1 & L^{32}E^2 & L^{33}E^3 \end{bmatrix} \quad \hat{E} = \begin{bmatrix} E^1 & 0 & 0 \\ 0 & E^2 & 0^3 \\ 0 & 0 & E^3 \end{bmatrix} \quad G_v = \begin{bmatrix} Av^1 L^{11}E^1 & Av^1 L^{12}E^2 & Av^1 L^{13}E^3 \\ Av^2 L^{21}E^1 & Av^2 L^{22}E^2 & Av^2 L^{23}E^3 \\ Av^3 L^{31}E^1 & Av^3 L^{32}E^2 & Av^3 L^{33}E^3 \end{bmatrix}$$

# Data set

- YNU-GIO tables (Sato and Shrestha, 2013)
  - constructed as a part of research project of Center for Economic and Social Studies in Asia (CESSA) at Yokohama National University (YNU)
    - Annual tables: 1997 to 2010
    - 35 industries
    - 27 endogenous countries
      - Nine Asian countries (JPN, CHN, KOR, TWN, MAL, THL, IDN, VTM and IND)

# Results:

## Regional Global Chains

### Regions:

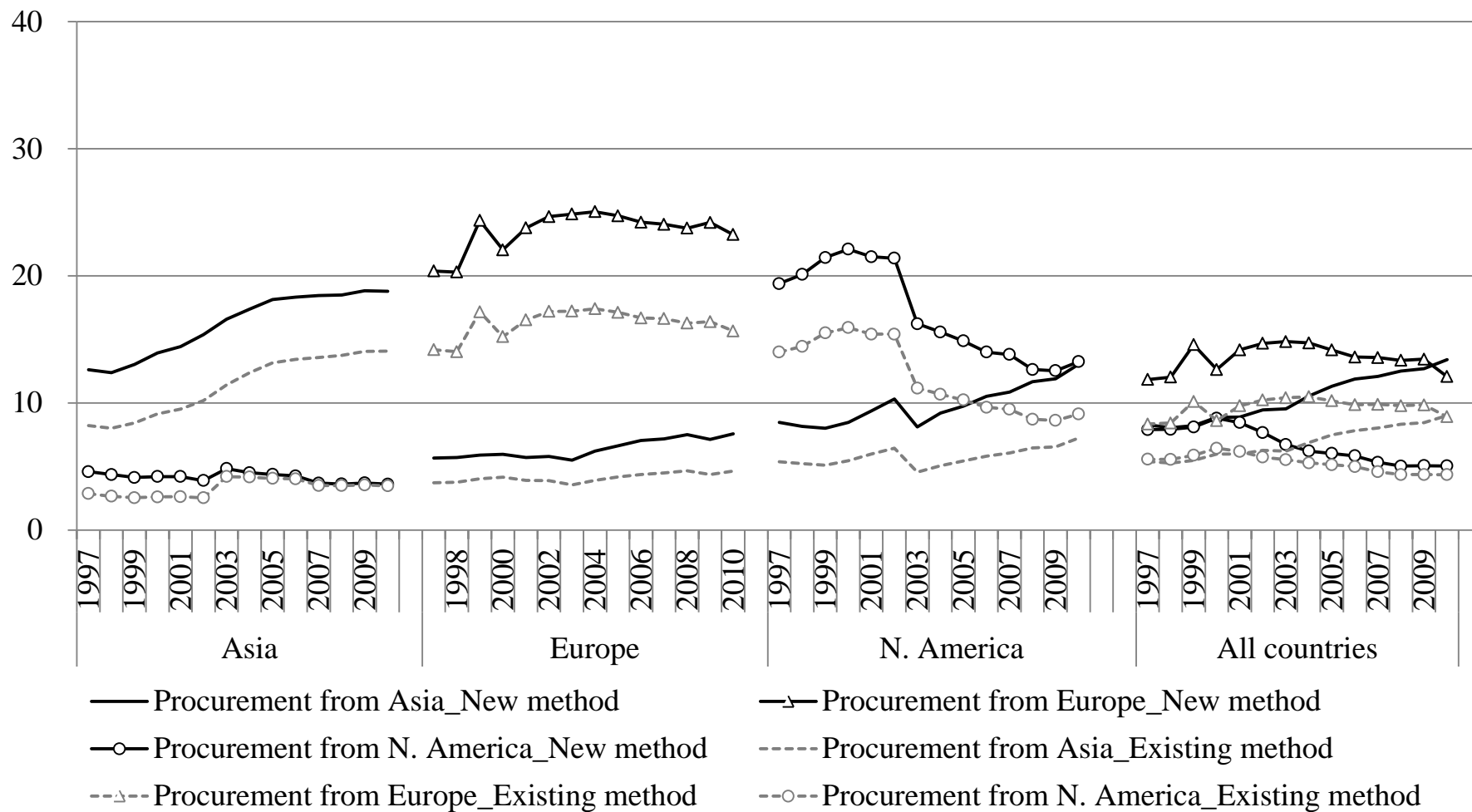
- Asia
- Europe
- North America
- All endogenous countries

### Industries:

- Manufacturing
- Electric machinery
- Transport equipment

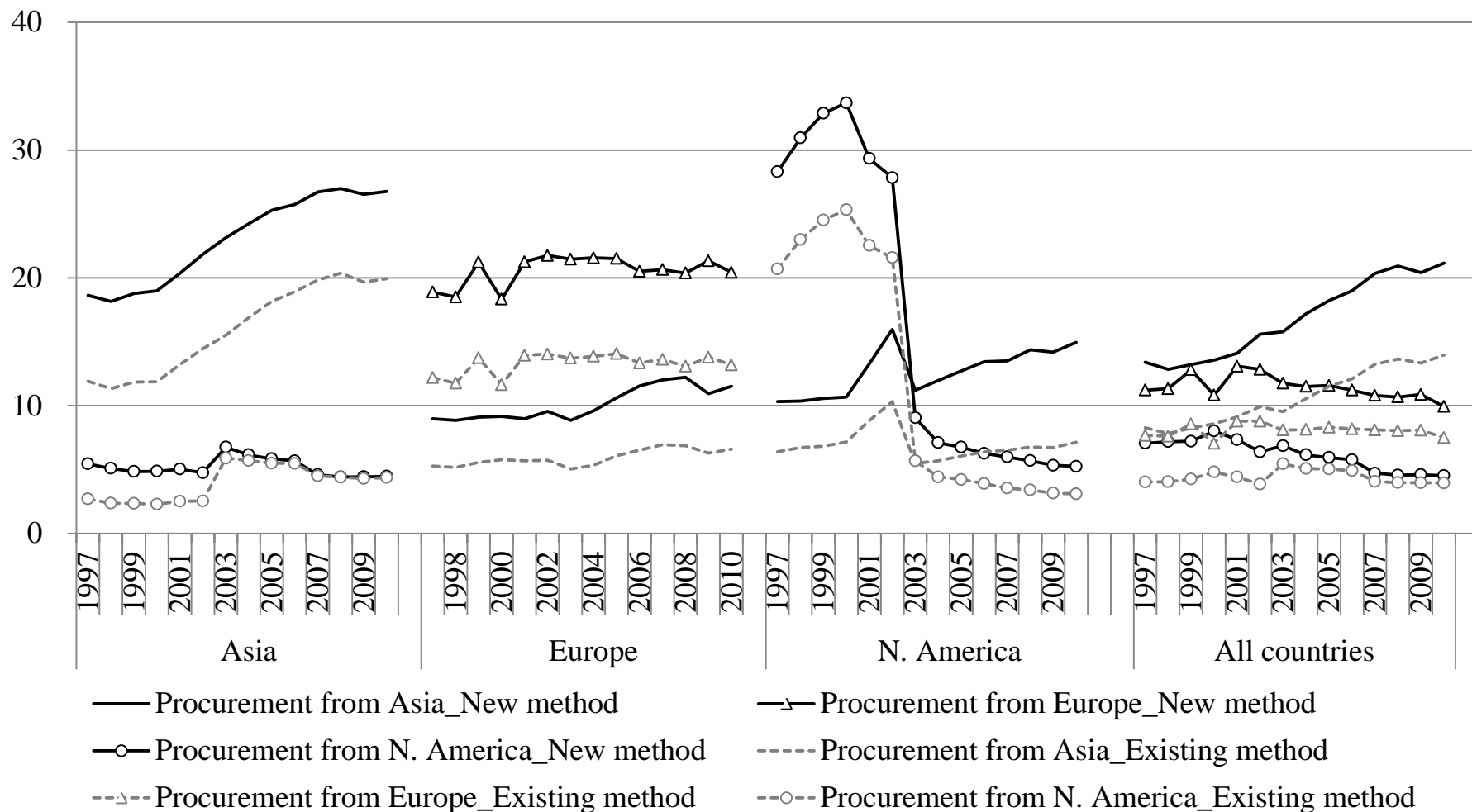
# Regional Contents in Export

## (Manufacturing, percent)



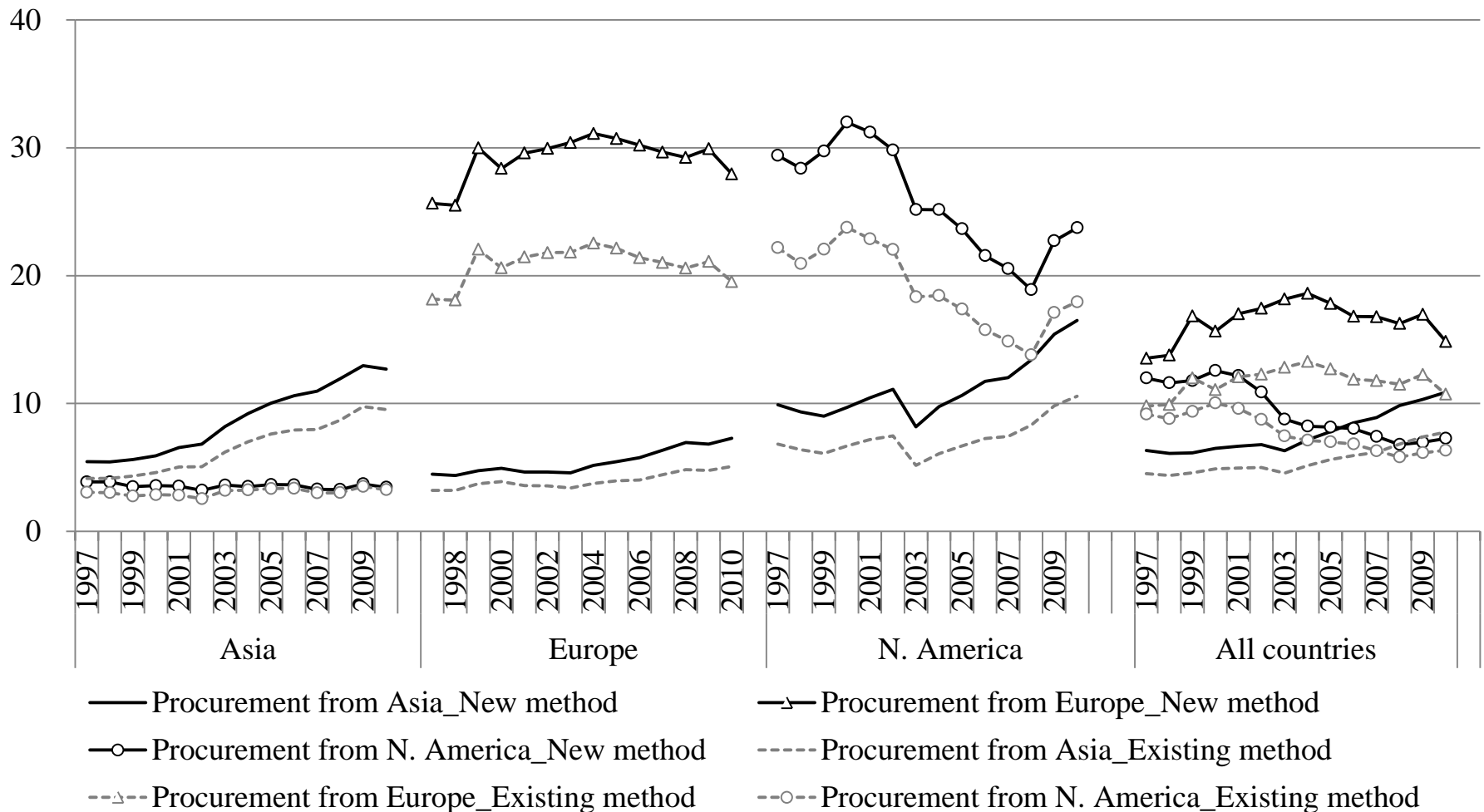
# Regional Contents in Export

## (Electric machinery, percent)



# Regional Contents in Export

## (Transport equipment, percent)





# Summary

- Asian contents in regional and global export has grown significantly
- Extent of economic integration in Asia and Europe
  - Results based on existing approach
    - **More or less same**
  - Results based on new approach
    - **Much more higher in Europe than in Asia**
- Regional integration in Electric machinery industry is higher in Asia, whereas Europe and North America shows higher level of economic integration in Transport equipment

# Results:

## Country-wide Global Chains

# Global Chains in Asia and Europe

(manufacturing, 2010, percent)

2010		Procured to									
Procurement from		Asia	JPN	CHN	KOR	TWN	MAL	THL	IDN	VTM	IND
	Domestic	69.6	85.1	70.9	64.5	45.5	37.6	54.5	87.8	46.2	85.3
	Foreign	30.4	14.9	29.1	35.5	54.5	62.4	45.5	12.2	53.8	14.7
	Asia	18.8	7.6	17.4	21.9	40.3	38.6	31.4	8.9	44.2	7.2
	China	3.4	4.0	0.0	8.9	12.6	11.2	9.3	2.6	17.2	3.5
	Europe	4.1	2.0	5.5	4.5	4.2	8.8	4.6	0.9	3.5	2.5
	N. America	3.6	2.5	3.2	4.9	5.9	11.5	4.6	1.1	3.0	1.7
	USA	3.2	2.2	2.7	4.4	5.5	11.0	4.2	0.9	2.6	1.5
	OPEC	0.9	0.8	0.8	1.1	2.3	0.7	1.0	0.3	1.0	1.4
	ROW	2.9	2.0	2.3	3.1	1.8	2.8	3.8	0.9	2.2	1.8

2010		Procured to												
Procurement from	Europe	FRA	GER	AUT	BEL	FIN	IRE	ITA	LUX	NLD	POR	SPN	UK	
	Domestic	61.5	65.7	68.6	53.7	42.3	57.0	35.9	67.7	48.7	53.5	52.1	56.3	63.7
	Foreign	38.5	34.3	31.4	46.3	57.7	43.0	64.1	32.3	51.3	46.5	47.9	43.7	36.3
	Asia	7.6	5.7	7.0	5.2	8.5	9.5	8.3	7.1	3.9	11.9	6.5	7.0	8.9
	China	3.2	2.5	3.0	2.1	3.0	4.5	3.6	3.5	1.3	4.5	2.2	3.2	3.4
	Europe	23.2	21.0	17.9	35.1	40.0	26.3	35.2	18.7	41.3	24.0	35.9	29.7	19.6
	N. America	4.3	4.8	3.4	2.7	5.6	3.7	16.3	2.6	3.1	5.5	2.0	3.1	5.2
	USA	3.9	4.3	3.0	2.4	4.9	3.3	15.6	2.3	2.8	4.9	1.6	2.6	4.5
	OPEC	0.5	0.5	0.3	0.3	0.6	0.2	0.2	0.8	0.3	0.6	0.6	1.0	0.3
	ROW	2.9	2.2	2.9	3.0	3.0	3.3	4.1	3.1	2.7	4.5	2.9	2.9	2.4

# Global Chains in Asia and Europe

## (electric machinery, 2010, percent)

2010		Procured to									
Procurement from		Asia	JPN	CHN	KOR	TWN	MAL	THL	IDN	VTM	IND
	Domestic	59.7	80.6	61.3	61.7	37.9	31.7	38.8	75.7	34.5	79.4
	Foreign	40.3	19.4	38.7	38.3	62.1	68.3	61.2	24.3	65.5	20.6
	Asia	26.8	11.9	24.2	26.1	49.2	40.7	45.9	19.3	53.0	11.5
	China	4.8	6.6	0.0	10.1	15.7	11.3	12.3	5.8	18.5	5.2
	Europe	5.4	2.3	7.6	4.1	4.1	10.5	5.3	2.0	5.0	3.2
	N. America	4.5	2.4	3.9	4.8	6.1	14.4	6.6	1.8	4.1	1.9
	USA	4.0	2.1	3.3	4.3	5.7	13.8	6.1	1.6	3.6	1.7
	OPEC	0.9	0.8	0.8	1.0	1.3	0.5	0.8	0.4	1.0	1.3
	ROW	2.8	2.0	2.3	2.4	1.4	2.3	2.6	0.9	2.4	2.6

2010		Procured to												
Procurement from		Europe	FRA	GER	AUT	BEL	FIN	IRE	ITA	LUX	NLD	POR	SPN	UK
	Domestic	60.8	67.7	71.1	57.5	50.2	50.1	37.2	57.9	61.5	52.6	39.9	51.8	58.9
	Foreign	39.2	32.3	28.9	42.5	49.8	49.9	62.8	42.1	38.5	47.4	60.1	48.2	41.1
	Asia	11.5	7.7	11.0	7.6	10.3	16.1	10.7	10.8	5.4	13.0	10.6	14.7	15.7
	China	5.2	3.6	5.1	3.2	4.8	7.6	4.7	5.9	2.0	5.7	4.9	7.2	6.1
	Europe	20.4	19.1	12.4	29.3	32.2	25.8	35.4	24.2	28.6	24.9	43.9	26.5	17.1
	N. America	4.4	3.1	3.0	2.6	4.5	4.8	13.6	3.3	2.6	5.7	2.6	3.5	6.1
	USA	4.0	2.8	2.8	2.2	3.9	4.4	12.7	3.0	2.4	5.2	2.2	3.0	5.3
	OPEC	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.7	0.2	0.4	0.6	0.8	0.3
	ROW	2.5	2.1	2.2	2.8	2.5	3.0	2.8	3.1	1.7	3.4	2.4	2.7	2.0

# Global Chains in Asia and Europe

(transport equipment, 2010, percent)

2010		Procured to									
Procurement from		Asia	JPN	CHN	KOR	TWN	MAL	THL	IDN	VTM	IND
	Domestic	76.8	88.0	77.2	65.3	57.6	47.2	48.1	82.5	35.2	80.9
	Foreign	23.2	12.0	22.8	34.7	42.4	52.8	51.9	17.5	64.8	19.1
	Asia	12.7	5.3	11.6	19.9	27.1	35.3	39.0	14.2	45.2	8.4
	China	3.8	2.6	0.0	8.1	8.3	9.0	6.4	1.9	16.6	4.1
	Europe	3.1	1.8	4.9	5.0	5.3	6.5	4.7	1.4	6.6	3.8
	N. America	3.4	2.6	2.9	5.1	5.7	6.7	3.2	0.9	8.2	2.9
	USA	3.0	2.3	2.4	4.5	5.2	6.2	2.8	0.8	7.6	2.6
	OPEC	0.9	0.7	0.9	1.0	2.6	1.0	0.9	0.2	1.5	1.4
	ROW	3.1	1.6	2.6	3.6	1.7	3.3	4.1	0.8	3.3	2.6

2010		Procured to												
Procurement from		Europe	FRA	GER	AUT	BEL	FIN	IRE	ITA	LUX	NLD	POR	SPN	UK
	Domestic	57.4	59.5	66.0	34.9	22.7	54.5	40.9	63.7	82.0	50.3	29.3	43.5	58.6
	Foreign	42.6	40.5	34.0	65.1	77.3	45.5	59.1	36.3	18.0	49.7	70.7	56.5	41.4
	Asia	7.3	6.5	5.8	6.1	13.7	7.1	13.5	8.0	1.0	11.2	7.3	7.6	9.5
	China	2.8	2.8	2.3	2.1	3.5	3.1	5.0	4.0	0.3	4.0	2.4	3.2	3.5
	Europe	28.0	23.7	21.9	53.0	56.5	30.8	30.1	21.5	15.0	29.9	58.4	42.7	23.5
	N. America	4.5	8.0	3.4	3.4	4.5	4.0	13.0	3.6	0.8	6.0	2.2	2.9	5.6
	USA	4.0	7.3	3.0	2.9	4.0	3.5	12.0	3.2	0.7	5.4	1.8	2.4	4.9
	OPEC	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.7	0.1	0.4	0.4	0.7	0.3
	ROW	2.5	2.0	2.7	2.3	2.3	3.4	2.3	2.6	1.1	2.3	2.4	2.6	2.5

# Summary

- Asian countries shows diverse economic structure compared to European countries
  - In particular, foreign contents in Japanese export is low compared to other countries

# Concluding remarks

- Asian contents in regional and global export has grown significantly
- Level of regional integration in Asia is lower than that in Europe
  - Existing approach shows more or less similar level
- There exist asymmetric economic structure in Asia both across countries and industries covered by the paper



**Asian economic and monetary integration in near future appears to be a challenging task**

# Future works

- Detailed country- and industry-specific analysis
- Estimation and use of more recent GIO
  - 2012 or 2011 tables, for example
- Inclusion of more Asian countries endogenously in the GIO table
  - For instance: Singapore and Philippines