

INTERNATIONAL PRODUCTION NETWORKS IN AUTO INDUSTRY IN THE 21ST CENTURY. THE CASE OF ASEAN

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Abstract

International production networks used to be recognized as a product of East Asian economic integration centred around Association of Southeast Asian Nations (ASEAN) since the 90s. Vertical specialization and intra-industry trade involve ASEAN member states as contract manufacturers of parts and components as well as assembly bases, attracting numerous resource-seeking investors from higher cost locations such as Japanese multinational enterprises (MNEs).

Auto industry is a perfect example of fragmentation of value chains and process-based vertical division of labour among East Asian economies, inducing intensive back-and-forth transactions in auto parts and components, as well as automobiles.

Authors selected sixty five six-digit HS codes classified into fifteen groups to study bilateral flows among several ASEAN economies and Japan and to identify major dominant inputs traded in the production networks in years 2001-2016. This, in turn, enabled to analyze trends in regards of specialization of individual ASEAN economies in auto industry.

The main objective of the paper is to examine the phenomenon of international production networks on the example of auto industry in ASEAN. Authors study the structure of bilateral intra-industry trade among economies of Southeast Asia and Japan in the 21st century, conducting statistical analysis based on Comtrade data.

Key words: international production networks, auto industry, ASEAN

JEL Code: F14, F15, F23

Introduction

International production networks characterize contemporary division of labor in East Asia, centred around Association of Southeast Asian Nations (ASEAN). Four member states of ASEAN, namely, Thailand, Indonesia, Malaysia and Philippines, proved to be heavily engaged in production networks established by the Japanese resource-seeking multinational

enterprises (MNEs), enhanced by unilateral liberalization, development of hard and soft infrastructure, including logistics services in emerging Asia (Bobowski 2017, 31-61; Bobowski 2017a, 143-152).

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Authors selected sixty five six-digit HS codes classified into fifteen groups to study bilateral flows among several ASEAN economies and Japan as well as to identify dominant inputs traded in the production networks in years 2001-2016. This, in turn, enabled to analyze trends in regards of specialization of individual ASEAN economies in auto industry.

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1 Theoretical frameworks

International production networks are relatively novel phenomena in the global economy, therefore, cannot be effectively addressed by classic, neoclassic or contemporary trade theories, e.g. Ricardian, Heckscher-Ohlin theorems or intra-industry trade model with horizontal product differentiation by Helpman and Krugman. To date, they're studied, among others, by Dicken (2003), Athukorala (2006, 1-27; 2009, 234-266), Hiratsuka (2011), Kimura and Obashi (2011).

International production networks in East Asia, a region that embraces ten members of Association of Southeast Asian Nations (ASEAN), China, Japan, Republic of Korea, India, Australia and New Zealand, are characterized by fragmentation of production, vertical specialization, open-ended process-based division of labor, sophisticated system of intra-firm and arm's length transactions, including back-and-forth transactions.

Fragmentation theory was developed by Jones and Kierzkowski (1990), recognizing flexibility of business' decision making in cutting out production blocks. Kimura and Ando (2005, 317–348) established a concept of two-dimensional fragmentation to capture a sophisticated nature of international production networks in East Asia in regards of geographical distance and disintegration.

Machinery industries, including autos, are pretty well suited to the fragmentation and production networking due to large number of parts and components, that may be manufactured using diversified technologies and skills.

The pattern of international division of labor inside international production networks in auto industry is an important and interesting field of study. The statistical picture consists of analysis of bilateral flows in selected pairs of countries, as well as identification of dominant tariff codes and vertical specialization. Similar analysis were made, for instance, for HDD industry by Cheewatrakoolpong, Sabhasri and Bunditwattanawong (2013).

2 Statistical analysis

For the purposes of statistical analysis, authors selected sixty five six-digit HS codes classified into 15 groups to study bilateral flows among four ASEAN member states (Indonesia, Malaysia, Philippines and Thailand) and Japan¹. In the second part of analysis, authors identified major dominant inputs traded in the production networks in years 2001-2016 to point at specialization of individual economies in auto industry.

A key pair in statistical analysis is Thailand-Japan, therefore, main production base / assembly centre on the one side, and major player in international production networks in East Asia on the other (Tab. 1). THA-JPN trade flows were the largest among seven pairs, with upward trend in years 2001-2013 from 1.71 to 8.38 billion USD in imports from Japan and 433.72 to 2,283.2 million USD in exports to Japan. In 2016, however, both imports and exports declined in absolute terms to 5.05 and 1.99 billion USD, respectively. Thailand recorded a surplus in bilateral flows with Japan in 2016 in five groups of codes: rubber, glass, metal, electric and vehicle bodies.

Contrary to previous pair, Thailand recorded a surplus in trade with Indonesia in the period 2001-2016, with upward tendency till 2013 (from 62.41 to 1,229.33 million USD in imports and 116.75 to 2,836.37 million USD in exports). In 2016 imports and exports decreased to 1,015.77 and 1,917.8 million USD, respectively. The only deficit groups of codes in pair THA-IND in 2016 were transmissions and seats, however, the latter played a marginal role in absolute terms. Interestingly, in 2016 there were three groups of codes with comparably high import and export values, namely, engine parts, machinery and electric.

¹ Selection of countries was based on studies by Tsukamoto (2006) and Hiratsuka (2011).

Tab. 1: Bilateral trade flows in the auto industry, international production network in ASEAN, 2001, 2004, 2007, 2010, 2013, 2016 (million USD)

	I, II, III	IV, V, VI	VII	VIII, IX, X, XI, XIII, XIV	XII, XV	I, II, III	IV, V, VI	VII	VIII, IX, X, XI, XIII, XIV	XII, XV
	Thailand – Japan (THA-JPN)					Thailand – Indonesia (THA-IND)				
Im01	23.5	627.51	38.88	195.54	823.9	5.44	4.87	19.87	4.54	27.68
Ex01	62.67	55.19	82.13	149.78	83.94	2.92	65.18	11.21	17.16	20.28
Im04	49.85	1,085.39	84.19	673.49	1,393.19	15.79	40.77	17.1	86.18	71.51
Ex04	133.82	96.65	188.67	211.1	163.2	11.46	156.54	29.75	378.55	119.74
Im07	58.27	1,534.28	112.91	815.87	1,255.54	41.5	128.46	30	42.31	131.74
Ex07	201.67	385.6	310.1	246.66	278.66	38.86	251.84	59.71	434.85	381.37
Im10	90.57	2,466.05	216.4	1,818.21	1,761.45	41.43	216.35	42.24	333.31	110.05
Ex10	195.93	388.43	396.48	560.9	281.74	70.77	425.72	100.6	983.15	485.34
Im13	135.69	3,276.14	211.85	2,220.59	2,531.91	56.87	300.91	55.18	679.22	137.15
Ex13	290.86	484.31	462.35	655.63	390.04	122.88	562.7	156.92	1,280.21	713.66
Im16	87.84	1,981.42	173.79	1,780.56	1,029.88	37.74	277.97	84.82	443.3	171.95
Ex16	262.07	401.55	483.33	459.14	391.47	74	550.57	86.88	769.22	437.12
	Thailand – Malaysia (THA-MAL)					Thailand – Philippines (THA-PHI)				
Im01	1.4	13.51	10.04	1.77	19.31	1.28	0.9	2.17	45.5	58.34
Ex01	19.41	21.65	13.78	19.42	41.16	9.78	11.48	5.16	6.92	18.01
Im04	6.89	13.19	23.66	12.26	49.65	6.65	12.4	7.07	193.39	127.49
Ex04	43.78	89.79	32.85	87.37	157.02	17.06	50.72	7.54	151.09	27.39
Im07	25.11	12.67	31.31	15.22	57.82	10.31	29.13	9.01	140.89	129.23
Ex07	83.66	166.12	69.14	243	327.93	29.25	130.39	20.25	358.58	89.13
Im10	24.74	11.03	43.76	81.4	52.24	1.59	43.5	16.5	376.78	104.5
Ex10	160.76	263.35	87.37	491.58	447.14	68.72	150.38	26.51	723.05	143.14
Im13	35.5	22.18	70.44	198.71	77.75	3.97	34.2	93.51	282.71	69.69
Ex13	256.06	368.17	119.79	436.03	676.97	85.46	125.89	32.74	736.25	128.49
Im16	26.57	20.21	59.53	178.51	30.82	2.39	30.13	101.14	198.03	43.88
Ex16	223.95	242.93	131.79	269.52	541.21	68	139.6	53.46	1,774.75	162.26
	Indonesia – Malaysia (IND-MAL)					Indonesia – Philippines (IND-PHI)				
Im01	0.37	0.96	1.88	0.99	9.84	0.02	5.61	0.22	0.45	5.83
Ex01	4.79	13.7	20.52	8.67	31.16	9.21	5.57	4.56	1.7	39.6
Im04	1.53	6.24	3.74	3.26	8.02	1.01	23.43	0.82	23.29	12.62
Ex04	16.42	11.25	14.31	33.63	61.45	19.29	15.48	5.3	8.96	40.72
Im07	0.87	38.52	6.68	24.77	24.36	0.78	27.4	4.51	18.39	11.71
Ex07	34.47	62.25	36.62	97.29	51.63	15.99	38.52	8.61	89.91	31.66

The 12th International Days of Statistics and Economics, Prague, September 6-8, 2018

Im10	3.05	37.38	27.09	25.79	76.92	2.15	60.19	4.68	12.73	35.5
Ex10	69.8	61.08	43.3	161.97	83.29	51.07	62.94	14.54	158.95	49
Im13	7.36	43.74	39.37	78.02	58.96	1.6	28.46	10.31	61.12	25.57
Ex13	93.44	59.6	59.14	189.53	79.46	58	55.13	13.05	393.99	58.75
Im16	8.33	16.38	25.57	23.92	37.23	1.04	6.88	12.64	35.61	40
Ex16	68.51	58.3	54.37	237.98	137.66	70.36	107.54	18.83	1,123.79	49.82
	Malaysia – Philippines (MAL-PHI)					Groups of codes				
Im01	1.26	1.66	1.3	0.35	14.08	I Rubber (401110, 401120, 401220, 401290, 401310), II Glass (700711, 700721, 700910), III Metal (830120, 830230) IV Engines (840731, 840732, 840733, 840734, 840790, 840820), V Engine parts (840991, 840999, 841330, 842123, 842131, 842542), VI Machinery (848310, 848320, 848330, 848340, 848350, 848360, 848390) VII Electric (850710, 850720, 850730, 850740, 850780, 851220, 851230, 851240, 851290, 851829, 852721, 852729, 853921, 853929, 854430) VIII Chassis fitted (870600), IX Vehicle bodies (870710), X Vehicle parts (870810, 870821, 870829), XI Transmissions (870840), XII Vehicles (870850, 870870, 870880, 870891, 870892, 870893, 870894, 870899), XIII Clocks (910400), XIV Seats (940120, 940190), XV Automobiles (870321, 870322, 870323, 870324, 870331, 870332, 870333, 870390)				
Ex01	0.32	1.33	3.38	0.85	6.16					
Im04	6.39	5.92	6.23	1.28	23.77					
Ex04	1.92	4.45	2.89	0.92	5.31					
Im07	10.59	18.85	17.3	2.26	18.66					
Ex07	1.97	10.25	7.37	3.82	4.93					
Im10	13.92	16.31	24.5	20.15	3.6					
Ex10	12.79	7.27	8.08	3.3	11.52					
Im13	14.25	9.32	26.92	12.4	3.04					
Ex13	8.39	4.96	7.73	2.45	7.34					
Im16	4.62	2.3	83.76	9.67	7.81					
Ex16	6.83	29.09	5.16	2.67	14.78					

Source: own calculations based on: UN Comtrade Database (2018).

Bilateral flows between Thailand and Malaysia increased in years 2001-2013 from 46.02 to 404.58 million USD in imports and 115.41 to 1,857.03 million USD in exports, respectively, with slight decline in 2016 – to 315.64 million USD in imports and 1,409.4 million USD in exports. Thailand recorded a surplus in each single year, except for three groups of codes, namely, seats, automobiles and clocks. Interestingly, in 2016 imports of clocks from Malaysia accounted for 49.42 percent of total imports in fifteen groups of codes to Thailand (156 of 315.64 million USD).

In the fourth pair, Thailand recorded a deficit in bilateral trade with Philippines in 2001 and 2004, however, in years 2007-2016 it turned into surplus of Thailand, with rising tendency in case of exports and imports, however, in case of the latter, with decline in years 2013 and 2016. In 2016 Thailand had a deficit in bilateral flows within four groups of codes, namely, machinery, seats, electric and transmissions. The latter two, when combined, accounted for 79.23 percent of total imports in fifteen groups of codes to Thailand (297.54 of 375.56 million USD).

Indonesia recorded a surplus in trade with Malaysia in years 2001-2016, however, upward trend was reversed in the side of imports from Malaysia in 2016. Noteworthy, there was a group of codes with no exports from Indonesia to Malaysia in 2016 (vehicle bodies), however, with small volume of imports from Malaysia (0.01 million USD), whereas in case of engine parts and machinery bilateral flows were balanced (with both exports and imports amounting to, approximately, 10 and 6 million USD, respectively).

Indonesia maintained a surplus in bilateral trade with Philippines in the studied period, with similar trends observed as in case of IND-MAL pair, except for engine parts, transmissions, seats and vehicle bodies. Furthermore, in case of the latter group of codes trade volume amounted to less than 1,000 USD, imports of seats from Philippines amounted to 2.34 million USD with no exports, while imports of transmissions proved to be the second largest in terms of volume in 2016 (32.43 million USD, 33.72 percent of total imports in fifteen groups of codes).

Malaysia used to record a deficit in trade with Philippines in years 2001-2016, with upward tendency in both exports and imports, excluding 2013. Interestingly, electric accounted for 77.45 percent of total import volume in 2016 (83.76 of 108.15 million USD), whereas in case of seven of fifteen groups of codes Malaysia had a surplus in bilateral flows, with special regard to engines and vehicles, accounting for, when combined, 70.82 percent of total export volume in fifteen groups of codes.

In in the following part of the statistical analysis authors identified two dominant six-digit HS codes in terms of value in each of selected groups of codes.

It appeared that four codes used to dominate in the studied years – they occurred 150 times, with special regard to two codes of the heading no. 8708 (870899 and 870894) with 91 (62 and 29) records within all the seven pairs (Tab. 2).

The first of these codes, 870899, was found as prevailing in imports of 2001 in all seven pairs, imports and exports of 2004 and 2007, exports of 2010 and exports of 2016 in all except one pair. For both imports and exports the considered code used to be dominant in 2001 for THA-MAL, THA-PHI, IND-MAL and MAL-PHI, in 2004 for THA-JPN, THA-IND, THA-MAL, IND-MAL and MAL-PHI, in 2007 for THA-JPN, THA-IND, THA-MAL, THA-PHI and IND-MAL, in 2010 for THA-MAL, IND-MAL and IND-PHI, in 2013 for THA-MAL, in 2016 for IND-MAL and MAL-PHI. Consistently, codes of groups V, VII as well as XI have gained in importance, starting with the THA-JPN pair.

Tab. 2: Dominant six-digit HS codes in bilateral trade flows in the auto industry, international production network in ASEAN, 2001, 2004, 2007, 2010, 2013, 2016

	THA-JPN	THA-IND	THA-MAL	THA-PHI	IND-MAL	IND-PHI	MAL-PHI
Im01	840991	851829	851829	870840	851220	870894	870850
	840999	854430	852721	870892	851240	870899	870899
	870893	870880	870870	870899	870894	848340	940190
	870899	870899	870899		870899	848390	
Ex01	852721	840991	870894	870880	850730	870850	851829
	854430	840999	870899	870899	852729	870899	852721
	870321	840790	401110	401110	870894	401110	870894
	870323	840820	401120	401120	870899	401120	870899
Im04	840991	870893	852721	870870	851220	870323	870850
	840999	870899	851290	870899	851290	848340	870899
	870870	870322	870894	870323	870894	848390	401110
	870899	870323	870899		870899		401120
Ex04	852721	870894	870870	870322	870891	870850	870894
	854430	870899	870899	870323	870899	870899	870899
	870870	870322	870322	840732	870322	401110	848320
	870899	870323	870323	840734	870323	401120	848340
Im07	840991	840991	851829	870840	870894	870322	850710
	840999	840999	851290	870870	870899	870323	850780
	870850	870893	870894	870899	870322	848310	870850
	870899	870899	870899		870323	848360	870899
Ex07	852721	870894	870894	870894	870870	870850	840991
	854430	870899	870899	870899	870899	870899	840999
	870870	870322	870322	870322	870322	870322	852721
	870899	870323	870323	870323	870323	870323	854430
Im10	840991	870840	870850	870840	851230	870870	850710
	840999	870322	870899	870323	851290	870899	852729
	870850	870323	870322	870332	870894	848310	401110
	870899		870323		870899	848340	401120
Ex10	852721	870894	870894	870894	870870	870850	870894
	854430	870899	870899	870899	870899	870899	870899
	870322	870322	870323	870323	870322	870322	401110
	870323	870332	870333	870332	870323	870332	401120

Im13	840991	870840	870850	851290	870894	840991	850710
	840999	870322	870899	854430	870899	841330	850720
	870850	870323	870323	870840	870322	870840	401110
	870899	870323	870332		870323		
Ex13	852721	870894	870894	870894	870322	870850	851290
	854430	870899	870899	870899	870323	870899	854430
	870321	870322	870322	870323	401110	870322	401120
	870322	870332	870323	870332	401120	870332	401290
Im16	840991	840991	852721	851290	851240	870840	850710
	840999	840999	851290	854430	851290	870894	851829
	870840	870840	870323	870840	870894	870899	870870
			870332		870899		870899
Ex16	852721	870850	870894	870894	870870	870322	870894
	854430	870899	870899	870899	870899	870333	870899
	870894	870322	401110	870322	870322	840732	840732
	870899	870332	401120	870332	870323	840734	840820

870899 Parts and accessories, for tractors, motor vehicles for the transport of ten or more persons, motor cars and other motor vehicles principally designed for the transport of persons, motor vehicles for the transport of goods and special purpose motor vehicles, n.e.s.

870894 Steering wheels, steering columns and steering boxes, for tractors, motor vehicles for the transport of ten or more persons, motor cars and other motor vehicles principally designed for the transport of persons, motor vehicles for the transport of goods and special purpose motor vehicles

870323 Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc

870322 Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1000cc but not exceeding 1500cc

Source: own elaboration based on: UN Comtrade Database (2018).

Another two dominant six-digit HS codes belonged to the heading no. 8703 (870322 and 870323) with 59 records in six of seven pairs (except MAL-PHI). Furthermore, of 84 cells of the matrix, only 12 lack any of the considered codes, in particular, in aforementioned MAL-PHI pair, dominated by groups of codes VII and I.

All the four six-digit HS codes considered here dominated in exports of 2004 and 2007 in THA-IND pair, of 2007 and 2013 in THA-MAL, of 2007 in THA-PHI, as well as imports of 2007 and 2013 in IND-MAL. Interestingly, three of four six-digit HS codes dominated simultaneously in exports of 2010 in four pairs: THA-IND, THA-MAL, THA-PHI and IND-MAL, in exports of 2004, 2007, 2013 and 2016 in two pairs: THA-MAL and IND-MAL, IND-MAL and IND-PHI, THA-IND and THA-PHI, THA-PHI and IND-MAL, respectively.

Conclusion

The main objective of the paper was to examine the phenomenon of international production networks on the example of auto industry in ASEAN. Authors studied the structure of bilateral intra-industry trade among economies of Southeast Asia and Japan in the 21st century, conducting statistical analysis based on Comtrade data.

From the above analysis, the following conclusions can be drawn:

- Japan is a dominant designer and coordinator of international production networks in auto industry in ASEAN, provider of capital, as well as hi-tech transmissions and engine parts used in spark-ignition and compression-ignition internal combustion piston engines;
- Thailand - Japan and Thailand - Indonesia bilateral flows dominated in terms of volume in international production networks of the auto industry in ASEAN in the studied period;
- bilateral flows in seven pairs of countries concentrated in automobiles and vehicles, their parts and accessories, n.e.s. in heading no. 8708, steering wheels, columns and boxes, spark-ignition internal combustion reciprocating piston engine, cylinder capacity of 1000cc-1500cc and 1500cc-3000cc;
- Thailand proved to be a major hub and assembly centre in Southeast Asia, specializing in exports of vehicles, their parts and components to Japan², Indonesia, Philippines and Malaysia;
- Indonesia used to focus on provision of engines and their parts to Thailand and Philippines, as well as automobiles to Malaysia and Philippines;
- both Thailand and Indonesia regard Philippines as a main supplier of transmissions, while Malaysia used to deliver electric components³, vehicles and their parts to Thailand, Indonesia and Philippines;
- import content of exports, even when disaggregating up to six-digit HS codes, indicates vertical specialization of four ASEAN members in international production networks in auto industry.

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² Another important components exported to Japan were those classified as electric: ignition wiring sets and other wiring sets for vehicles, aircraft or ships; radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles.

³ Such as electrical windscreen wipers, defrosters and demisters for motor vehicles, parts of electrical lighting or signaling equipment, windscreen wipers, defrosters and demisters of a kind used for motor vehicles, n.e.s.

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