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Technological intensity of international trade. The case of the second-tier Asian Tigers

SUMMARY

The paper addresses the issue of technological intensity of international trade (exports) of countries known as the second-tier Asian Tigers: Indonesia, Malaysia and Thailand. Due to the fact that they are the part of the South-East Asia region playing the role of an important industrial centre in the contemporary world economy, it seems important to explore the characteristics of their trade both from the point of view of its geographical structure (main trading partners, bilateral relations) as well as of the sectoral one. The empirical material makes it possible to identify main directions of their exports specialisation and to verify whether they originate from their revealed comparative advantages.

Key words: international trade, Indonesia, Malaysia, Thailand, second-tier Asian tigers, comparative advantage.

STRESZCZENIE

Artykuł odnosi się do kwestii technologicznego zaawansowania handlu międzynarodowego (eksportu) krajów określanych mianem tygrysów azjatyckich drugiej generacji (Indonezji, Malezji oraz Tajlandii). Z uwagi na fakt, iż wchodzą one w skład regionu Azji Południowo-Wschodniej, który stanowi ważne centrum przemysłowe współczesnej gospodarki światowej, ważnym jest, by rozpoznać specyfikę ich wymiany zarówno w ujęciu geograficznym (najwięksi partnerzy handlowi oraz wymiana dwustronna), jak i sektorowym. W oparciu o materiał analityczny możliwe jest zidentyfikowanie głównych kierunków ich specjalizacji eksportowej oraz sprawdzenie, czy wynikają one z posiadanych ujawnionych przewag komparatywnych.

Słowa kluczowe: handel międzynarodowy, Indonezja, Malezja, Tajlandia, tygrysy azjatyckie drugiej generacji, przewaga komparatywna.

1. Introduction

Dynamically growing shares and significance of South and East Asian countries in international trade pose a great deal of questions concerning both causes as well as structural features of this process. For a quite long time this region has been regarded as a fast developing industrial centre of the contemporary world economy. In this context, one may want to highlight the importance of this phenomenon by exploring its nature.

In order to do that the author took a closer look at the international trade of Indonesia, Malaysia and Thailand (IMT) [1] – broadly known as the second-tier Asian Tigers (or also as newly industrialised economies, NIEs)[2] and set up three hypotheses:

- (1) a considerable share (more than 40%) in the exports of the second-tier Asian Tigers is brought about by technologically intensive industries;
- (2) groups of exported goods (according to Harmonised System sections) with the highest indices of revealed comparative advantage (RCA) – when compared for each country covered in this research – remain very much alike;
- (3) groups of goods with the highest RCA indices do not have a substantial share (they remain below 30%) in the Indonesian, Malaysian and Thai exports.

The subject of the undertaken research was thus geographical (main trading partners as well as bilateral relations) and sectoral – structure of IMT international trade, the identification of their revealed comparative advantages and industries (according to Harmonised System sections) generating the highest values of trade revenues. The second part of the paper – following the same approach – is focused on technologically intensive sectors. They were selected/identified arbitrarily from all 99 HS sections.[3]

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[1] According to the WTO Regional Trade Agreements Database, http://rtais.wto.org/UI/PublicAllRTAList.aspx (accessed: 09.03.2012), all these countries are the signatories of ASEAN Free Trade Area (Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area, http://www.aseansec.org/12375.htm (accessed: 09.03.2012)), which came into force on 28 January 1992, ASEAN-Japan Free Trade Area (Agreement on Comprehensive Economic Partnership among Japan and Member States of the Association of Southeast Asian Nations, http://www.aseansec.org/22572.htm (accessed: 09.03.2012)), which came into force on 1 December 2006, ASEAN–China partial scope and economic integration agreement (Agreement on Trade in Goods of the Framework Agreement on Comprehensive Economic Co-operation between the Association of Southeast Asian Nations and the People's Republic of China, http://www.aseansec.org/16646.htm (accessed: 09.03.2012)), which came into force on 1 January 2005. The only country which has signed the free trade agreement with the USA so far is Singapore.

[2] The Philippines also belong to this group, but due to the limited scope of the paper, this country was excluded by the author from the research.

[3] As many 14 groups covered by the analysis include: organic chemicals (product code 29); pharmaceutical products (30); photographic or cinematographic goods (37); plastics and articles thereof (39); impregnated, coated or laminated textile fabric (59); machinery, nuclear reactors, boilers, etc. (84); electrical, electronic equipment (85); railway, tramway locomotives, rolling stock, equipment (86); vehicles other than railway, tramway (87); aircraft, spacecraft and parts thereof (88); ships, boats and other floating structures (89); optical,

2. Economic growth and international competitiveness of the second-tier Asian Tigers

A high and steady rate of economic growth of analysed economies was one of their most characteristic features in the first decade of the 21st century (see Figure 1). Malaysian and Thai economies due to their higher openness [4] (respectively 155.3% and 138.6%) in comparison with Indonesia (43.8%)[5] were more exposed to fluctuations occurring in the global environment. The evidence for that was 2009, when the world economy and the South-East Asian region heavily suffered from the consequences of the financial turmoil. However, it is worth noticing that this decline in the case of the second-tier Asian Tigers' economies did not last very long. What is more, in the period 2000–2011 (2000 = 100) the real GDP growth rate reached 76.6% in Indonesia, 65.3% in Malaysia and 58.8% in Thailand.

It is assumed that exports is one of the main factors accelerating economic growth. Basing on the International Monetary Fund data,[6] one can determine a significant correlation between percentage changes of the value of merchandise exports and the GDP growth rate (calculations for the period 2000–2011). In the case of Indonesia it is 44%, of Malaysia 87.4% and of Thailand 68.9%.

Another aspect which has to be stressed in addition to these long-term tendencies is also a continuous improvement in the well-known rankings assessing the international competitiveness of economies (see Table 1). This proves the credibility of positive economic perspectives and could have been one of the factors accelerating inflows of foreign direct investments (see Figure 2).

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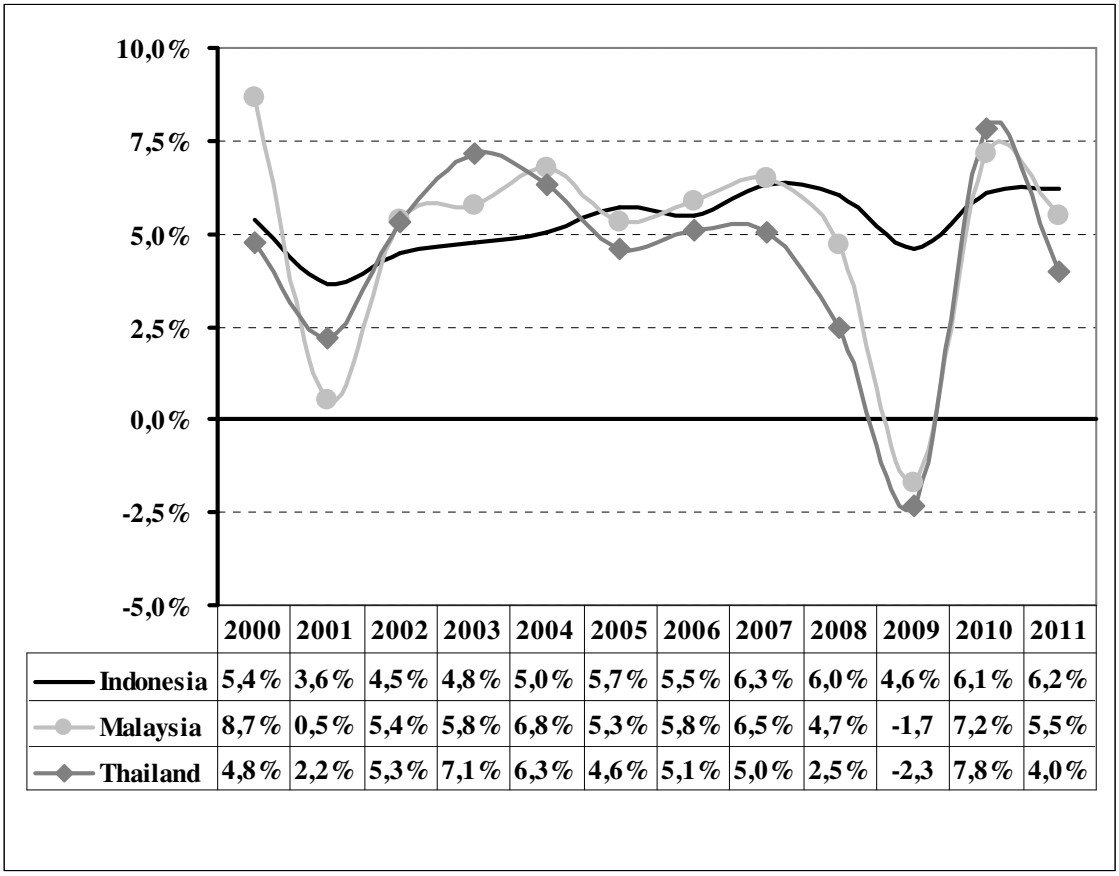
photo, technical, medical, etc. apparatus (90); clocks and watches and parts thereof (91); and arms and ammunition, parts and accessories thereof (93).

[4] Calculated for 2010 as a ratio (value of country's exports in USD + value of country's imports in USD)/value of country's GDP in USD.

[5] Within the period 2000–2010 the openness ratio of the Indonesian, Malaysian and Thai economy was decreasing. In 2000 its value was respectively 96%, 236.9% and 252.2%. This may be interpreted as a mid/long-term process of the growing potential of domestic consumer markets.

[6] International Monetary Fund, World Economic Outlook Database, April 2011, http://www.imf.org/external/pubs/ft/weo/2011/01/weodata/index.aspx (accessed: 10.03.2012).



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Indonesia	5,4%	3,6%	4,5%	4,8%	5,0%	5,7%	5,5%	6,3%	6,0%	4,6%	6,1%	6,2%
Malaysia	8,7%	0,5%	5,4%	5,8%	6,8%	5,3%	5,8%	6,5%	4,7%	-1,7	7,2%	5,5%
Thailand	4,8%	2,2%	5,3%	7,1%	6,3%	4,6%	5,1%	5,0%	2,5%	-2,3	7,8%	4,0%

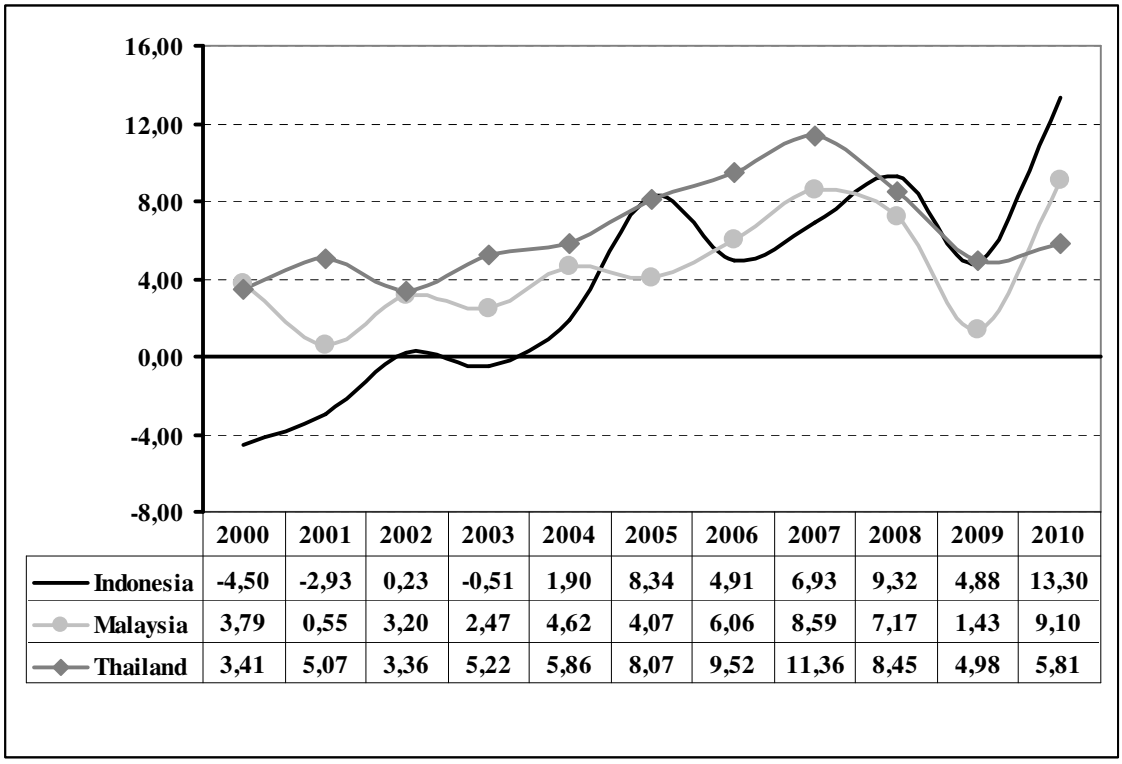
Figure 1. GDP annual growth rate of Indonesia, Malaysia and Thailand (2000–2011)

Source: International Monetary Fund, World Economic Outlook Database, April 2011, http://www.imf.org/external/pubs/ft/weo/2011/01/weodata/index.aspx (accessed: 09.03.2012).

Table 1. Comparison of the Indonesian, Malaysian and Thai position in selected rankings

Country	IMD WCY ranking							
	2004	2005	2006	2007	2008	2009	2010	2011
Indonesia	58	59	52	54	51	42	35	37
Malaysia	16	28	22	23	19	18	10	16
Thailand	29	27	29	33	27	26	26	27
	WEF GCI ranking							
	2004	2005	2006	2007	2008	2009	2010	2011
Indonesia	69	74	50	54	55	54	44	46
Malaysia	31	24	26	21	21	24	26	21
Thailand	34	36	35	28	34	36	38	39
	Heritage Foundation Economic Freedom ranking							
	2004	2005	2006	2007	2008	2009	2010	2011
Indonesia	126	120	131	126	122	131	114	116
Malaysia	71	62	64	52	52	58	59	53
Thailand	54	59	56	54	65	67	66	62

Source: IMD, *World Competitiveness Yearbook*, 2004–2011; WEF, *Growth Competitiveness Index*, 2004–2011 and Heritage Foundation, *Economic Freedom Index*, 2004–2011 (all databases from author's own resources).



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Indonesia	-4,50	-2,93	0,23	-0,51	1,90	8,34	4,91	6,93	9,32	4,88	13,30
Malaysia	3,79	0,55	3,20	2,47	4,62	4,07	6,06	8,59	7,17	1,43	9,10
Thailand	3,41	5,07	3,36	5,22	5,86	8,07	9,52	11,36	8,45	4,98	5,81

Figure 2. The FDI inflow to Indonesia, Malaysia and Thailand 2000–2010 (USD billion)

Source: author's own elaboration based on UNCTAD, *World Investment Report 2011. Non-equity Modes of International Production and Development*, New York/Geneva 2011, http://www.unctad.org/Templates/Page.asp?intItemID=5823&lang=1.

3. The analysis of the Indonesian, Malaysian and Thai exports and their revealed comparative advantages

The main IMT trading partners (according to the value of their exports) are the United States, China and Japan (see Table 2).[7] The shares of bilateral trade remain significantly lower.

Table 2. Main exporting markets of Indonesia, Malaysia and Thailand (share of country's exports, position, 2010)

	USA (%)	Japan (%)	China (%)	Indonesia (%)	Malaysia (%)	Thailand (%)	Value of total exports (USD billion)	Share in the world exports (%)
Indonesia	9.1 (3)	16.3 (1)	9.9 (2)	x	5.9 (7)	2.9 (9)	157.78	**1.05**
Malaysia	9.5 (4)	10.4 (3)	12.6 (1)	2.8 (11)	x	5.3 (5)	198.79	**1.32**
Thailand	10.4 (3)	10.5 (2)	11.0 (1)	4.4 (7)	5.4 (5)	x	195.31	**1.30**

Source: author's own elaboration based on http://www.intracen.org/trade-support/trade-statistics (accessed: 25.02.2012).

[7] Another important trading partner of Malaysia is also Singapore (13.4%), but this country was omitted by the author for the coherence of further analysis.

In order to examine the technological intensity of each country's exports, the key element was to calculate the index of revealed comparative advantages (RCA).[8] This was done by using the data from 2010 (see Table 3) for every HS section. The results show that the highest values of RCA indices (higher than 3) in the case of all analysed economies' exports refer to almost the same HS sections (see bolded entries in Table 3), which are agricultural goods (vegetable plaiting materials, vegetable products, animal and vegetable fats and oils, cleavage products), raw materials (rubber and articles thereof, tin and articles thereof) and also labour-intensive merchandise goods (wood and articles of wood, wood charcoal, pulp of wood, fibrous cellulosic material, printed books, newspapers, pictures, etc., manmade staple fibres). These groups cover respectively about 28.1%, 14.7% and 17.1% of Indonesian, Malaysian and Thai exports. What is also worth bearing in mind is that Indonesia makes the most effective use of these groups as it comes to its exports on the US, Japanese and Chinese markets.

Table 3. Revealed comparative advantages of IMT exports (HS sections) and their share in country's exports (2010)

	HS sections with RCA index > 3	**Share in the country's exports to USA**	**Share in the country's exports to Japan**	**Share in the country's exports to China**	**Share in the total country's exports**
Indonesia	09, **14, 15,** 18, 26, **40,** 47, **55,** 67, 75, **80,** 92	**23.8%**	**24.5%**	**39.2%**	**28.1%**
Malaysia	**14, 15, 40,** 44, **80**	**13.4%**	**9.2%**	**23.1%**	**14.7%**
Thailand	10, 11 ,16, 17, **40,** 49, **55, 80**	**19.2%**	**19.3%**	**21.1%**	**17.1%**

HS sections appearing at least twice are in bold.

Source: author's own elaboration based on http://www.intracen.org/trade-support/trade-statistics (accessed: 25.02.2012).

4. Technological intensity of international trade with the USA, China and Japan

The analysis of technological intensity of Indonesian, Malaysian and Thai international trade (basing on the value of their exports) covers 14 arbitrarily identified HS sections: 29, 30, 37, 39, 59, 84, 85, 86, 87, 88, 89, 90, 91, 93. The general outlook (their shares in the country's exports) is far and away better (see Table 4) than the one constructed only for groups with the highest values of RCA index. What is of a particular importance is that one can easily determine a suggestive dominance of two sections: (84) machinery, nuclear reactors, boilers,

8 Calculated as a share of the commodity group *i* of the country *j* in the world exports of the commodity group *i* divided by the share of commodity group *i* in the total world exports. If RCA >1, this means that a country has a revealed comparative advantage.

etc.; and (85) electrical, electronic equipment. A closer look allows recognising the main types of traded goods (see bolded entries in Table 4 and 5).These are:[9]

a) in Indonesia:
   - within HS 29: to China: cyclic hydrocarbons (2902; 2.52%), acyclic alcohols and derivatives (2905; 1.84%);
   - within HS 84: to the USA and Japan: printing machinery (8443; 1.94% and 1.15%);
   - within HS 85: to the USA: electric appliances for line telephony (8517; 3.01%); to Japan: insulated wire/cable (8544; 1.45%); to China: television camera, transmission appliances for radio-telephony (8525; 0.52%);

b) in Malaysia:
   - within HS 84: to the USA, Japan and China: automatic data processing machines, optical readers, etc. (8471; 12.79%, 2.18% and 9.03%) and parts and accessories of computers and office machines (8473; 6.73%, 1.75% and 9.98%);
   - within HS 85: to Japan: television receivers (8528; 5.89%) and electronic integrated circuits and microassemblies (8542; 4.71%); to the USA and China: electronic integrated circuits and microassemblies (8542; 9.15% and 23.62%);
   - within HS 90: to the USA: oscilloscope/spectrum analysers (9030; 3.18%);

c) in Thailand:
   - within HS 29: to China: cyclic hydrocarbons (2902; 2.04%), polycarboxylic acids, their anhydrides, halides, etc. (2917; 2.75%);
   - within HS 39: to China: polymers of ethylene, in primary forms (3901; 3.06%);
   - within HS 84: to the USA: automatic data processing machines, optical readers, etc. (8471; 11.55%); to Japan: printing machinery (8443; 2.13%) and automatic data processing machines, optical readers, etc. (8471; 3%); to China: automatic data processing machines, optical readers, etc. (8471; 18.73%).
   - within HS 85: to the USA: electronic integrated circuits and microassemblies (8542; 2.75%), electric appliances for line telephony (8517; 2.49%) and television receivers (8528; 2.27%); to Japan and China: electronic integrated circuits and microassemblies (8542; 4.7% and 3.76%).

[9] HS category code and the share in total country's exports in brackets.

These data suggest that technological intensity of IMT exports must have been achieved due to the inflow of direct foreign investments from developed countries oriented towards low-cost locations and growing market motives. One may assume that at the same time one of the main goals of domestic economic policies was and still is strengthening development opportunities in these industries. This can be regarded as a manifestation of strategic economic vision focused on the modernisation and re-shaping of an economic system to make capital intensive sectors more efficient, which would be able to bring about unique, inimitable advantages.

Table 4. Shares of technologically intensive industries in the IMT exports to the USA, Japan and China (2010)

HS section	Indonesia					Malaysia					Thailand				
	RCA	% of total exp	% of exp to the USA	% of exp to Japan	% of exp to China	RCA	% of total exp	% of exp to the USA	% of exp to Japan	% of exp to China	RCA	% of total exp	% of exp to the USA	% of exp to Japan	% of exp to China
29	0.69	1.7	0.7	0.6	**5.4**	0.76	1.9	0.7	1.3	3.3	0.82	2.0	0.2	0.6	**7.4**
30	0.07	0.2	0.0	0.1	0.0	0.03	0.1	0.0	0.0	0.0	0.06	0.2	0.0	0.1	0.0%
37	0.01	0.0	0.0	0.0	0.0	0.52	0.1	0.0	0.0	00	0.25	0.0	0.0	0.0	0.0%
39	0.42	1.4	1.4	1.5	1.4	0.97	3.1	1.2	2.7	3.8	1.47	4.7	1.9	4.9	**8.5**
59	0.54	0.1	0.0	0.1	0.1	0.17	0.0	0.0	0.0	0.0	0.50	0.1	0.0	0.0	0.1
84	**0.27**	**3.2**	**3.2**	**2.3**	0.9	**1.25**	**15.1**	**24.7**	**5.8**	**21.2**	**1.43**	**17.2**	**21.0**	**15.2**	**26.0**
85	**0.50**	**6.6**	**9.6**	**4.8**	**2.6**	**2.14**	**28.1**	**36.7**	**23.3**	**31.3**	**1.13**	**14.8**	**19.5**	**20.0**	**12.0**
86	0.04	0.0	0.0	0.0	0.0	0.21	0.0	0.0	0.0	0.0	0.06	0.0	0.0	0.0	0.0
87	0.24	1.7	0.4	1.5	0.2	0.11	0.8	0.3	0.4	0.7	0.24	9.5	1.4	5.3	0.3
88	0.05	0.1	0.0	0.0	0.0	0.23	0.3	0.8	0.1	0.0	1.32	0.6	0.9	0.3	0.4
89	0.63	0.7	0.0	0.0	0.1	0.30	0.3	0.1	0.0	0.0	0.18	0.2	0.0	0.0	0.1
90	0.12	0.4	0.2	0.2	0.1	0.88	2.8	**6.4**	2.9	2.4	0.58	1.8	2.8	3.5	1.7
91	0.02	0.0	0.0	0.0	0.0	0.44	0.1	0.0	0.1	0.0	1.00	0.2	0.2	0.3	0.0
93	0.03	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.10	0.0	0.0	0.0	0.0
Σ	**X**	**16.1**	**15.8**	**11.1**	**10.8**	**X**	**52.7**	**70.9**	**36.7**	**62.7**	**X**	**51.5**	**48.0%**	**50.3**	**56.6**

Source: author's own elaboration based on http://www.intracen.org/trade-support/trade-statistics (accessed: 25.02.2012).

5. Technological intensity of bilateral exports

The inflow of foreign direct investments and international division of labour affected the bilateral trade relations of the second-tier Asian Tigers increasing their technological and intra-branch intensity of their trade. Table 5 contains data concerning the shares of selected industries.

Table 5. Shares of technologically intensive industries in the IMT bilateral exports (2010)

HS section	Indonesia		Malaysia		Thailand	
	% of exports to Malaysia	% of exports to Thailand	% of exports to Indonesia	% of exports to Thailand	% of exports to Indonesia	% of exports to Malaysia
29	2.5	4.3	7.0	2.5	3.5	2.0
30	0.1	0.4	0.2	0.0	0.2	0.2
37	0.0	0.0	0.1	0.1	0.0	0.1
39	1.9	1.9	**10.4**	4.0	7.6	4.0
59	0.0	0.1	0.1	0.0	0.1	0.1
84	**2.4**	**9.3**	**10.8**	**21.9**	**18.0**	**19.7**
85	**3.8**	**6.2**	**9.4**	**21.8**	5.8	**14.5**
86	0.0	0.0	0.0	0.1	0.0	0.0
87	**2.7**	**10.7**	3.6	1.8	**26.2**	**11.80**
88	0.1	0.1	0.1	0.1	0.0	0.5
89	0.8	6.1	0.4	1.5	0.1	0.0
90	0.1	0.3	1.8	3.9	1.1	1.0
91	0.0	0.0	0.0	0.0	0.0	0.0
93	0.0	0.1	0.0	0.0	0.0	0.0
Σ	**14.4**	**39.5**	**43.9**	**57.7**	**62.6**	**53.9**

Source: author's own elaboration based on http://www.intracen.org/trade-support/trade-statistics (accessed: 25.02.2012).

Relatively high shares in the bilateral trade relations are characteristic mainly for HS sections 84, 85 and 87 (see bolded entries in Table 5). A closer look into the data helped to identify particular types of goods which caused this state of affairs. These are:

a) in the case of Indonesia:
   - within HS 84: to Malaysia: self-propelled bulldozers, angledozers, graders, excavators, etc. (8429; 0.44%), refrigerators, freezers, etc. (8418; 0.35%), parts for use with the motor engines (8409; 0.35%); to Thailand: part for use with the motor engines (8409; 2.79%), air, vacuum pumps (8414; 1.53%);

- within HS 85: to Malaysia and Thailand: electrical ignition/starting equipment (8511; 0.57% and 0.83%), television receivers (8528; 0.43% and 1.02%); to Malaysia: electric transformers, static converters (8504; 0.63%); to Thailand: electric motors and generators (8501; 1.33%);
- within HS 87: to Malaysia and Thailand: parts and accessories of motor vehicles (8708; 1.61% and 6.37%), cars (8703; 0.89% and 3.96%);

b) in the case of Malaysia:

- within HS 39: to Indonesia: polymers of ethylene (3901; 2.58%), polymers of propylene (3902; 2.61%), polymers of styrene (3903; 1.27%);
- within HS 84: to Indonesia: machines and mechanical appliances having individual functions (8479; 1.74%), automatic data processing machines, optical readers, etc. (8471; 1.64%), air conditioning machines, with motor-driven elements (8415; 1.04%); to Thailand: parts and accessories of computers and office machines (8473; 11.54%), automatic data processing machines, optical readers, etc. (8471; 5.48%);
- within HS 85: to Indonesia: television receivers (8528; 2.02%), electronic integrated circuits and microassemblies (8542; 1.27%), insulated wire/cable (8544; 1.09%); to Thailand: prepared unrecorded media for sound record (8523; 6.35%), electronic integrated circuits and microassemblies (8542; 4.03%);

c) in the case of Thailand:

- within HS 84: to Indonesia: parts for use with the motor engines (8409; 3.41%), air conditioning machines, with motor-driven elements (8415; 2.77%), self-propelled bulldozers, angledozers, graders, excavators, etc. (8429; 3.18%); to Malaysia: parts and accessories of computers and office machines (8473; 7.80%), automatic data processing machines; optical readers, etc. (8471; 3.64%);
- within HS 85: to Malaysia: electronic integrated circuits and microassemblies (8542; 4%), electric appliances for line telephony (8517; 1.58%);
- within HS 87: to Indonesia: cars (8703; 12.74%), parts and accessories of motor vehicles (8708; 7.28%); to Malaysia: parts and accessories of motor

vehicles (8708; 5.01%), cars (8703; 4%), trucks, motor vehicles for the transport of goods (8704; 2.19%).

6. Conclusion

The analysis of the empirical material makes it possible to verify the hypotheses set up in the introduction. In the Malaysian and Thai case, one can confirm that goods produced by technologically intensive industries have a considerable share (more than 40%) in their exports. For the Indonesian economy, it is only 16.1%, which can be regarded as a result of a substantially lower level of economic development.[10]

Also the second hypothesis relating to the similarity of exports in groups with the highest RCA indices (more than 3) was proven true. What is also legitimate is the statement (hypothesis no. 3) that these HS sections do not have a substantial share (below 30%) in the Indonesian, Malaysian and Thai exports. However, if taking into account all groups for which RCA was identified (RCA > 1), this would be true for Indonesia (76.3%), Malaysia (79.2%) and Thailand (59.7%) – the most developed economy of all three covered by the research. This may lead to a careful deduction that after having achieved a certain level of economic development, the issue of revealed comparative advantages becomes the subject of development-conscious measures (i.e., implemented within the domestic industrial policy), but not only a simple result of external conditions which cannot be changed (geographical location, climate, mineral resources).

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[10] Gross domestic product based on purchasing-power-parity (PPP) *per capita* (2010) in the case of Indonesia was about 4 400 USD, Malaysia – 14 700 USD and Thailand 9 200 USD.

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