



UNIVERSITÉ DE NANTES

Lemna

# Economic Integration in ASEAN+3: A network analysis

NGUYEN Thi Nguyet Anh, PHAM Thi Hong Hanh, VALLEE Thomas  
LEMNA, Institute of Economics and Management, University of Nantes

**8<sup>th</sup> FIW International Economics Conference**

Vienna, Austria

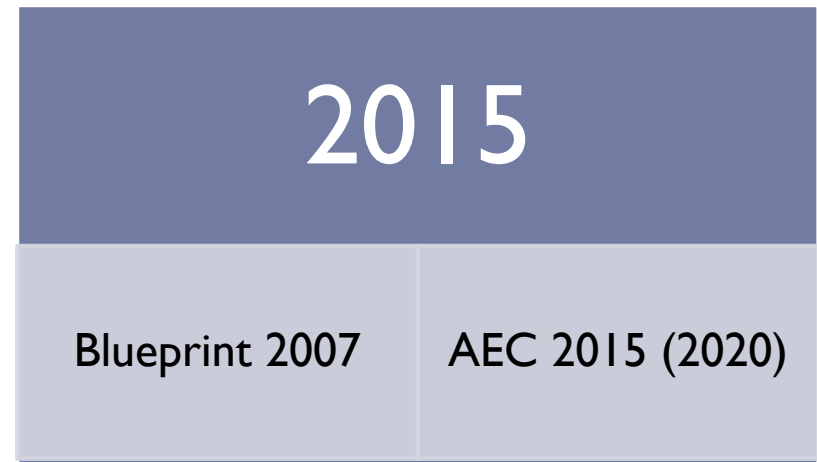
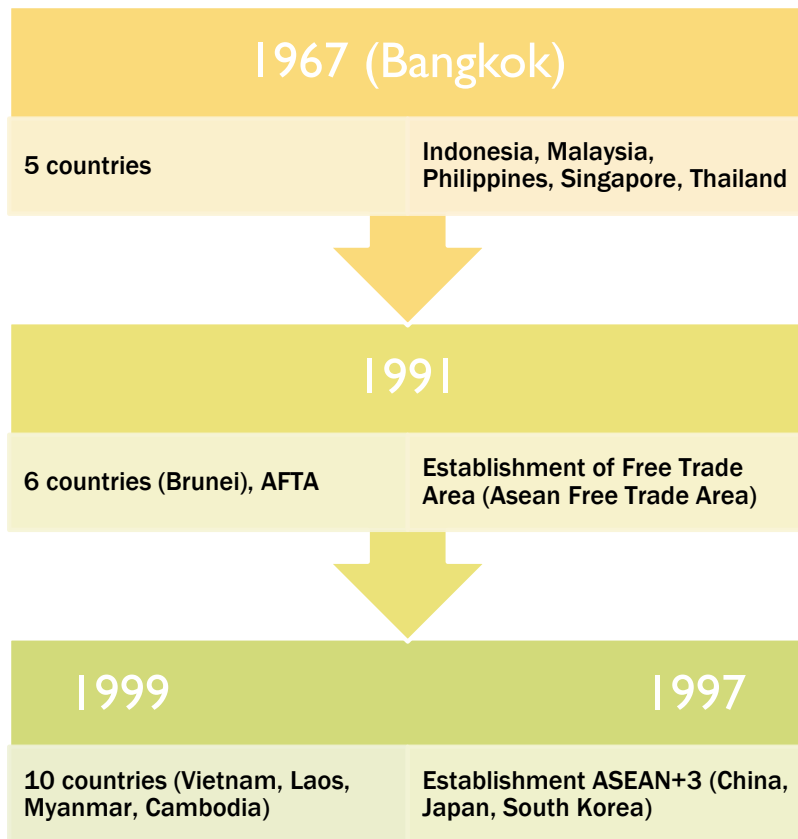
December 3, 2015

# Outline

---

- ▶ Context of research
- ▶ Objectives
- ▶ Network analysis in economic integration
- ▶ Methodological approach
- ▶ Results
- ▶ Conclusion

# Context of research



- 625 million people (8.8% world pop)
- GDP : US\$ 2.6 trillion (2015)
- 6.5% of global trade
- 11% of total FDI inflow of the world.
- ASEAN+3: trade growth 1.8% annually. 26.9% of world exports, 36.1% FDI inflows (2013)

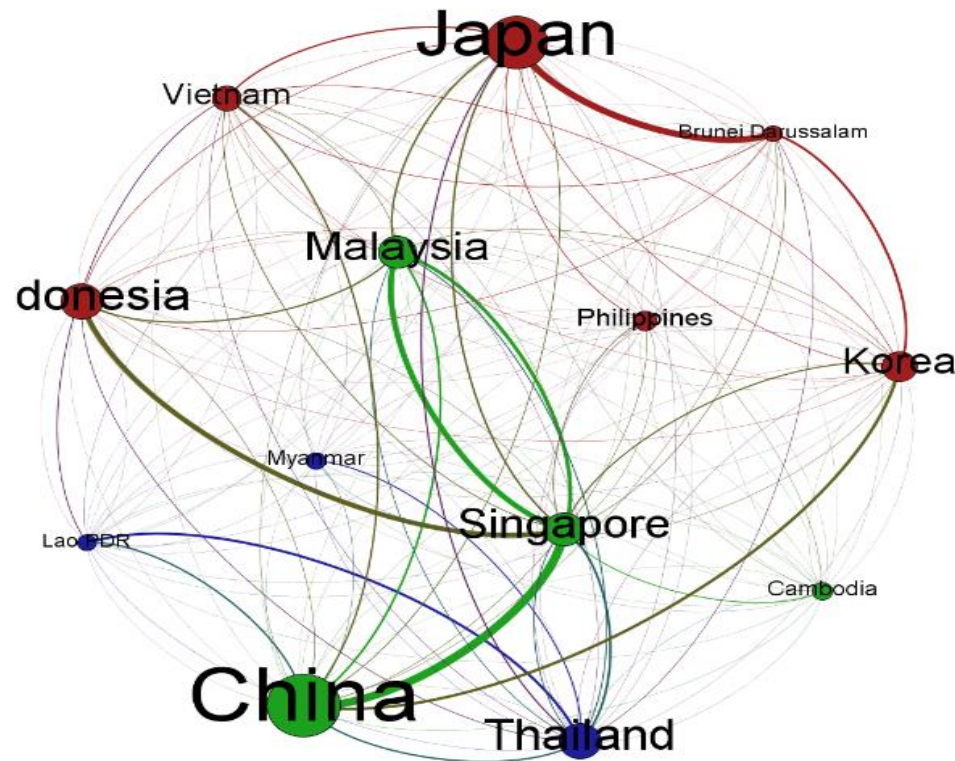
# Objectives

---

- ▶ Analyze the interdependence among ASEAN+3 countries through a series of network indicators;
- ▶ Address the question which country plays a central role in ASEAN+3 economic network;
- ▶ Investigate whether ASEAN and ASEAN+3 are complimentary or substitutionary.

# Network analysis in economic integration

- ▶ A network assembles of nodes and edges to analyze the relational data and measure the role of each node.



# Network analysis in economic integration

---

- ▶ Snyder & Kick (1979) provided strong evidence for a “core-semi-periphery-periphery” structure of international trade network.
- ▶ Kim & Shin (2002) Kastle et al. (2006) focused on the issue of globalization and regionalization for longitudinal data.
- ▶ Kali & Reyes (2007) mapped the topology of the international trade network and provided new network-based measures of international economic integration.
- ▶ Benedictis & Tajoli (2010) assessed the characteristics of international trade network.
- ▶ Fagiolo et al (2007) compared the degree and pattern of trade and financial integration.

# Methodological approach

---

- ▶ Intensity indices allow to investigate the tendency of countries belonging to the same region to trade relatively more between each other (intra-regional trade) than with the rest of the world (inter-regional trade) (Iapadre and Plummer, 2011).
- ▶ Network analysis' indicators is an useful approach to assess the relationship between countries in terms of both trade and FDI by using a broad set of centrality measures:
  - ▶ Degree centrality (\*)
  - ▶ Closeness centrality
  - ▶ Betweenness centrality
  - ▶ Eigenvector centrality(\*)

# Intensity Indices

---

- ▶ The goal is to assess possible hierarchical structures in the geography of international trade, such as core-periphery or hub-and-spoke patterns.
- ▶ Different indices are calculated :
  - ▶ **The Trade Intensity** which are measured by a comparison between actual bilateral trade and a properly defined benchmark.
  - ▶ **The Revealed Trade Preference Index** which is constructed from the homogeneous bilateral intensity index ( $HI_{ij}$ ) and the complementary extra-bilateral intensity index ( $HE_{ij}$ ).
  - ▶ **The Revealed Trade Leadership** Index allows one to determine the role (local supplier versus export hub) of each country member in a specific region.



# Results – Trade integration

Table 5: Trade intensity indices

Country	1990 - 1997				1998 - 2005				2006-2010				2011 - 2013			
	RIP	REP	RTL	TB	RIP	REP	RTL	TB	RIP	REP	RTL	TB	RIP	REP	RTL	TB
<b>ASEAN</b>																
Brunei Darussalam	-0.10	-0.22	-0.06	8.57	0.64	0.42	-0.11	25.13	0.89	0.57	-0.16	44.54	0.88	0.47	-0.21	48.32
Cambodia	-	-	-	-15.01	0.81	-0.15	-0.48	-10.21	0.81	0.17	-0.32	-5.88	0.67	0.35	-0.16	-6.39
Indonesia	0.25	0.46	0.11	1.02	0.67	0.54	-0.07	7.39	0.77	0.58	-0.09	0.34	0.71	0.61	-0.05	-0.72
Lao PDR	-	-	-	-13.74	-0.06	-0.15	-0.05	-10.84	0.95	0.85	-0.05	-8.55	0.93	0.83	-0.05	-2.98
Malaysia	0.61	0.75	0.07	-0.45	0.71	0.68	-0.02	20.37	0.71	0.68	-0.01	3.39	0.70	0.67	-0.01	12.42
Myanmar	-	-	-	-0.96	0.90	0.86	-0.02	-0.15	0.89	0.89	0.00	0.00	0.86	0.86	0.00	0.00
Philippines	0.35	0.42	0.04	-6.92	0.57	0.48	-0.04	-6.19	0.69	0.50	-0.09	-1.46	0.62	0.49	-0.07	-3.60
Singapore	0.64	0.74	0.05	13.59	0.75	0.73	-0.01	21.00	0.72	0.77	0.02	26.30	0.62	0.73	0.06	23.95
Thailand	0.43	0.61	0.09	-4.84	0.59	0.57	-0.01	7.60	0.61	0.63	0.01	6.48	0.52	0.65	0.07	2.99
Vietnam	-	-	-	-8.11	0.73	0.50	-0.12	-5.97	0.67	0.47	-0.10	-9.74	0.52	0.40	-0.06	1.15
<b>ASEAN+3</b>																
Brunei Darussalam	-0.17	-0.03	0.07	8.57	0.54	0.65	0.05	25.13	0.80	0.84	0.02	44.54	0.79	0.83	0.02	48.32
Cambodia	-	-	-	-15.01	0.70	-0.57	-0.64	-10.21	0.74	-0.43	-0.59	-5.88	0.60	-0.17	-0.38	-6.39
Indonesia	0.52	0.67	0.07	1.02	0.64	0.61	-0.02	7.39	0.69	0.60	-0.05	0.34	0.68	0.61	-0.03	-0.72
Lao PDR	-	-	-	-13.74	-0.10	-0.41	-0.16	-10.84	0.90	0.56	-0.17	-8.55	0.90	0.50	-0.20	-2.98
Malaysia	0.68	0.61	-0.04	-0.45	0.70	0.50	-0.10	20.37	0.67	0.53	-0.07	3.39	0.62	0.57	-0.02	12.42
Myanmar	-	-	-	-0.96	0.92	0.68	-0.12	-0.15	0.90	0.73	-0.08	0.00	0.90	0.79	-0.05	0.00
Philippines	0.53	0.38	-0.08	-6.92	0.62	0.43	-0.10	-6.19	0.61	0.50	-0.06	-1.46	0.55	0.56	0.00	-3.60
Singapore	0.65	0.48	-0.08	13.59	0.67	0.52	-0.07	21.00	0.60	0.58	-0.01	26.30	0.45	0.51	0.03	23.95
Thailand	0.66	0.49	-0.09	-4.84	0.68	0.47	-0.11	7.60	0.64	0.49	-0.08	6.48	0.57	0.50	-0.04	2.99
Vietnam	-	-	-	-8.11	0.77	0.50	-0.13	-5.97	0.76	0.37	-0.20	-9.74	0.73	0.36	-0.19	1.15
China	0.09	-0.06	-0.07	1.77	0.53	0.19	-0.17	3.07	0.36	-0.03	-0.19	6.48	0.15	-0.08	-0.11	2.62
Japan	0.34	0.20	-0.07	1.46	0.51	0.25	-0.13	1.49	0.46	0.35	-0.05	0.94	0.39	0.39	0.00	-1.91
Korea	0.50	0.38	-0.06	-1.20	0.56	0.38	-0.09	6.27	0.50	0.40	-0.05	1.95	0.35	0.44	0.04	3.12

Notes: RIP: Revealed import preference; REP: Revealed export preference; RTL: Revealed trade leadership; TB: Trade balance (% of GDP)

Source: Authors' creation

# Results – FDI integration

Table 8: FDI intensity indices

Country	Revealed inward stock preference		Revealed outward stock preference		Revealed FDI leadership	
	2001-2006	2007-2012	2001-2006	2007-2012	2001-2006	2007-2012
<b>ASEAN</b>						
Brunei Darussalam	-0.74	-0.65	0.94	0.93	0.84	0.79
Cambodia	0.90	0.81	-0.75	0.37	-0.82	-0.22
Indonesia	-1.00	0.17	0.16	0.89	0.58	0.36
Lao PDR	0.14	0.83	-0.14	0.79	-0.14	-0.02
Malaysia	-1.00	0.36	-1.00	0.61	0.00	0.15
Myanmar	0.79	0.78	0.00	0.00	-0.40	-0.39
Philippines	0.43	0.04	-1.00	-0.17	-0.72	-0.11
Singapore	-0.13	-0.28	0.88	0.31	0.51	0.55
Thailand	0.52	0.59	0.92	0.92	0.20	0.16
Vietnam	0.23	0.26	0.00	0.00	-0.11	-0.13
<b>ASEAN+3</b>						
Brunei Darussalam	-0.75	-0.52	0.73	0.69	0.74	0.60
Cambodia	0.93	0.95	-0.93	-0.35	-0.93	-0.65
Indonesia	-1.00	0.25	0.18	0.88	0.59	0.32
Lao PDR	0.49	0.98	-0.36	0.65	-0.42	-0.20
Malaysia	-1.00	0.32	-1.00	0.35	0.00	0.01
Myanmar	0.50	0.72	0.00	0.00	-0.25	-0.36
Philippines	0.96	0.93	-1.00	-0.30	-0.98	-0.62
Singapore	0.71	0.59	0.70	0.69	-0.01	0.05
Thailand	0.95	0.97	0.73	0.80	-0.11	-0.09
Vietnam	0.78	0.91	0.00	0.00	-0.39	-0.45
China	0.75	0.54	-0.62	-0.70	-0.69	-0.62
Japan	-0.23	0.16	0.06	0.09	0.15	-0.03
Korea	0.92	0.93	0.69	0.46	-0.12	-0.23

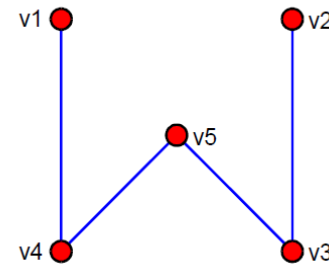
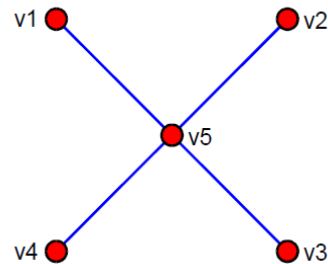
# Intensity Indices - Results

---

- ▶ In trade: After the implement of ASEAN+3, both intra-regional import and export preferences of most ASEAN countries have dropped due to the market share with large economies to the rest of the world.
  - ▶ Singapore, Thailand, Malaysia and Indonesia can be seen as intra-regional *local suppliers*.
  - ▶ Cambodia and Lao, have been considered as intra-regional *export hubs*.
  - ▶ China and Japan have been important intra-regional *export hub* but played a relevant role in supplying goods and service.
- ▶ In FDI: the dominant role of five ASEAN founding members as FDI local suppliers. ASEAN + 3 model has modified the position of some ASEAN countries in the regional FDI mapping.
  - ▶ Thailand has become a FDI destination in ASEAN+3
  - ▶ China - the main rivals of ASEAN countries in attracting intra-regional FDI → FDI hub in ASEAN+3

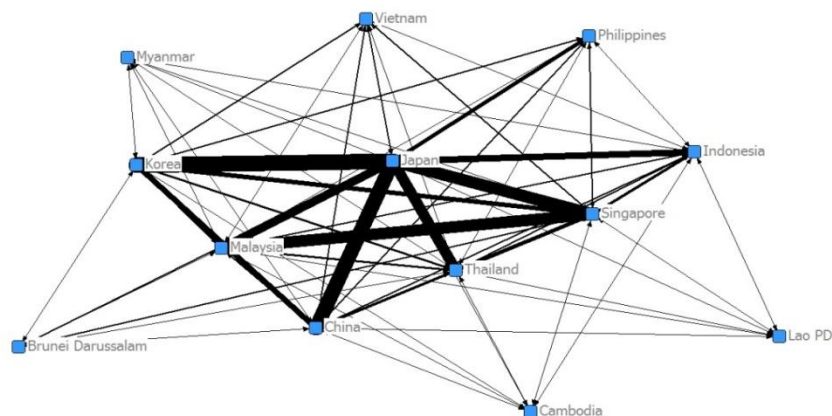
# Network analysis in trade/FDI

- ▶ Goal: Show trade relations as a network, in which countries act as nodes and link indicates the presence of an import /export relationship between the two countries.

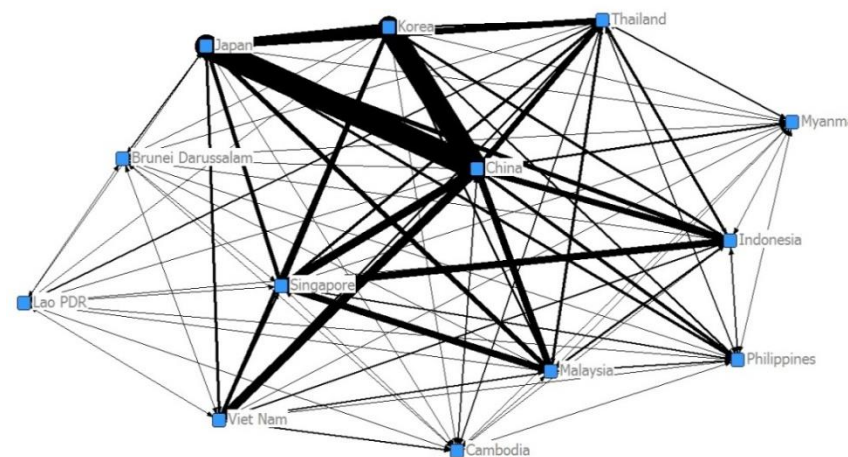


- ▶ Two main indicators:
  - ▶ Degree centrality measures of a node's position in a network by number of connections of each node (binary network) or their strength (weighted network), taking the node's degree divided by the maximum possible degree.
  - ▶ Eigenvector Centrality captures the influence of each country in network, measured by sum of the centralities of the neighbor's nodes multiplied by a normalization parameter.
    - ▶ “hub centrality” determines high “hub” score country → key exporter
    - ▶ “authority centrality” determines high “authority” score → key importer

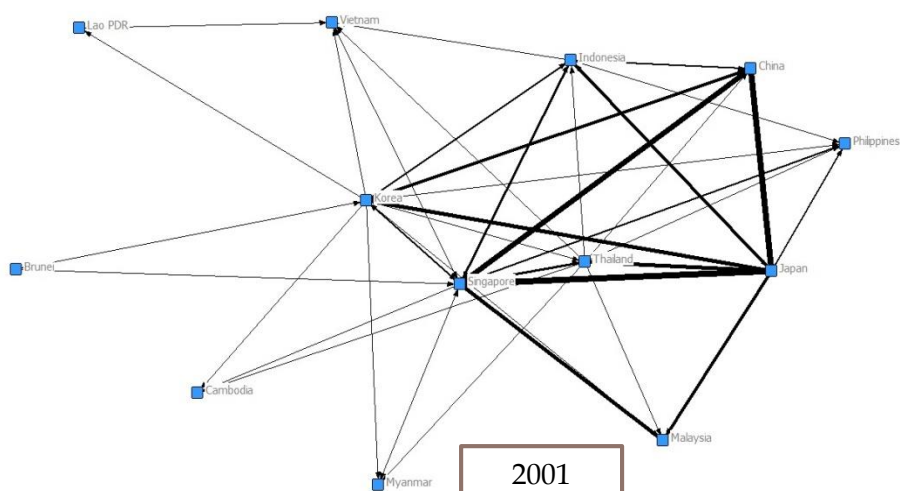
# Trade – FDI Network Evolution



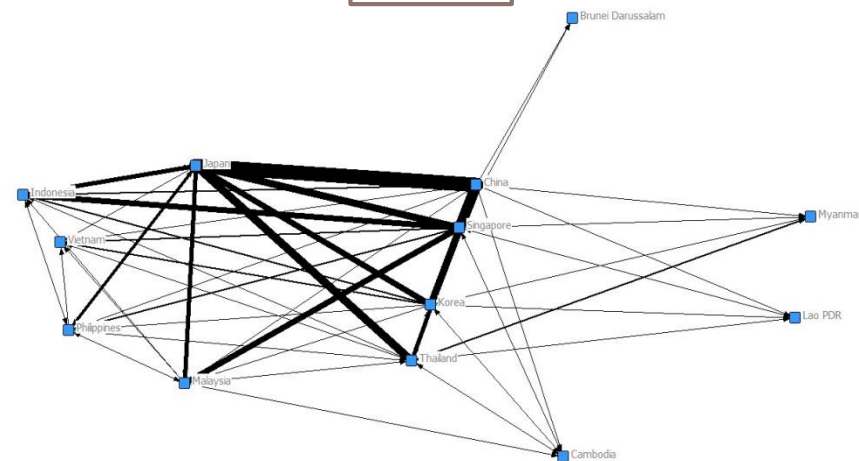
1995



2013



2001



2012





# Network analysis - Trade integration

Table 6a: Trade weighted degree centrality indices (Export values)

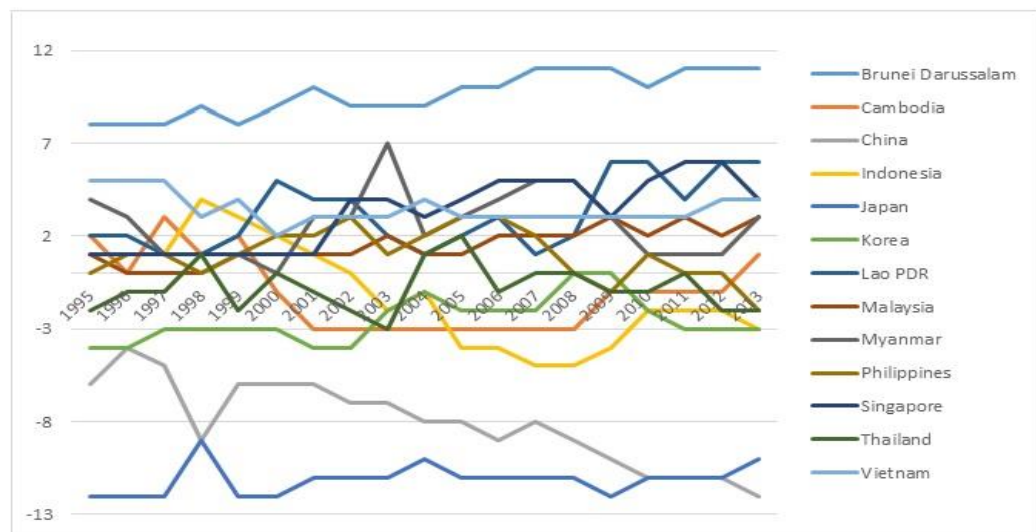
Country	1990-1997				2006-2010				2011-2013			
	n- Outdegree	Rank	n-Indegree	Rank	n- Outdegree	Rank	n- Indegree	Rank	n- Outdegree	Rank	n- Indegree	Rank
Brunei Darussalam	179.75	10	131.04	10	541.52	10	277.59	12	802.83	12	553.74	12
Cambodia	12.23	12	57.38	12	43.35	13	466.62	10	129.38	10	961.27	11
Indonesia	1,759.33	6	1,201.02	7	5,655.49	7	6,473.36	6	9,207.84	6	10,865.27	6
Lao PDR	6.82	13	25.54	13	56.83	12	172.42	13	191.26	13	424.94	13
Malaysia	2,181.13	5	2,679.15	4	7,284.98	5	8,174.90	5	10,391.51	5	11,490.16	5
Myanmar	44.87	11	116.82	11	329.12	11	460.41	11	588.65	11	1,158.32	10
Philippines	426.23	8	855.67	8	1,864.76	8	3,206.95	9	2,340.38	9	4,690.03	9
Singapore	3,158.96	2	3,849.24	2	13,431.71	3	9,941.89	4	17,065.32	4	12,806.40	4
Thailand	1,412.85	7	2,107.35	6	6,148.57	6	6,421.43	7	9,323.44	7	10,186.52	7
Vietnam	187.67	9	305.49	9	1,811.87	9	3,691.17	8	3,911.22	8	7,493.02	8
China	2,767.77	4	2,413.49	5	22,642.83	1	24,385.59	1	37,135.44	1	35,790.92	1
Japan	7,915.29	1	6,111.64	1	21,999.93	2	18,783.33	2	27,315.86	2	26,170.32	2
Korea	2,815.25	3	3,014.34	3	13,194.96	4	12,550.25	3	21,120.07	3	16,932.27	3

# Network analysis - Trade integration

Table 6b: Trade weighted degree centrality indices (Exports/GDP values)

Country	1990 - 1997				2006-2010				2011- 2013			
	n-Outdegree	Rank	n-Indegree	Rank	n-Outdegree	Rank	n-Indegree	Rank	n-Outdegree	Rank	n-Indegree	Rank
Brunei Darussalam	2.43	9	0.14	10	4.4	2	0.06	13	4.84	2	0.08	13
Cambodia	0.45	12	0.05	12	0.44	13	0.21	10	0.91	11	0.28	10
Indonesia	4.09	7	0.54	7	1.12	9	2.92	4	1.07	8	2.35	6
Lao PDR	0.27	13	0.02	13	1.01	10	0.06	12	1.93	6	0.1	12
Malaysia	15.64	4	2.13	4	3.52	3	2.6	6	3.43	3	2.37	5
Myanmar	0.81	11	0.09	11	1.36	6	0.11	11	0.96	9	0.16	11
Philippines	2.86	8	0.39	8	1.17	8	0.74	9	0.94	10	0.64	9
Singapore	22.07	2	2.8	2	7.06	1	2.62	5	5.97	1	2.34	7
Thailand	17.51	3	2.24	3	2.33	4	3.07	3	2.55	4	2.94	3
Vietnam	1.27	10	0.16	9	1.95	5	0.97	8	2.53	5	1.46	8
China	5.72	6	0.91	6	0.54	11	4.72	2	0.45	13	6.04	2
Japan	54.21	1	7.06	1	0.46	12	6.19	1	0.49	12	6.4	1
Korea	10.62	5	1.52	5	1.29	7	2.37	7	1.7	7	2.61	4

Figure 2: Evolution of the asymmetry in the rank of the weighted degree centrality indexes  
(Rank in Out-degree – Rank in In-degree)



# Network analysis - Trade integration

---

- ▶ With absolute export value, China, Japan and Korea are the most integrated country in the regional trade network by high ranking.
- ▶ China and Japan are main importers from the ASEAN+3 area, but they mainly export outside the ASEAN+3 → confirm *export hubs*.
- ▶ Singapore in the weighted network is opposite to the Chinese one, being an important exporter to the ASEAN+3 countries and a less central importer.
- ▶ Korea, which however tends to be out-ASEAN market oriented as China and Japan.
- ▶ Philippines, Malaysia, Vietnam and Brunei are the key exporters to the region
- ▶ Cambodia, Lao and Myanmar, have only played a peripheral in ASEAN+3 network with no clear positions.



# Network analysis - Trade integration

Table 7a: Trade eigenvector centrality indices (X Network)



Country	1990 - 1997							1998 - 2005						
	Eigenvec	nEigenvec	Rank	Hub	Rank	Authority	Rank	Eigenvec	nEigenvec	Rank	Hub	Rank	Authority	Rank
Brunei	0.03	4.32	10	0.02	9	0.01	10	0.02	2.28	10	0.01	12	0.01	13
Cambodia	0.00	0.63	12	0.00	12	0.00	12	0.01	0.71	12	0.00	13	0.01	12
Indonesia	0.21	29.92	7	0.20	6	0.18	7	0.17	24.29	6	0.21	6	0.17	7
Lao PDR	0.00	0.23	13	0.00	13	0.00	13	0.00	0.43	13	0.03	11	0.02	11
Malaysia	0.28	39.45	5	0.24	5	0.32	5	0.22	30.79	5	0.26	4	0.27	5
Myanmar	0.01	1.31	11	0.00	11	0.01	11	0.01	1.44	11	0.05	9	0.06	10
Philippines	0.09	12.96	8	0.04	8	0.12	8	0.11	15.72	8	0.06	8	0.11	8
Singapore	0.38	53.99	3	0.26	4	0.46	2	0.28	40.20	4	0.24	5	0.29	4
Thailand	0.24	34.41	6	0.14	7	0.31	6	0.17	23.63	7	0.13	7	0.17	6
Vietnam	0.03	4.59	9	0.02	10	0.03	9	0.05	7.75	9	0.04	10	0.07	9
China	0.33	47.06	4	0.28	2	0.35	4	0.52	72.96	2	0.49	2	0.52	1
Japan	0.63	88.44	1	0.81	1	0.39	3	0.59	82.76	1	0.59	1	0.46	2
Korea	0.39	55.53	2	0.27	3	0.50	1	0.43	60.47	3	0.33	3	0.40	3
Country	2006 - 2010							2010 - 2013						
	Eigenvec	nEigenvec	Rank	Hub	Rank	Authority	Rank	Eigenvec	nEigenvec	Rank	Hub	Rank	Authority	Rank
Brunei	0.02	2.61	10	0.01	10	0.01	12	0.02	3.10	10	0.01	10	0.01	12
Cambodia	0.01	0.99	12	0.00	13	0.01	11	0.01	1.67	12	0.00	13	0.01	11
Indonesia	0.17	24.36	6	0.14	6	0.15	7	0.19	27.48	5	0.17	6	0.19	7
Lao PDR	0.00	0.32	13	0.00	12	0.00	13	0.00	0.69	13	0.00	12	0.00	13
Malaysia	0.18	25.39	5	0.17	5	0.19	5	0.19	27.19	6	0.18	5	0.19	6
Myanmar	0.01	1.51	11	0.01	11	0.01	10	0.02	2.76	11	0.01	11	0.02	10
Philippines	0.07	10.56	9	0.05	8	0.08	9	0.08	11.43	9	0.05	9	0.09	9
Singapore	0.26	36.68	4	0.27	4	0.23	4	0.24	34.26	4	0.26	4	0.22	4
Thailand	0.16	22.16	7	0.14	7	0.17	6	0.18	24.84	7	0.15	7	0.19	5
Vietnam	0.09	12.70	8	0.04	9	0.09	8	0.14	20.04	8	0.07	8	0.15	8
China	0.59	83.19	1	0.45	2	0.73	1	0.60	85.05	1	0.53	2	0.69	1
Japan	0.54	76.59	2	0.67	1	0.40	2	0.50	70.95	2	0.56	1	0.46	2
Korea	0.44	62.21	3	0.45	3	0.38	3	0.44	62.21	3	0.49	3	0.35	3

# FDI Integration

**Table 9: FDI degree centrality indices**

Country	Weighted Degree Centrality (Stock of FDI)							
	2001-2006				2007-2012			
	n-Outdegree	Rank	n-Indegree	Rank	n-Outdegree	Rank	n-Indegree	Rank
Brunei	17.39	7	3.68	13	19.52	9	13.54	13
Cambodia	0.15	11	23.27	11	2.01	12	261.55	11
Indonesia	181.19	4	1266.64	2	328.76	7	4116.99	3
Lao PDR	0.36	10	8.07	12	1.00	13	143.39	12
Malaysia	0.00	12	1191.95	3	3126.89	4	2892.48	5
Myanmar	0.53	9	96.50	10	4.45	10	433.70	10
Philippines	0.00	13	481.83	7	98.87	8	1196.41	8
Singapore	3337.14	2	1141.83	5	10495.34	2	4693.19	2
Thailand	175.42	5	1186.56	4	1053.78	6	3852.11	4
Vietnam	1.14	8	205.56	8	3.41	11	1299.64	7
China	162.38	6	3613.58	1	1368.02	5	12675.47	1
Japan	5068.11	1	178.50	9	13955.27	1	1001.82	9
Korea	1265.52	3	756.95	6	4315.83	3	1638.77	6

Country	Weighted Degree Centrality (Stock of FDI / GDP)							
	2001-2006				2007-2012			
	n-Outdegree	Rank	n-Indegree	Rank	n-Outdegree	Rank	n-Indegree	Rank
Brunei	0.0285	2	0.0002	12	0.0170	6	0.0007	13
Cambodia	0.0002	10	0.0017	11	0.0020	10	0.0043	11
Indonesia	0.0093	6	0.0628	3	0.0063	7	0.1425	2
Lao PDR	0.0010	7	0.0002	13	0.0018	11	0.0027	12
Malaysia	0.0000	11	0.0810	2	0.1218	2	0.1000	4
Myanmar	0.0003	9	0.0088	10	0.0018	12	0.0132	10
Philippines	0.0000	12	0.0190	6	0.0037	8	0.0215	8
Singapore	0.3530	1	0.0393	5	0.5492	1	0.1025	3
Thailand	0.0128	5	0.0397	4	0.0395	4	0.0850	5
Vietnam	0.0000	13	0.0125	8	0.0000	13	0.0248	7
China	0.0007	8	0.1447	1	0.0027	9	0.2765	1
Japan	0.0140	4	0.0123	9	0.0310	5	0.0373	6
Korea	0.0198	3	0.0175	7	0.0467	3	0.0135	9

# FDI Integration

Table 10a: FDI eigenvector centrality indices in the weighted Networks (FDI)

Country			2001-2006						2007-2012			
	nEigenvec	Rank	Hub	Rank	Authority	Rank	nEigenvec	Rank	Hub	Rank	Authority	Rank
Brunei Darussalam	0.400	11	0.002	7	0.001	13	0.164	13	0.001	9	0.001	13
Cambodia	0.411	12	0.000	10	0.003	11	1.225	11	0.000	13	0.005	11
Indonesia	30.024	5	0.042	5	0.295	4	24.738	6	0.022	6	0.236	3
Lao PDR	0.134	13	0.000	10	0.001	12	0.792	12	0.000	12	0.002	12
Malaysia	26.871	7	0.000	10	0.277	5	23.027	7	0.058	4	0.210	5
Myanmar	1.603	10	0.000	9	0.012	10	2.552	10	0.000	10	0.016	10
Philippines	10.958	8	0.000	10	0.120	7	8.473	8	0.002	8	0.091	7
Singapore	67.351	3	0.524	2	0.310	2	65.905	3	0.577	2	0.220	4
Thailand	27.830	6	0.017	4	0.306	3	29.541	5	0.032	5	0.304	2
Vietnam	3.150	9	0.000	8	0.024	9	6.521	9	0.000	11	0.059	8
China	72.186	2	0.006	6	0.760	1	80.112	1	0.022	7	0.849	1
Japan	79.308	1	0.812	1	0.027	8	76.075	2	0.758	1	0.047	9
Korea	37.144	4	0.250	3	0.207	6	35.700	4	0.289	3	0.140	6

Table 10b: FDI eigenvector centrality indices in the weighted Networks (FDI/GDP)

Country			2001-2006						2007-2012			
	nEigenvec	Rank	Hub	Rank	Authority	Rank	nEigenvec	Rank	Hub	Rank	Authority	Rank
Brunei Darussalam	17.1327	6	0.0003	8	0.0023	11	5.9227	9	0.0015	9	0.0022	13
Cambodia	0.7010	12	0.0002	9	0.0072	10	0.7415	12	0.0010	11	0.0040	11
Indonesia	36.5607	4	0.0253	4	0.3545	3	39.2337	4	0.0103	6	0.3623	2
Lao PDR	0.2617	13	0.0005	6	0.0022	12	0.6235	13	0.0020	7	0.0028	12
Malaysia	46.6070	3	0.0000	10	0.4867	2	40.0742	3	0.0832	3	0.3408	3
Myanmar	3.8705	11	0.0000	12	0.0368	9	3.6512	11	0.0003	12	0.0363	9
Philippines	10.0818	8	0.0000	11	0.1035	5	6.1740	8	0.0015	8	0.0610	6
Singapore	98.7752	1	0.9972	1	0.0020	13	96.9638	1	0.9893	1	0.0232	10
Thailand	22.7742	5	0.0162	5	0.2210	4	26.7727	5	0.0332	5	0.2447	4
Vietnam	5.1215	10	0.0000	13	0.0495	8	4.6872	10	0.0000	13	0.0393	7
China	73.2335	2	0.0005	7	0.7437	1	78.7878	2	0.0010	10	0.8152	1
Japan	9.4148	9	0.0298	3	0.0685	7	15.0883	6	0.0472	4	0.1140	5
Korea	15.3870	7	0.0635	2	0.0977	6	12.3627	7	0.0930	2	0.0387	8

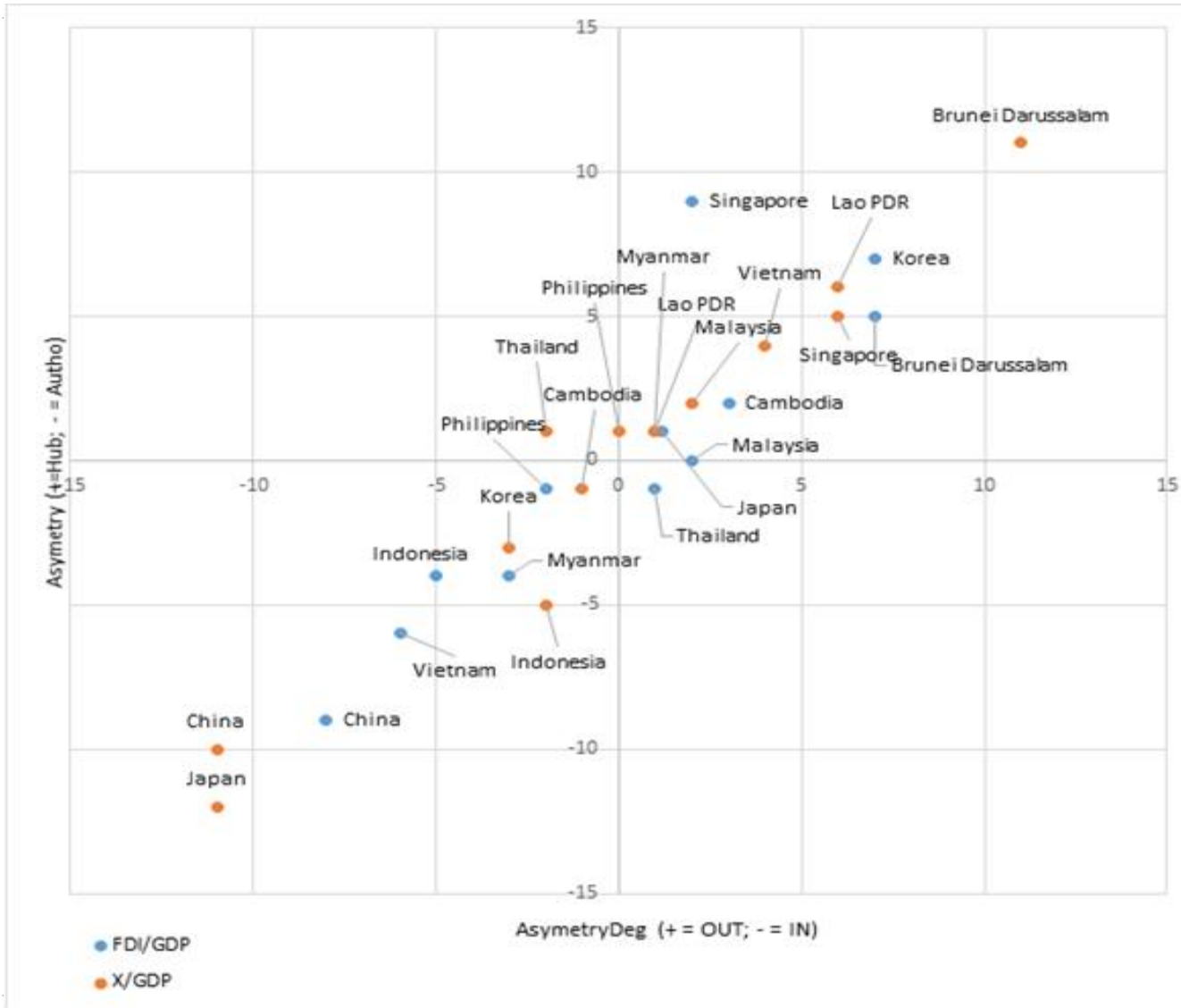


# Network analysis - FDI

---

- ▶ In terms of inward FDI, China has maintained the first rank throughout the observation period (rank 1<sup>st</sup> authority)
- ▶ Japan and Singapore plays a central role in supplying FDI flows to ASEAN+3 network (first hubs)
- ▶ Singapore is the more connected when taking in account the country size.
- ▶ Developing countries are only considered as relatively peripheral countries (such as Cambodia, Lao PDR, Myanmar) with such a small eigenvector centrality index.

# Trade – FDI Network



# Conclusion

---

- ▶ Findings:
  - ▶ The level of trade and FDI integration varies among ASEAN+3 member states over the observation period.
  - ▶ ASEAN+3's intra-regional trade network is more densely connected than its intra-regional FDI network.
  - ▶ Large and/or advanced countries tend to be better linked and to form a sub-regional bloc of tightly connected economies.
  - ▶ ASEAN+3 does not complement, but is gradually substituting ASEAN in terms of economic integration, only in favor of founding ASEAN countries and three new comer countries.

# Conclusion

---

## ► Contribution:

- First to perform the detailed network analysis on trade integration in ASEAN+3;
- Extend the network approach to the investment connection by capturing the FDI flows among ASEAN+3;
- Suggestion for policy implications in ASEAN+3 economic cooperation

## ► Policy applications:

- Revisit the existing intra-regional trade and investment agreements in order to restructure trade and FDI connections among country members;
- Developing countries should be facilitated to connect to central ones and use them as hubs to link with the rest of ASEAN+3 network.

## Corresponding author:

NGUYEN Thi Nguyet Anh

LEMNA, Institute of Economics and Management, University of Nantes

Chemin de la Censive du Tertre, BP 52231, 44322 Nantes Cedex 3, France

Email: [thi-nguyet-anh.nguyen@univ-nantes.fr](mailto:thi-nguyet-anh.nguyen@univ-nantes.fr)

Tel: +33 750 99 23 79

# THANK YOU FOR YOUR ATTENTION!