Benefiting From the Implementation of AEC 2015

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Abstract

We start the paper by asking how integrated is ASEAN as an economic zone. Implementing the analytical framework proposed by Bowen, Munandar, and Viaene et al (2009, 2011) we analyze the distance of ASEAN from its theoretical fully integrated economic (FIE) equilibrium, and suggest the likely direction of factor mobility within ASEAN. It will be argued that assuming equal access to technology, free flows of factors of production (fixed and human capital) will benefit all members. The shared benefits from greater integration would depend on the increase of intra and extra ASEAN trade, including trade in value added. We then map the pattern of trade in value added (TiVA) in Asia, treating ASEAN as a single production base. The mapping employs the triangular trading scheme framework proposed by Lejour et al (2012), implemented on Asian Input-Output (AIO) Table developed by IDE-JETRO (2005), our own update on the AIO Table (2013), and the OECD Inter-Country Input-Output (ICIO) Table (2011). This allows us to speculate that the implementation of Asian Economic Community (AEC) may foster more indepth cooperation and trade among the ASEAN members. This paper ends with some considerations on the importance of Trade Agreements between ASEAN and targeted partners on some specific sectors.

Keywords: ASEAN, Economic Integration, Trade in Value Added

1. Introduction

The implementation of AEC in stages from 2015 onwards until 2025 provides ASEAN member countries with the opportunity for economic advancement. Under the assumption of equal access to technology and no barriers to factor mobility (physical and human capital), a greater integration will potentially benefit all members. The capacity to reap the full benefits would depend on the increase of intra and extra ASEAN trade, including trade in value added (TiVA).

TiVA has been made possible by the reduction of trade, transportation and coordination costs due to improved transportation technology, better digital connectivity and ICT penetration, trade liberalization, and competition over Foreign Direct Investments (FDIs). Such production sharing is driven by offshoring of production and distribution activities by multi-nationals along the global value chains (GVC). Producers (including ASEAN companies) can specialize on tasks that can be completed most efficiently in different production locations within global economies, including in ASEAN.

There is a chance for ASEAN to benefit from TiVA by generating value added, creating decent employment, and encouraging industrial upgrading. These depend on the availability of specialized skill-set at reasonable price, the capability to compete on CQDC (cost, quality, delivery and compliance), investment regime, and openness to trade in goods and services. As a single and competitive production base, promoting ASEAN integration to the larger Global Production Network entails enhanced access to a wider & larger global market. This paper considers some strategies to enhance competitiveness and participation within GVC.

2. Methodology and Data

This section provides a summary of the methodologies and data we use. Technical details are available on the Appendixes.

2.1 Integrated Economic Equilibrium

As studied by Bowen et al (2010), under the assumption of perfect factor mobility (physical and human capital), and equal access to technology, three theoretical

predictions under fully Integrated Economy Area (IEA) can be proposed (see Appendix **1** for details):

1. Each economy's shares of total IEA output, physical capital and human capital will be identical
2. Distribution of output and productive factors across IEA members would exhibit Zipf's law
3. Since the number of IEA members is fixed, then theoretical shares of each IEA member's productive factors can be computed.

Zipf's law establishes specific relationship among IEA members, that is, the share of output and productive factors will follow their rank, where the size of rank 1st will be twice of rank 2nd, three times of rank 3rd, and so on. We apply the results of Gabaix (1999) to assume that the IEA member shares will evolve as geometric Brownian motion:

$$\frac{dS_{njt}}{S_{njt}} = \mu dt + \sigma dB_t$$

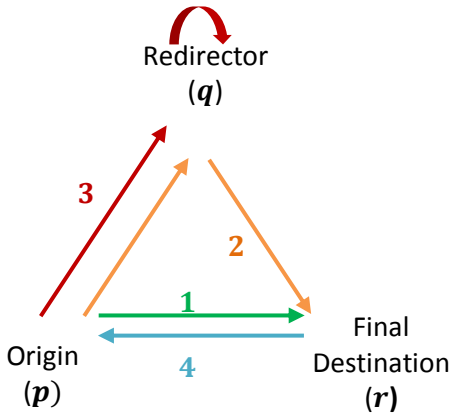
where $S_{njt} > \min(S_{njt})$, μ is the average (drift parameter), and σ is the standard deviation, $\min(S_{njt})$ is the lower bound, and B_t is the wiener process.

2.2 Measuring Competitiveness within the GVC

In this section, we describe briefly the method to decompose value in export flows to measure competitiveness within the GVC. We estimate the values of trade in value added by reconstructing the multiregional bilateral input output into triangular trading scheme, as introduced by Lejour et al (2012) and Johnson and Noguera (2013). The scheme provides explicit expressions on the four types of trade activities (Figure **1**):

1. Trade in value added from the origin $\boldsymbol{p}$ to final destination $\boldsymbol{r}$
2. Trade in value added from the origin $\boldsymbol{p}$, processed in country $\boldsymbol{q}$, exported to final destination $\boldsymbol{r}$
3. Trade in value added from the origin $\boldsymbol{p}$, processed in country $\boldsymbol{q}$, and consumed as final products in country $\boldsymbol{q}$
4. Trade in value added from the origin $\boldsymbol{p}$, processed in country $\boldsymbol{r}$, exported back to final destination $\boldsymbol{p}$

Figure 1. Triangular Trading Scheme



We utilize the Leontief inverse matrix, which shows the total amount of goods and services required for the production of one unit of output, in order to investigate the origin of final demand exports from country $\boldsymbol{q}$ to $\boldsymbol{r}$ (see Appendix **2** for details). This gives a result of decomposition on foreign and domestic value added embodied in bilateral export value, which can be used to construct indicators of internal and external competitiveness as a hub (redirector):

$$INT_i = \frac{FVAEXP_i}{FVAEXP_i + FVADOM_i}$$

$$EXT_i = \frac{FVAEXP_i}{\sum_{j=1}^{N} FVAEXP_j}$$

where

i/j : country index, $i/j = 1,2,\dots,N$

INT_i : internal competitiveness of country i

EXT_i : external competitiveness of country i

$FVAEXP_i$: foreign value added embodied in country i's exports

$FVADOM_i$: foreign value added used for domestic consumptions.

The internal competitiveness indicates the export capability of one country after utilizing foreign VA, while the external competitiveness shows the scale of such capability in global market.

2.3 Updating AIO Table

Since IDE JETRO publishes Asian IO only for 2005, we updated the IO to 2009 and 2013 so as to enable the triangular trade analysis to be expanded into post 2007/2008 Global Financial Crisis (GFC). To accomplish this, we use some steps below (see Appendix **3** for details):

1. Collecting trade in goods data from UN COMTRADE, CEIC, IFS and UNCTAD for 2005-2013
2. Building AIO for 2009 & 2013 : Intermediate Demand Block, Import Block, Final demand Block, and Export Block
3. Readjusting Hongkong trade by counting re-exports by country of origin, destination, and also by type of goods and destination
4. Estimate Total Intermediate Input, Total Intermediate Output, Statistical Discrepancy And Total Input/output

Besides AIO Table, we also use the OECD Inter Country IO Table (2011) as the data source of our GVC analysis.

2.4 Data Source

We use various data source for each part of analysis as below:

Table 1. Data Source

Nu	Variable	Data Source
A. Integrated Economic Equilbrium		
1	Output (GDP Constant 2005)	World Development Indicator
2	Human Capital (Number of persons with occupation: professionals, technical and related workers)	Labor Force Survey
3	Physical Capital (Capital stocks at current PPPs)	Penn World Table ver 8.0
B. Measuring Competitiveness within GVC		
1	Asian Input Output Table 2005	IDE JETRO
2	Inter Country Input Output Table 2011	OECD
3	Updated Asian IO Table 2009 & 2013	-

C. Updating AIO Table		
1	Value Added	CEIC
2	Exports and Imports (HS 6 Digits)	UN Comtrade, UNCTAD, CEIC
3	Consumption	CEIC
4	Gross Fixed Capital Formation	CEIC
5	Change in stocks	CEIC
6	Hongkong-re-export by country destination	CEIC

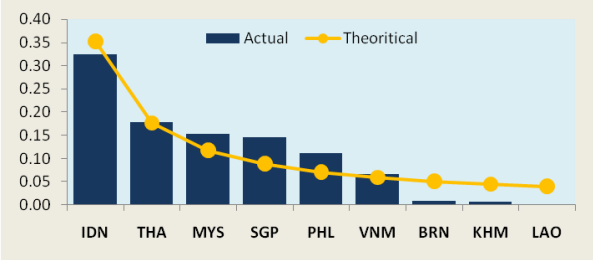
3. Progress of ASEAN Economic Integration

This section discusses the results of theoretical and actual share distributions, and level of integration within ASEAN countries. Because of the limitation on database availability, we consider only 9 ASEAN countries on the calculation (excluding Myanmar). Table **2** gives the distribution of long run theoretical share of ASEAN economies. As described on the previous Section, Zipf's law implies that the share value of the highest ranked (largest) economy is twice the share value of the second ranked economy, three times the share value of the third ranked economy, etc.

Table 2. Theoretical Share of ASEAN Economies

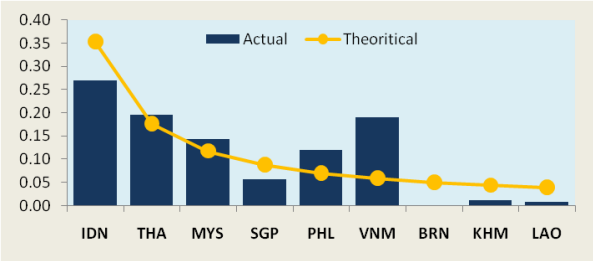
Rank	1	2	3	4	5	6	7	8	9
Theoritical Share	35%	18%	12%	9%	7%	6%	5%	4%	4%

Figure 2. Actual and theoretical share of Real Output (2008-2012)

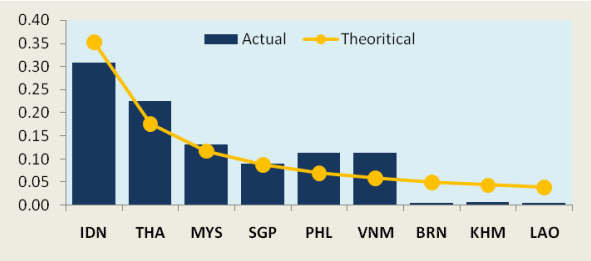


Figures **2** presents the comparison of theoretical and actual shares in terms of real output. It indicates that ASEAN resembles a fully integrated zone, where the observed values confirm the theoretical share of Zipf's law. However, some countries fall below their theoretical share, and hence a greater integration in short run will bring a higher potential growth for them than others, but all will benefit in long run since an increase of output in one country will be followed by others.

Figure 3. Actual and theoretical share of Production Factors (2008-2012)



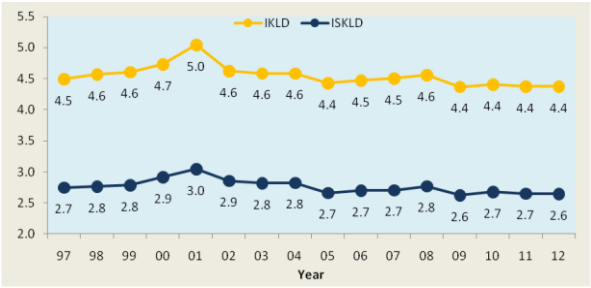
(a) Human Capital



(b) Physical Capital

Figure **3** shows the results of primary factors. A negative gap indicates that some countries need to increase their factor endowments in order to reach their potential growth. Thus, a free movement of skill labors and physical capital among ASEAN members will potentially help those countries. However, the allocation of primary factors between countries may vary for other reasons, for example a difference in technologies. This explains why one country could have a positive gap in output while their actual shares of primary factors are below its theoretical share. However, these technological differences may disappear as a result of deeper integration. To provide an indication of the potential empirical validity of the equal share relationship between output and productive factors, a spearman rank test in Appendix **4** shows that all rank correlations are positive and significant.

Figure 4. Dynamics of ASEAN Economic Integration



Moreover, Figure **4** shows that the inverted values of Kullback-Leibler divergence (IKLD and ISKLD) have changed slightly after 2002, indicating a slow progress of integration. The ISKLD of ASEAN on 2012 is 4.4, far below Bowen's calculation (2011) for EU and US States, where the ISKLD are 20 and 15, respectively. As being more integrated could potentially benefit all members, this suggests that ASEAN need to promote further convergence in output and factor share.

4. Benefiting from a Greater Integration: Enhancing ASEAN Competitiveness in GVC

In the previous section we saw that ASEAN has not made a significant progress in terms of economic integration in recent years, but a commitment to implement AEC by the end of 2015 will potentially result in a greater integration. Since the increase of output and productive factors in one ASEAN member will be followed by others, then the capacity to reap the full benefits of greater integration depends on the ability to accelerate the growth of real output and primary factors. Furthermore, as the income per capita of ASEAN economy is far below developed countries, the output per labor ratio (productivity) could significantly be raised by catching-up the same access of technological change, i.e. by strengthening the integration into global economy, especially developed countries.

UNCTAD (2013) has shown that a greater participation in Global Value Chain will contribute to economic development through direct GDP, employment, and opportunities for industrial upgrading. GVC participation can also generate value added in domestic economies as the potential business linkages rises between local firms and foreign affiliates. As the OECD (2013) notes, experience of some emerging economies demonstrates that participation in GVC can offer a fast track to development and industrialization. With the increase in research on the benefits of GVC, improvements of GVC participation are frequently discussed. This section concerns mainly on the analysis of current ASEAN position and some key strategies to enhance the competitiveness.

4.1 ASEAN competitiveness in GVC

Figure **5** provides a comparison of internal and external competitiveness based on the OECD ICIO Table, specifically on the Aggregate Medium-High Tech Industries. China stands out among 24 countries/ group economies (EU and ASEAN are aggregated) as the one that have developed both internal and external competitiveness. The internal competitiveness gauge suggests that countries like Mexico, Canada, Taiwan, and Korea have strong export capability after utilizing foreign value added, while the external

competitiveness gauge shows the scale of such capability is dominated by China. Joint analysis on the two gauges suggests that China has the strongest "import productivity", that is the ability to generate large scale export after sourcing their inputs from external producers. Meanwhile, with a slight difference in internal competitiveness, ASEAN's export scale is far below China and other economies like EU, US and Korea.

Figure 5. Comparison of Internal and External Competitiveness on Aggregate Medium-High Tech Industries (2011)

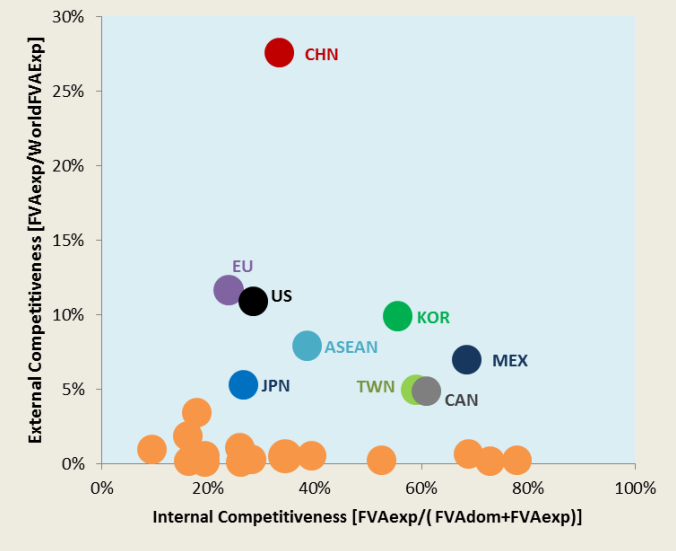


Table **3** presents the dynamics of ASEAN competitiveness based on the IDE JETRO AIO Table year 2005 and own updated Table year 2009 and 2013. With a difference in countries data coverage[1], the result of ASEAN's export scale using AIO Table seems to be higher than using OECD ICIO Table. For that reason, on the next GVC analysis, we focus on the use of OECD ICIO Table. However, both results still give the same essential indication of competitiveness, like the ability to export (internal competitiveness) and the order in which sectors that ASEAN has better position. The result shows that ASEAN internal and external competitiveness have a negative trend during the period 2005-2013. The weakest performances appear in transport equipment and chemical products, where the foreign input is mostly used for domestic oriented production.

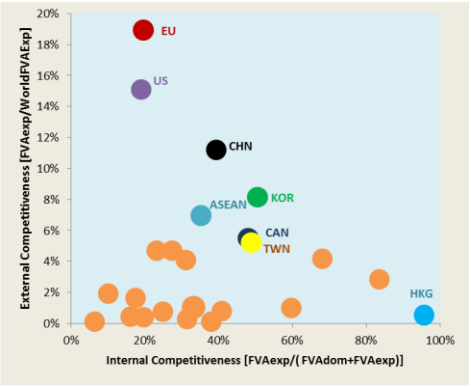
[1] Because of the limitation on database availability, exports based on the IDE JETRO AIO Table captures only exports to 10 countries, but based on the OECD ICIO Table captures exports to all countries. Intra ASEAN trade is excluded for ASEAN's export calculation.

Table 3. Dynamics of ASEAN Internal and External Competitiveness on Specific Medium-High Tech Industries

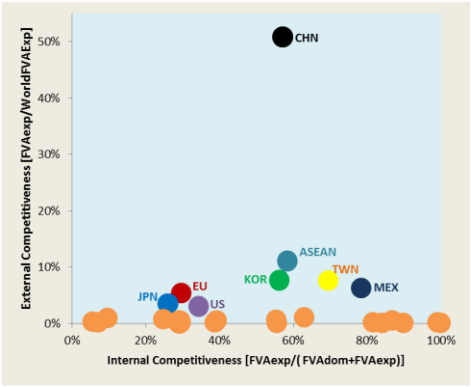
Sector	Internal Competitiveness			External Competitiveness		
	2005	2009	2013	2005	2009	2013
Chemical Products	18%	13%	11%	29%	26%	23%
Industrial Machinery	46%	43%	43%	13%	10%	9%
Computers, electronic & electrical equipment	76%	71%	67%	32%	28%	28%
Transport Equipment	13%	10%	8%	19%	15%	14%

Figure **6** presents the comparison of internal and external competitiveness in more detailed medium-high tech sectors. It illustrates that China is dominating as the most competitive global producers, especially on the electronic, machinery and chemicals. Domestic market size seems to have no role in explaining "Import productivity". The case of China suggests that, despite large domestic market, "import productivity" can be as strong as (even stronger than) those with smaller domestic market size.

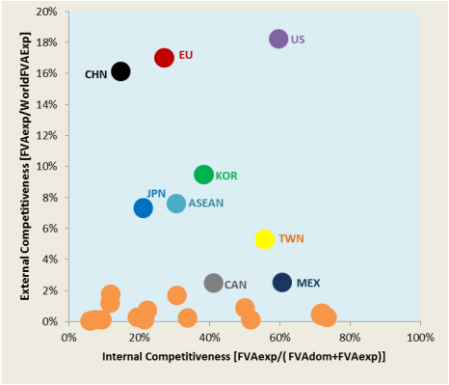
Figure 6. Comparison of Internal and External Competitiveness in GVC On Specific Medium-High Tech Industries (2011)



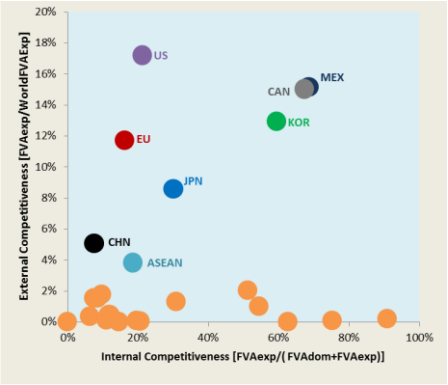
Chemicals and chemical products



Computer, electronic, and optical equipment



Machinery and Equipment

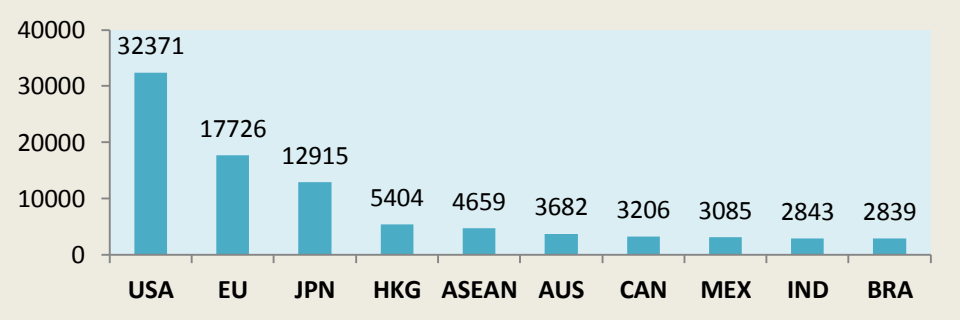


Motor vehicles, trailer, and semi-trailers

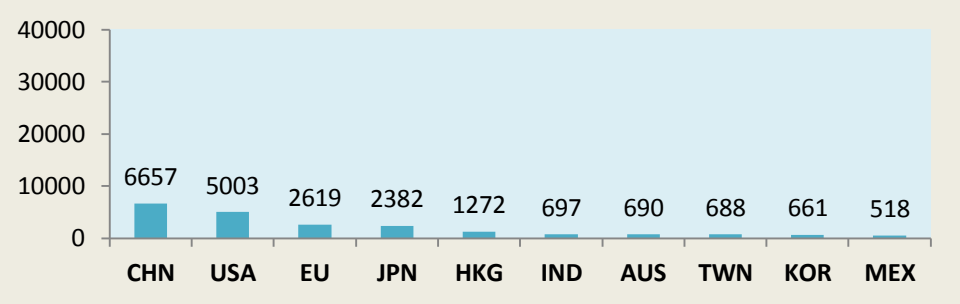
4.2 The Importance of Extra ASEAN Trade Agreement

Figure **7** exhibits the comparison of export values between China and ASEAN to their biggest partners as a global producer. It shows that market access between ASEAN and China are different in terms of exports scale, especially to US, EU, and Japan. Access to large export markets is one of the key factors in ensuring "import productivity" within the GVC in most competitive global economies. Such access allow for economies of scale (the bigger the market the lower your per unit cost). This suggests that ASEAN as a zone must not lose sight of the importance of extra-ASEAN trade agreements, in addition to intra-ASEAN.

Figure 7. Comparison of Export Values as a Global Hub for Special Case: Computer, Electronic, and Optical Equipment



(a) China as a Hub Exporter



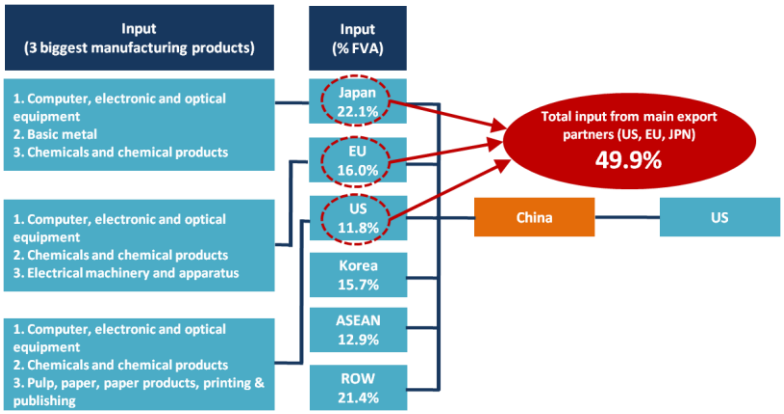
(b) ASEAN as a Hub Exporter

As illustrated in Figure **8**, input sourcing[2] inferred by the triangular trade I/O shows that around 50% of imports as a global hub are originating from its biggest export market (high volume of intra industry trade), which suggests that Chinese Electronics industry is closely linked to the highly innovative electronics industry in the US, Japan,

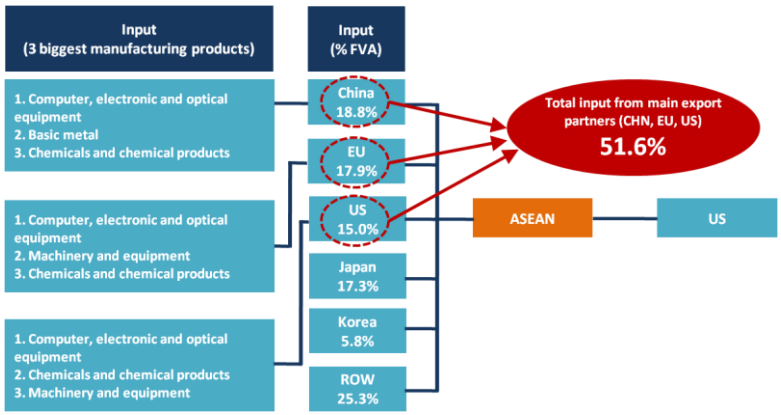
[2]Input sourcing is narrowed into imports of manufacturing products. Based on OECD data, manufacturing products are classified as sector number 15 to 37

and EU as a part of production sharing network (TiVA). It shows that China has an important role as a redirector in the production network to developed countries. The labor force gets the benefits through knowledge and technology spill-over and descent jobs, which builds the foundation for industrial upgrading overtime. Meanwhile, ASEAN is trapped in low value added labor intensive electronics segment.

Figure 8. Input Sourcing as a Global Hub for Special Case: Computer, Electronic, and Optical Equipment



(a) China as a Hub Exporter



(b) ASEAN as a Hub Exporter

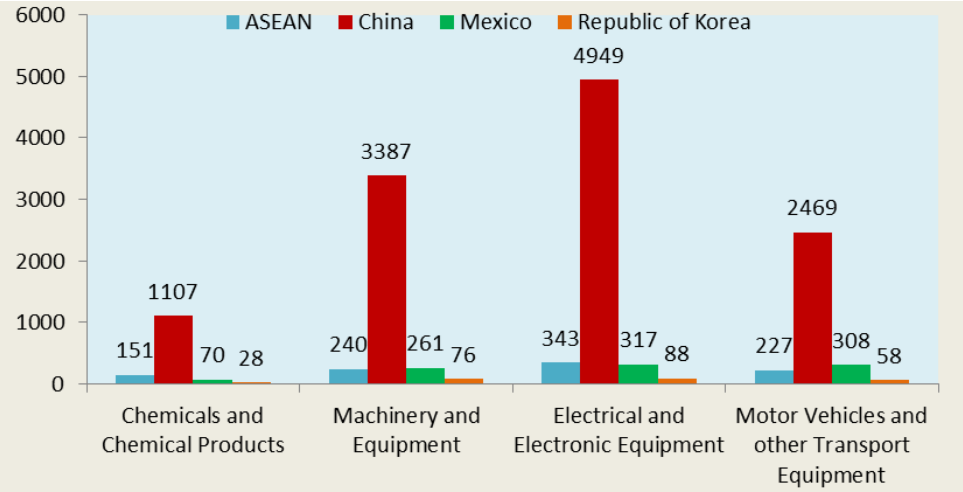
4.3 Boosting the Export Oriented Investment

As studied by Mishkin and Palmer (2012), the capacity to maintain market share depends on the ability to compete on a global level. This leads to a situation where the entrance to the market is limited by the competition in global standard products. Therefore, strengthening the linkage with global companies (global value chain) is one

of key approaches in competing and developing on cost, delivery, quality and compliance to international standards.

Figure **9** shows that China is the location of choice by multinational companies (global producers) on all medium-high tech sectors. These indicate that China is producing globally standardized high value added products. From the agglomeration perspective, the presence of many firms tends to make China more attractive to new firms from the input-cost side; here the suppliers attract more suppliers.

Figure 9. Number of Foreign Affiliates Company Recently Established



Source: ITC Database 2011

Based on 2011 data as shown on Table **4,** the reported export value generated by MNCs is high in China, suggesting “high import (TiVA) productivity”. On the contrary, ASEAN need to boost the investment to generate more exports and employment opportunities.

Table 4. Exports Generated by FDI Companies and Reported Employment

Country/ Economic Group	Foreign Affiliates	FDI (US $million)	Export (US $million)	Exports/FDI	Employment
ASEAN	15,865	111,200	1,440,184	12.95	6,004,303
China	32,034	116,011	2,072,469	17.86	8,023,426
Mexico	12,907	21,504	362,826	16.87	3,898,434
Korea	2,398	13,670	650,400	47.58	332,819

Source: ITC Database 2011

4.4 Promoting the High-Skill Intensive Industries

Figure 10. Comparison of ASEAN and High Income Countries Product Space Maps

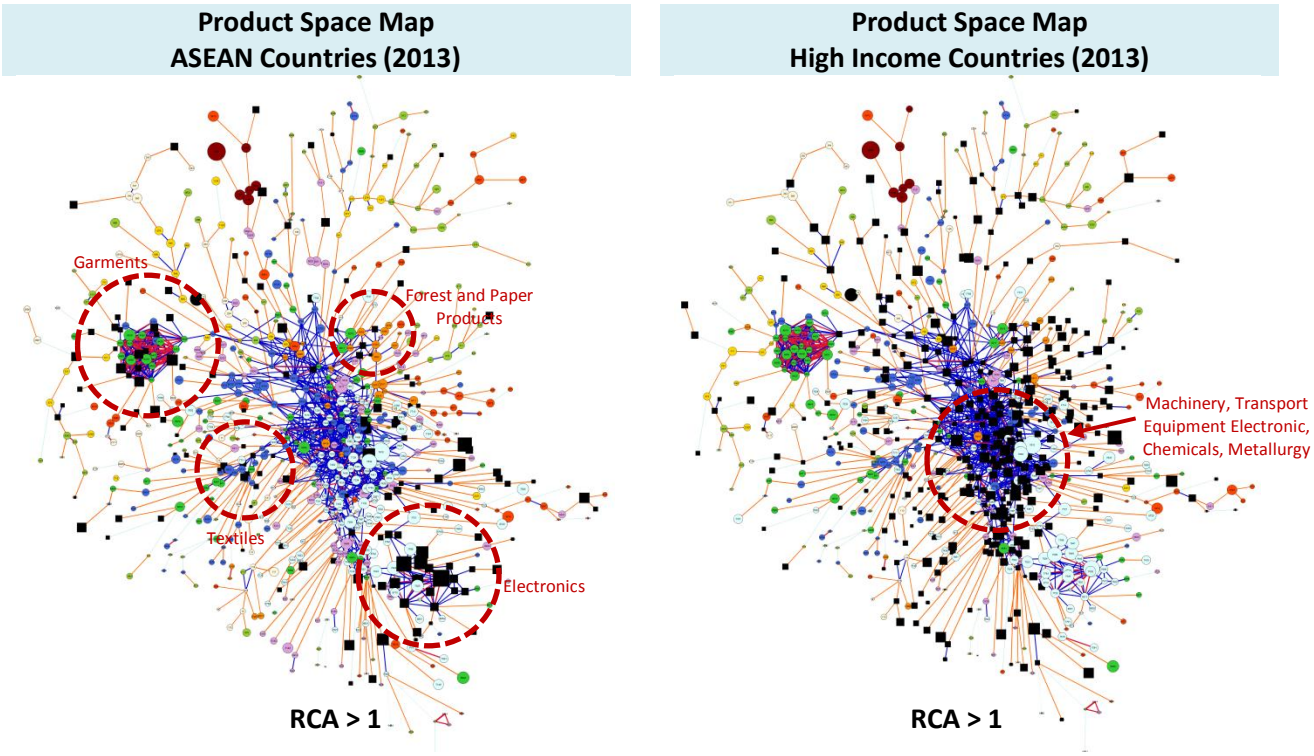


Figure **10** illustrates the comparison of product space map between ASEAN and high income countries. Every color on the network represents a specific sector (see Appendix **6** for details), where the black squares are the sectors on which the country have *Revealed Comparative Advantage* (RCA)>1. The notion of product space as proposed by Hidalgo et al (2007)[3] suggests that transition from less developed to developed country should be conditioned by promoting capital and skill intensive sectors, and gradually moving away from cheap labor & natural resource rent. Our calculation of the product space map for high income countries shows the importance of promoting capital & skill intensive export industries as a part of the overall growth strategy, i.e. metallurgy, simple machinery, chemical, transport equipment, electrical equipment and electronics.

[3] Product space mapping is implemented using an open source software Product Space Explorer (http://www.chidalgo.com/productspace/data.htm) and Cytoscape (www.cytoscape.org). Intra ASEAN trade is excluded for ASEAN's export calculation. We use Balassa's (1965) measure of revealed comparative advantage (RCA). Data to calculate the RCAs are from UN Comtrade Database.

5. Conclusion

This paper showed that ASEAN resembles a fully integrated economic zone, where the observed values confirm the theoretical share of Zipf's law. Under the assumption of equal access to technology and no barriers to factor mobility (physical and human capital), a greater integration will potentially benefit all members. The capacity to reap the full benefits would depend on the increase of intra and extra ASEAN trade, including trade in value added (TiVA) or participation in Global Value Chain (GVC).

Joint analysis on the internal and external competitiveness as a global hub suggests that China has the strongest "import productivity", that is the ability to generate large scale export after sourcing their inputs from external producers. It has been shown that access to large export markets is one of the key factors in ensuring "import productivity" within the GVC in most competitive global economies. This suggests that ASEAN as a zone must not lose sight of the importance of extra-ASEAN trade agreements, in addition to intra-ASEAN

The reported export value generated by MNCs is high in China, suggesting "high import (TiVA) productivity". On the contrary, ASEAN need to boost the investment to generate more exports and employment opportunities. Calculation of the product space map for high income countries shows the importance of promoting capital & skill intensive export industries as a part of the overall growth strategy, i.e. metallurgy, simple machinery, chemical, transport equipment, electrical equipment and electronics.

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Appendix 1

Technical Notes on the Progress of ASEAN Economic Integration

A. Theoritical Predictions

Under the assumption of perfect factor mobility (physical and human capital), and equal acces to technology, three theoretical predictions under fully Integrated Economy Area (IEA) can be proposed:

1. Each economy's shares of total IEA output, physical capital and human capital will be identical
2. Distribution of output and productive factors across IEA members would exhibit Zipf's law
3. Since the number of IEA members is fixed, then theoretical shares of each IEA member's productive factors can be computed

B. Equality of Output and Factor Shares

Output (Y_t) is assumed to be determined by physical capital (K_t) and human capital (H_t) under Constant Elasticity of Substitution (CES) production function:

$$Y_t = \gamma\{\delta {K_t}^{-\rho} + (1-\delta){H_t}^{-\rho}\}^{-1/\rho}$$

Assuming perfect mobility of physical and human capital between two countries, we expect each production factor to flow from low-return to high return country until the marginal productivity is equalized, then we obtain:

$$\frac{H_t}{H_t + H_t^*} = \frac{Y_t}{Y_t + Y_t^*} = \frac{K_t}{K_t + K_t^*}$$

if the countries are N:

$$\frac{H_{it}}{\sum_{k=1}^{N} H_{kt}} = \frac{Y_{it}}{\sum_{k=1}^{N} Y_{kt}} = \frac{K_{it}}{\sum_{k=1}^{N} K_{kt}}$$

interpreted as the shares of output, physical, and human capital are equal for each IEA member.

C. Distribution of Output and Productive Factors (Zipf's law)

Zipf's law establishes specific relationship among IEA members, that is, the share of output and productive factors will follow their rank, where the size of rank 1st will be twice of rank 2nd, three times of rank 3rd, and so on. We apply the results of Gabaix (1999) to assume that the IEA member shares will evolve as geometric Brownian motion:

$$\frac{dS_{njt}}{S_{njt}} = \mu dt + \sigma dB_t$$

where $S_{njt} > \min(S_{njt})$, μ and σ is the average and standard deviation of distribution share, $\min(S_{njt})$ is the lower bound, and B_t is wiener process.

D. Calculation for Integration Progress

We use the Kullback-Leibler Divergence (KLD) to measure the difference between two probability distributions (Bowen et al., 2010; Kullback and Leibler, 1951). By analogy, KLD can be applied in our context to measure the distance between actual and theoretical share distributions.

$$KLD(\bar{S}: S_t) = \frac{1}{3} \sum_{j=Y,K,L} \left(\sum_{m=1}^{M} \bar{S}_{mj} \, ln\left(\frac{\bar{S}_{mj}}{S_{mjt}}\right) \right)$$

where $\bar{S}_{mjt}$: observed proportion at the time t ;

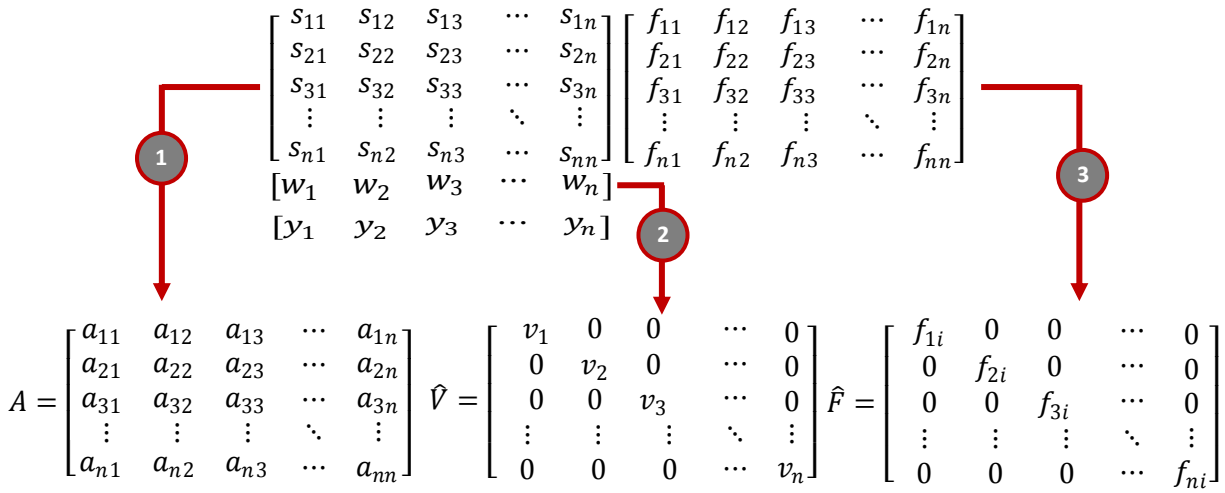
$\bar{S}_{mj}$: independent of time the theoretical share

Values of KLD range between zero and infinity. It is equal to zero (which is interpreted as the full integration). Furthermore, to measure the index of internal integration, we calculate the IKLD as the inverse of KLD, that is, $IKLD = \frac{1}{e^{KLD(\bar{S}:S_t)}}$.

Appendix 2

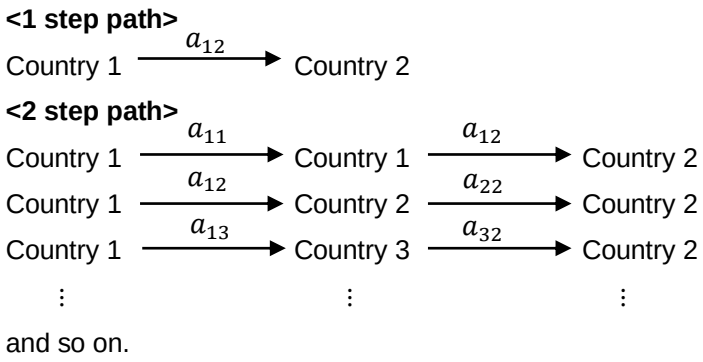
Technical Notes on the Triangular Trading Scheme

Figure a. Matrix Transformation for Triangular Trading Scheme



Suppose a production structure defined by the input coefficient matrix A shown in Figure **a**. Input coefficients a_{ij} are calculated from an input-output table by dividing input values of goods and services used in each industry by the industry's corresponding total output, i.e. $a_{ij} = s_{ij}/x_j$ where s_{ij} is a value of good/service i purchased for the production in industry j, and x_j is the total output of industry j. So, the coefficients represent the direct requirement of inputs for producing just one unit of output of industry j. We utilize the Leontief inverse matrix $\boldsymbol{L}$, which shows the total amount of goods and services required for the production of one unit of output, can be expanded as an arithmetic series $\boldsymbol{L = (I - A)^{-1} = I + A + A^2 + A^3 + A^4 + \cdots}$. It is immediately clear that the equation represents the decomposition of the total impact on output into its constituent layers according to the number of production stages involved. Matrix I corresponds to an initial (unit) demand injection and the following $\boldsymbol{A^k}$ are regarded as progressive impacts of the initial demand when supply chains are sliced at the $\boldsymbol{k}$-th stage of the production process (Figure **b**).

Figure b. Impact Delivery Path



The triangular trading scheme is constructed by multiplying the the Leontief matrix with the value added and final demand exports, that is

$$V * B * F.$$

Appendix 3

Technical Notes on the Updating AIO

The starting point of the updating procedure is the 2005 AIO table. In general, the 2013 value of a specific cell in the AIO table is calculated by multiplying the 2005 value of the cell by its nominal growth rate in 2013.

Formula

1. Intermediate demand block.

$$A_{t+1}^{ij} = A_t^{ij} * (int\ M_{t+1}^{*ij} / int\ M_t^{*ij})$$

2. Freight and Insurance int demand block.

$$BA_{t+1}^{j} = BA_t^{j} * ((int\ M_{t+1}^{*j} / int\ M_t^{*j})$$

3. Import int demand block.

$$A_{t+1}^{ij} = A_t^{ij} * ((int\ M_{t+1}^{*ij} / int\ M_t^{*ij})$$

4. Duties and Import Commodity Taxes

$$DA_{t+1}^{j} = DA_{jt} * ((int\ M_{t+1}^{*j} / int\ M_t^{*j})$$

5. Value Added

$$V_{t+1}^{j} = V_t^{j} * ((V_{t+1}^{*j} / V_t^{*j})$$

6. Total Intermediate Input / Output

ET_{in} = Intermediate demand block + Freight and Insurance + Import + Duties and Import Commodity Taxes.

ET_{out} = sum intermediate demand block (line base)

6. Total Input / Total Output.

$$XX_{in} = ET + Value\ Added$$

$$XX_{out} = XX_{in}$$

7. Final Demand Block.

$$cF_{t+1}^{ij} = cF_t^{ij} * (cM_{t+1}^{*ij}/cM_t^{*ij})$$

$$iF_{t+1}^{ij} = iF_t^{ij} * (capM_{t+1}^{*ij}/capM_t^{*ij})$$

8. Freight and Insurance Fin demand.

$$cBF_{t+1}^{j} = cBF_t^{j} * ((consM_{t+1}^{*j}/consM_t^{*j})$$

9. Import Fin demand.

$$cF_{t+1}^{ij} = cF_t^{ij} * (consM_{t+1}^{*ij}/consM_t^{*ij})$$

$$iF_{t+1}^{ij} = iF_t^{ij} * (capM_{t+1}^{*ij}/capM_t^{*ij})$$

10. Duties and Import Fin Demand.

$$cDF_{t+1}^{ij} = cDF_t^{ij} * (consM_{t+1}^{*ij}/consM_t^{*ij})$$

$$iDF_{t+1}^{ij} = iDF_t^{ij} * (capM_{t+1}^{*ij}/capM_t^{*ij})$$

11. Value added Fin Demand.

$$C_{t+1}^{j} = C_t^{j} * (C_{t+1}^{*j}/C_t^{*j})$$

$$I_{t+1}^{j} = I_t^{j} * (I_{t+1}^{*j}/I_t^{*j})$$

12. Export Block.

$$L_{t+1}^{ij} = L_t^{ij} * (EX_{t+1}^{*ij}/EX_t^{*ij})$$

13. Statiscal Discrepancy.

$QX = Total\ output\ (XXout)$- total intemediate output (ET_{out})– final demand - export

Appendix 4

Spearman Rank Correlations between Output (Y) and Human Capital (H), and Physical Capital (K)

	y & h			y & k			k & h		
	Rho	tstat	Prob	Rho	tstat	Prob	Rho	tstat	Prob
1997-2012	0.78	3.33	0.01	0.98	14.31	0.00	0.77	3.16	0.02
2001-2012	0.77	3.16	0.02	0.95	8.05	0.00	0.85	4.27	0.00

Notes: y = output share; h = human capital share; * n = 9

Seemingly Unrelated Regression Estimates of Output and Factor Share Equations

		1997-2012			2001-2012		
		Intercept	Slope	Adj R2	Intercept	Slope	Adj R2
n=9	y on h	0.851	0.851 ***	0.627	-0.470	0.832 ***	0.653
	y on k	0.938	0.938 ***	0.961	-0.175	0.935 ***	0.958
	h on k	1.078	1.078 ***	0.748	0.295	1.104 ***	0.777

y = output share; h = human capital share; k=capital share, n = 9

OLS Estimates of Parameters with Respect to the Share of Output, Physical and Human Capital

		1997-2012			2001-2012		
		Intercept	Slope	Adj R2	Intercept	Slope	Adj R2
n=9	Y	-0.211	1.959 ***	0.701	-0.228	1.940 ***	0.698
	H	-0.588	1.698 ***	0.435	1.170	1.729 ***	0.437
	K	-0.250	1.947 ***	0.684	0.796	1.922 ***	0.674

y = output share; h = human capital share; k=capital share, n = 9

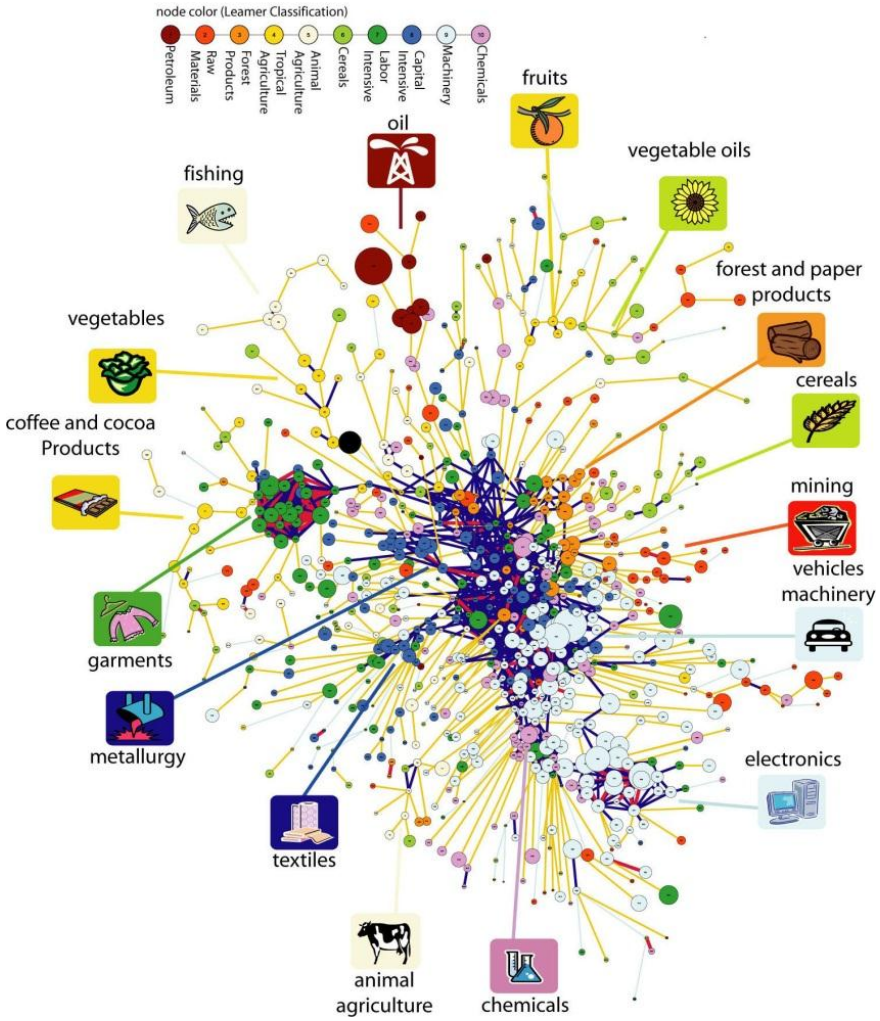
Appendix 5

Top 10 Hub Exporters in Aggregate Medium-High Tech Industries
(Values in US$ Million)

No	Negara	Total FVA	FVA for Domestic	FVA for Export	%DOM	%Ekspor	Skala
1	China	466,611	311,624	154,987	67%	33%	28%
2	EU	275,645	210,147	65,499	76%	24%	12%
3	United States	216,337	154,980	61,358	72%	28%	11%
4	Korea	100,379	44,751	55,629	45%	55%	10%
5	ASEAN	115,622	71,138	44,484	62%	38%	8%
6	Mexico	57,371	18,110	39,261	32%	68%	7%
7	Japan	112,305	82,483	29,822	73%	27%	5%
8	Taiwan	47,338	19,449	27,888	41%	59%	5%
9	Canada	44,987	17,595	27,392	39%	61%	5%
10	India	61,348	51,370	9,979	84%	16%	2%
World				562,407			

Appendix 6

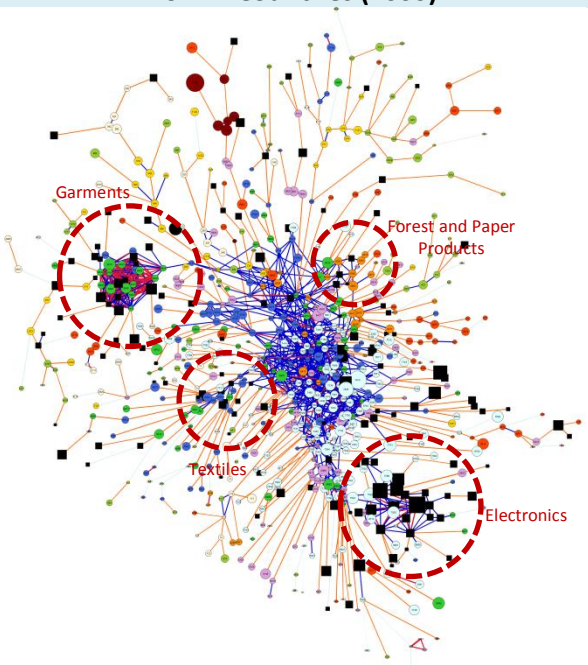
Properties of Product Space Network



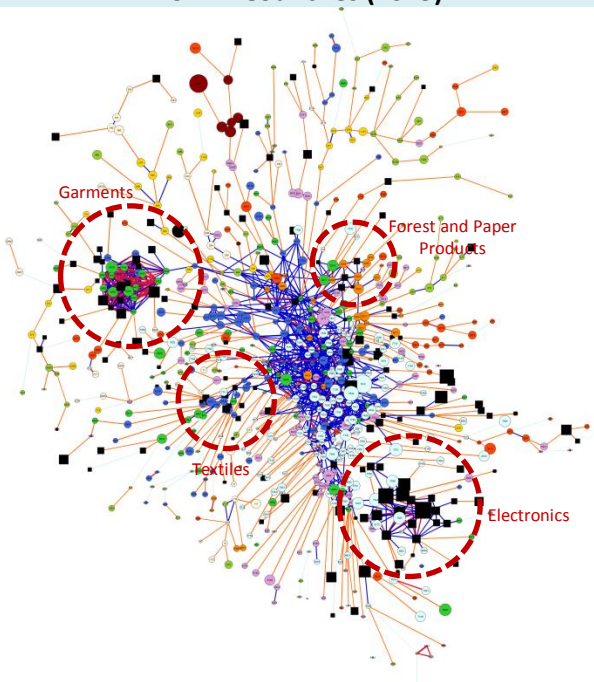
Appendix 7

Product Space Map ASEAN (2000,2013), Upper Middle Income (2013) and High Income (2013)

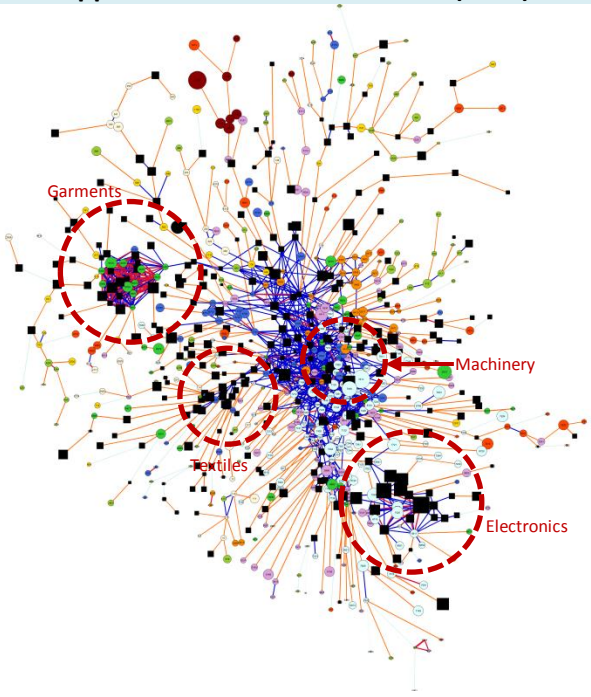
Product Space Map
ASEAN Countries (2000)



Product Space Map
ASEAN Countries (2013)



Product Space Map
Upper Middle Income Countries (2013)



Product Space Map
High Income Countries (2013)