

Chapter 12

Manufacturing of Refrigerators

David Sit¹

12.1. Introduction

This series of case studies seeks to understand better the role of services in global value chains (GVCs) and examine how policies may impact the configuration, location and operation of value chains. The company in this case study is a Japan-based multi-product conglomerate that specializes in infrastructure systems, energy solutions, and information and telecommunication systems. It also produces a range of capital goods, consumer goods, and services, including logistics, distribution, and financial services. This case study explores a value chain that manufactures, sells, and services home appliances.

Total revenue of the group was over USD 4 billion in FY2013. Home appliances account for approximately 10 per cent of the group's revenue. Key products for the consumer market include refrigerators, air conditioners, vacuum cleaners, rice cookers and other home appliances.

The company has a global production and distribution network. In addition to manufacturing plants in Japan, within the Asian region the company has established important manufacturing bases in Thailand, Malaysia, the Philippines and China. Each of the facilities is responsible for the production of one or more product categories for its domestic market and for exports. The company's biggest market is its home market, where products are sold in the company's own 4,500 sales outlets as well as through other retailers. The company also owns a number of subsidiaries in South East Asia, India, Middle East, the United States and the United Kingdom for sales, marketing and after-sales services.

This case study focuses specifically on the manufacture of refrigerators in Thailand. The company's Thai factory is located in an industrial estate in the neighborhood of Bangkok, and it produces a wide range of products in the company's portfolio. The factory has approximately 5000 staff, with 30 Japanese engineers. Refrigerators are manufactured in this factory and shipped to markets in Southeast Asia and East Asia. Issues arising in respect of the value chains of other products manufactured at other production sites will also be discussed to provide a comprehensive view of policy affecting the home appliance sector.

The case study is structured in the following way. Part 2 will map out the value chain. Part 3 will analyze how services enter the value chain. Part 4 will discuss how policies relating to foreign investment restrictions, foreign labor restrictions and other areas affect the value chain.

12.2. Mapping the Value Chain

The company, together with its affiliated companies, is involved in every stage of the value chain from pre-production procurement of raw materials and parts to after-sales customer services.

The value chain begins at the procurement of raw materials and parts. Modern refrigerators require a long list of inputs. The exterior shell is usually made with metal and coated with paint. The interior cabin is usually made from plastics. Metal sheets, chemicals for the paint, and plastics are procured

¹ Research Analyst at Fung Global Institute

locally from third party suppliers. Key components such as compressors and motors involving technologically advanced manufacturing are procured within the firm's family of companies. To guarantee quality, most of them are manufactured in either factories of the group in Thailand or imported from the group's factories in Japan.

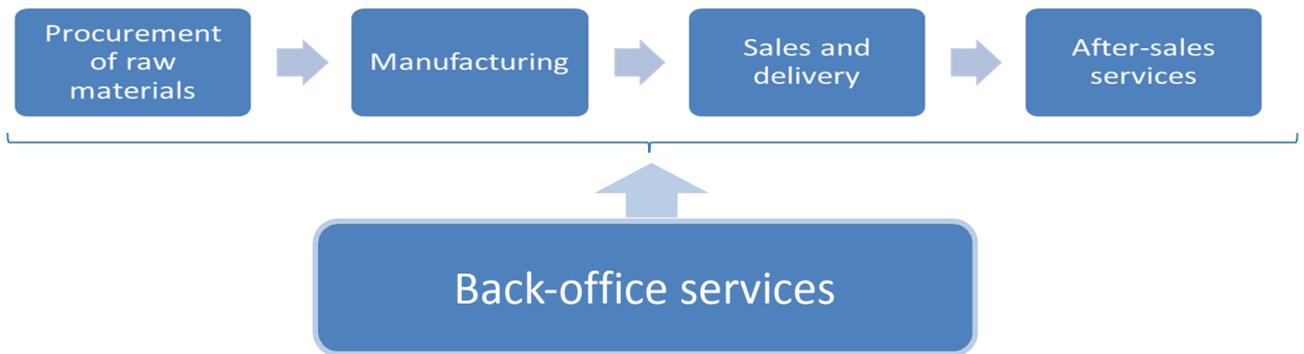
Modern refrigerators such as the company's product involve the use of computer chips and programming software which are also provided from within the company group. All the materials and components are shipped from suppliers to the manufacturing plant by an affiliated logistics company. This logistics company supports the group's international operations by providing international forwarding, warehousing and distribution services. The Thai subsidiary of this logistics company is an affiliate in which the group owns minority shares. Raw materials and components are shipped to the factory by sea, road or rail.

After the raw materials arrive in the factory, they are stored in on-site warehouses before they are used on the manufacturing line. A typical refrigerator manufacturing process requires the assembly of three parts, namely the exterior shell, the interior cabin and the cooling mechanism. Standard procedures for manufacturing the outer shell involve cutting and welding sheets of metal into appropriate sizes and spraying them with a coat of paint. The interiors of the refrigerators are usually made of plastic that require moulding and shaping before being placed on the assembly line. Tubes for refrigerant, water and electrical wires must be installed within the inner cabinet and connected to the mechanical parts. The back panel is then assembled with the compressor and storage tank for refrigerant. Finally, the doors are installed and fitted with seals. The assembly line will put together all these components.² After the refrigerators pass their post-production quality inspections, they will be packed with foam and boxes and shipped to distributors in Thailand, as well as overseas markets.

The company has subsidiaries in many economies who act as distributors. The company does not own retail outlets in Thailand, but they work with local retail stores and distribution channels that eventually become their long-term business partners. The company works with these partners on marketing, sales and post-sales services. The company prepares advertising materials and plans advertisement campaigns for its products. In addition, the company hires agents to promote the company's products in retail stores. Home electrical appliances of the company come with warranty services for repair and maintenance for up to five years. Many of the repair service stations are outsourced to retailers, while some are maintained in-house by the company. Complicated maintenance operations requiring specialized engineering services will be brought back to the company. The company maintains call centers for technical supports to customers. In addition to typical after-sales services, the company also provides recycling services in Japan. Business customers who purchase the company's products may also negotiate hire purchase plans supported by the financial services arm of the group.

To support a global value chain, a comprehensive set of back-office services is required. Among them are various management services, utilities and research and development for new products which help the company to maintain its cutting edge. Service companies owned by the group contribute to product designs by collecting feedback from customers and user experiences. Figure 12.1 provides a brief overview on the value chain.

² Manufacturing procedures for refrigerators are described with reference to <http://www.madehow.com/Volume-1/Refrigerator.html>

Figure 12.1. Overview of Value Chain

Source: Courtesy of the company

12.3. Services in the Value Chain, Outsourcing and Bundling

For ease of analysis, the value chain is disaggregated into five stages, namely pre-manufacturing, manufacturing, sales, back-office services, and after-sales services. A list of services inputs to the value chain can be found in Appendix A.

The number of services that are used in this value chain is estimated to be 55. Approximately half (25) of the services are back-office services, followed by 12 in the manufacturing stage, and 9 in the procurement process for raw-materials procurement. The large number of service inputs at the back-office stage is not surprising for a complicated GVC that requires support services at every stage of the chain.

Outsourcing

Among the 55 services in the value chain, 31 services (56% of all services) are outsourced or partially outsourced to third-party services providers who are not members or affiliates of the group.

There are three main reasons why the company outsources service inputs in the value chain. The most common reason for outsourcing is for efficiency and cost saving. With modularization of tasks in GVCs, third parties can compete to be part of the value chain of multinational corporations (MNCs), offering quality services at lower costs. The company, as the lead firm in the value chain, can outsource services for cost minimization. In some industries, outsourced suppliers may be able to attain economies of scale therefore they are capable of providing services to the company at a lower cost than the company would be able to provide itself. An example is the MNC that provides IT services to the company. The IT service provider is able to take advantage of its existing network, allowing it to operate IT functions at a lower cost than if the company operated the functions itself.

Lack of expertise, local knowledge or local connections are other reasons for outsourcing. Local connections in some economies are essential for the company to expand to the market more efficiently. That is one of the reasons why the company cooperates with local retailers with long-term business relationships rather than operating in-house retail stores.

Government regimes may sometimes necessitate outsourcing. When these services are efficiently supplied, they add value to the company and to society as a whole. For example, safety inspections in factories help to minimize the likelihood of industrial accidents; standard conformity requirements ensure products are safe for public use, also adding to the goodwill enjoyed by the company. On the

other hand, if government lacks the capability to carry out policy efficiently, deadweight social and private costs may be incurred.

Bundling

Bundling is a way of offering goods together with services in a single offering. This can enhance efficiency, support innovation, and help the company generate higher revenues from their products. In this value chain, the company offers warranties for their products. This is essentially bundling insurance, and repair and maintenance services with the physical product. The company expands its product portfolio in this way. It also creates a positive signaling device to customers on the quality of the products, enabling company to sell more products and at a price premium. The same happens on the input side when the company purchases machinery that is bundled with maintenance.

12.4. Policy Interfaces

Foreign investment restrictions

Restrictions on foreign equity ownership are not uncommon in many economies, particularly developing economies. While foreign equity restrictions in respect of manufacturing activities tend to be more relaxed, restrictions in many services sectors are still prominent. These restrictions can hinder value chain operations and reduce efficiency.

A 2014 OECD report on FDI restrictions in ASEAN economies identifies three major types of restrictions – namely, limitations on foreign equity ownership, screening or approval for foreign investments, and restrictions on land ownership. The OECD's FDI Regulatory Index suggests the restrictions are generally more severe in ASEAN economies than the OECD average, particularly in services sectors such as distribution, construction, media, communications, financial services, business services and real estate investment.

The wholesale and retail sector, which one of the most relevant services to the company in this case study, faces a range of different restrictions in several ASEAN economies. The restrictions include foreign equity ownership limitations, scale of operation requirements, and limitations on the type of goods sold (OECD, 2014; Aldaba & Pasadilla, 2010).

The company in this case study, for example, has been affected by such restrictions in one ASEAN economy. A newly enacted government order restricts foreign equity ownership for wholesale, distribution and after sales services to 33 per cent. The company had established a local distribution subsidiary years before the new rule was promulgated. The equity was shared between the group (67.5 per cent) and local partners (32.5 per cent). A grandfather clause in the new arrangement allowed the company to maintain the existing ownership structure at the same scale of equity capital. However, the new rule mandates any subsequent changes in the size of equity capital must observe the 33 per cent rule³.

This new rule hinders the company's ability to inject new capital into the subsidiary in question. This is because the local partner is unwilling to invest new capital. The company does not want to incur the costs and uncertainty of seeking equity investments from other local partners, leaving the company no

³ Unless the change in equity share is for expansion purposes. In the case study firm's case, the intended equity infusion is to pay off loans to the company group's finance affiliate, a purpose which is not covered by the grandfather concession.

room to further expand business in the economy. The company also reported frequent changes to requirements of this nature, which increases uncertainty in the business environment.

In other economies, the company works well with local partners in distribution activities despite holding minority shares in joint venture arrangements. Although joint venture relationships can be difficult if government regulations are constraining, local partners contribute to the value chain with local expertise, market experience and local connections. The company treasures trustworthy local partners for long-term business relationships that also help them guarantee quality services to customers.

Foreign labor restrictions

Foreign labor regulations restrict the conditions under which foreign employees can work in an economy. Work permits for foreign personnel may be subject to quota or outright prohibition. The latter is the case in some ASEAN economies for professional services in particular (e.g. medical, legal).

While protection for local employment may make sense in some situations, restrictions on professionals and technicians can hinder value chain operations if there is a lack of available skills locally. In addition, excessive restrictions on foreign skilled labor are likely to impede knowledge transfer to local workers – a vital issue from a developmental perspective.

An example of such a restriction is Thailand's Alien Working Act, B.E. 2551 (2008), which governs approval of work permits for employment of foreign workers. Based on this act, the government outlines clear requirements on paid-up capital associated with foreign labor employment. For every THB 2 million paid-up capital, a company can employ one additional foreign employee up to a maximum of ten. If a company wishes to employ additional foreign workers, it has to employ more than 100 local personnel, pay at least THB 3 million in corporate income tax during previous year, export at least THB 30 million worth of goods or bring in more than 5,000 foreign tourists in the previous year.

The company's manufacturing plants in Thailand employ more than 5,000 workers, so the company generally has no difficulty in acquiring work permits. However, some services businesses, particularly in distribution, may have been affected. Generally speaking, work permits for foreign staff in the Asia-Pacific region are not very challenging to the company.

Issues relating to standards conformity

Standards are becoming more pervasive and challenging as production and consumption activities increasingly cross frontiers, and awareness grows of such matters as environmental protection and consumer health and safety. Standards promulgated and enforced by governments are largely predicated on public policy objectives. In addition, standards may help to enhance GVC participation by addressing information asymmetries among different parties involved in GVCs, act as a signaling tool on quality issues, and enhance competition through standardization and modularization (Tijaja 2013).

An example of a cost-augmenting standards regime faced by the case study firm comes from uncertainty in implementation. In 2008, an economy in East Asia implemented new standards on 13 categories of IT-related products. The new standards regime appears to require that certain information relating to source codes be submitted for the products that use these IT components. The guidelines are not very clear on the extent source codes shall be disclosed. In order to minimize risk and protect its most up-to-date source codes from disclosure, the company decided not to sell its most modern product models to the market concerned. Other common issues that add to cost are overlapping standards conformity assessment requirements and complicated paperwork.

Customs regimes and efficiency

As the law enforcement entity at the border, the customs authorities provide important regulatory services. Customs collect tax revenue, prevent smuggling of dangerous goods and protect consumers by checking conformity of standards and guarding against counterfeit goods (Grainger 2008). However, customs procedures can add extra costs to value chain operations if not carried out efficiently.

The company featured in this case study often experiences delays in customs procedures in a number of South East Asian economies. Delays in imports of key components can cause delay in production schedules, which adds cost in storage, transportation and manufacturing.

To get around this issue, the logistics company in the group often hires local agents to handle customs procedures. In some economies, customs agents have to be licensed third-parties. While firms may choose to outsource these functions to a third party even if they were not obliged to, the costs arise if the service is unduly expensive or inefficient. Table 12.1 summarize how policies affect the value chain.

Table 12.1. Policies affecting the Value Chain

Government policies/services	Authority(ies) in charge	Details	How the policy affects services in the value chain
Customs procedures <ul style="list-style-type: none"> • Inefficiency in customs clearance • Compulsory customs agents 	Customs	The company is required to clear imports with customs	Inefficient customs procedures dictate the need for a local agent, imposing extra costs on the company
Foreign equity restrictions <ul style="list-style-type: none"> • limitation on share of foreign equity • limitation on sector of business • restriction on ownership of key resources such as land 	Ministry of Commerce / Ministry of Investment	The company is prohibited from ownership of equity beyond a certain percentage	May necessitate involuntary partnership with local agents or other service suppliers, adding extra costs for the company.
Foreign labor Restrictions <ul style="list-style-type: none"> • Quota on work permits • Forbidden sectors for foreign workers 	Ministry of Labor	Work permits for foreign labor may be restricted by quantity or other terms. Some sectors may only be open to local employees.	May cause a lack of skills for operations
Standards on products	Standards conformity regulatory agencies	Standards requirements may sometimes not well- defined. Duplicating conformity and certification requirements exist.	Add uncertainty and cost to the value chain for testing and certification.

Appendix A

Table A.1. Raw-materials, input/pre-production stage

<i>Stage/ Category</i>	<i>Service</i>	<i>Central Product Classification (CPC) Ver.2 Code</i>	<i>Outsourced or in-house/in-group provision</i>
1. Procurement of raw materials	1. Procurement agent for raw material sourcing	85999 - Other support services n.e.c.	In-house or in-group. The company procures raw materials directly from third parties
	2. Customs-related services for raw materials imported	85999 - Other support services n.e.c.	Outsourced. The company employed local agents to handle imports and exports
	3. Quality assurance services (of raw materials)	83441 - Composition and purity testing and analysis services	In-house
2. Logistics	4. Freight transportation services (of raw materials) by road, rail, sea or air	Division: 65 - Freight transport services	Possibly in-group and outsourced. Logistics services are provided by in-group logistics company. Actual delivery may be outsourced to third-parties
	5. Repair and maintenance for fleets	87143 - Maintenance and repair services of trailers, semitrailers and other motor vehicles n.e.c.	In-house and outsourced
3. Storage	6. Storage of raw materials – general storage	67290 - Other storage and warehousing services	Possibly in-house. Must be located near factories.

4. Research and Development	7. Conception and design of product	83920 Design originals	In-group. The company houses industrial design and engineering centres.
	8. Patent acquisition	83960 Trademarks and franchises n/a	In-house.
	9. Product development/ R&D for new technology	81129 - Research and experimental development services in other engineering and technology 81400 - Research and development originals	In-group research and development centres.

Table A.2. Manufacturing stage

<i>Stage/ Category</i>	<i>Service</i>	<i>Central Product Classification (CPC) Ver.2 Code</i>	<i>Outsourced or in-house/in-group provision</i>
1. Production administration	10. Production Administration - Production management	83115 - Operations management consulting services	In-house. In-house team manages production.
	11. Production Administration - Quality assurance and compliance with ISO	83441 - Composition and purity testing and analysis services	Possibly in-house.
2. Services supporting factory daily operations	12. Cleaning services of factory	85330 - General cleaning services	Possibly in-house
	13. Engineering Services	83310 - Engineering advisory services	In-house. The company's engineer team provides engineering services.
		Class: 8332 - Engineering services for specific projects	
	14. Security guards for factory and warehouses	85250 - Guard services	Possibly outsourced. Specialized security firms enjoy benefits from network effects.
	15. Sewage water treatment services	94110 - Sewerage and sewage treatment services	Possibly outsourced. Infrastructure is generally provided by host economies.
	16. Repair and maintenance services of machines and equipment in the factory	87156 - Maintenance and repair services of commercial and industrial machinery	Outsourced. Machinery and equipment providers offer maintenance for machines.
17. Waste collection and recycling services		Class: 9421 - Collection services of hazardous waste	Possibly outsourced.
		94229 - Collection services of non-hazardous recyclable materials, other	
		94239 - General waste collection services, other	

<p>3. Services from government regulation requirements</p>	<p>18. Government inspections on fire prevention, health hazards, environmental protection and other aspects.</p>	<p>91133 - Public administrative services related to mining and mineral resources, manufacturing and construction 91290 - Public administrative services related to other public order and safety affairs</p>	<p>Possibly in-house and outsourced. Government provides inspection services. Company may have to prepare documentation for inspection from time to time.</p>
<p>4. Worker- related services</p>	<p>19. Catering services for workers</p>	<p>63393 - Other contract food services</p>	<p>Possibly outsourced to local suppliers</p>
	<p>20. Dormitory for factory workers</p>	<p>63220 - Room or unit accommodation services for workers in workers hostels or camps</p>	<p>Possibly in-group. Japanese large companies usually offer dormitory for factory staff.</p>
	<p>21. Transportation services for employees</p>	<p>64114 - Local special-purpose scheduled road transport services of passengers</p>	<p>Possibly outsourced to local transportation companies.</p>

Table A.3. Delivery and sales/post-manufacturing stage

<i>Stage/ Category</i>	<i>Service</i>	<i>Central Product Classification (CPC) Ver.2 Code</i>	<i>Outsourced or in-house/in-group provision</i>
1. Delivery to wholesaler/retailer	22. Land transport of products to distributors	65112 - Road transport services of freight by tank trucks or semi-trailers	Partially in-group and partially outsourced. In-group logistics company arranges deliveries
	23. Sea transport of products to distributors	65219 - Other coastal and transoceanic water transport services of other freight	Partially in-group and partially outsourced. In-group logistics company arranges deliveries.
2. Sales services	24. Retail trade services - distributors	Group of 621 - Non-specialized store retail trade services	In-house. Subsidiaries of the firm act as distributors in different economies
		Group of 622 - Specialized store retail trade services	
	25. Retail Administration Operation management	83115 - Operations management consulting services	Outsourced to retailers.
		83116 - Supply chain and other management consulting services	
	26. Storage and warehousing services for machineries at distributors	67290 - Other storage and warehousing services	In-group. In-group logistics firm and subsidiaries provide warehousing for products to be sold
27. Financing services for customers	71140 Financial leasing services	In-group. In-group financial company offers hire purchase schemes to customers.	

Table A.4. Back-office, utilities and general services

<i>Stage/ Category</i>	<i>Service</i>	<i>Central Product Classification (CPC) Ver.2 Code</i>	<i>Outsourced or in-house/in-group provision</i>
1. Finance	28. Auditing on financial accounts	Group of 822 - Accounting, auditing and bookkeeping services	Outsourced as required by legislation. In-company accounting department assists in preparing documents for auditing.
	29. Financial services	71121 - Deposit services to corporate and institutional depositors	Possibly outsourced to large multinational banks.
		71313 - Group pension services	
		71701 - Services of holding equity of subsidiary companies	
	30. Internal auditing (including audits of financial accounts and corporate governance)	Group of 822 - Accounting, auditing and bookkeeping services	In-group.
		83118 - Head office services	
31. Insurance services for machinery used in factory	71334 - Other property insurance services	Possibly outsourced to large multinational insurance companies.	
32. Insurance for staff	71321 - Accidental death and dismemberment insurance services	Possibly outsourced to large multinational insurance companies.	
	71322 - Health insurance services		
2. General Management	33. Business and management consultancy services	Class of 8311 - Management consulting and management services	In-house.
	34. Company secretary services	83990 - All other professional, technical and business services, n.e.c.	In-house. As listed company, it employs its own company secretary.

	35. Corporate communications, marketing and public relationship	83114 - Marketing management consulting services 83121 - Public relations services	In-group corporate communications department responsible for corporate communications and marketing.
	36. Courier, postal and local delivery services	Group of 681 - Postal and courier services	Possibly outsourced
	37. Estate management	72112 - Rental or leasing services involving own or leased non-residential property	Possibly in-group
	38. Human resources management	83113 - Human resources management consulting services	In-group human resources departmen.
	39. Human resources management -Personnel search and referral services	Class of 8511 - Personnel search and referral services	In-group human resources department. Agents might be needed to recruit locally
	40. I.T. and information system management, consulting and support, with webpage development	Class of 8313 - Information technology (IT) consulting and support services Class of 8314 - Information technology (IT) design and development services Class of 8316 - IT infrastructure and network management services	In-group and outsource. In-group IT division and outsourced MNC IT service provider provide comprehensive IT services
	41. Safety and security services	85230 - Security systems services 85250 - Guard services	Possibly outsourced. Local security firms enjoy network effects and connection with legal enforcement

3. Legal	42. Telecommunication services	Group: 841 - Telephony and other telecommunications services 84210 - Internet backbone services 84221 - Narrowband Internet access services 84222 - Broadband Internet access services	Outsourced. Host economies provide telecommunication services
	43. Uniform -Design and alternation	83919 - Other specialty design services	Possibly outsourced
	44. Uniform -Laundry	97130 - Other textile cleaning services	Possibly outsourced
	45. Legal services	82120 - Legal advisory and representation services concerning other fields of law 82130 - Legal documentation and certification services	In-group and possibly outsourced. Legal department exists within corporate structure. Possibly outsourced to local legal experts in some economies.
4. Advertisement	46. Retail Administration-Advertising	83611 - Full service advertising	Partially in-house and partially outsourced. Subsidiaries in different economies plan advertisement campaigns. Retailers also promote products on their own
	47. Advertisement – advertisement agencies services	83611 - Full service advertising 83620 - Purchase or sale of advertising space or time, on commission	
	48. Advertisement – designers’ services	83611 - Full service advertising	
	49. Advertisement – cameramen, directors, photographers and models.	83611 - Full service advertising	
3. Utilities	50. Electricity supply	Class of 8631 - Support services to electricity transmission and distribution	Possibly outsourced to local utilities suppliers.

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	51. Gas supply	86320 - Gas distribution services through mains (on a fee or contract basis)	Possibly outsourced to local utilities suppliers.
	52. Water supply	86330 - Water distribution services through mains (on a fee or contract basis)	Possibly outsourced to local utilities suppliers.

Table A.5. After-sales services

<i>Stage/ Category</i>	<i>Service</i>	<i>Central Product Classification (CPC) Ver.2 Code</i>	<i>Outsourced to third-parties</i>
1. Sales/After-sales Customer services	53. Customer services – complains and compliments handling	85931 - Telephone call centre services	In-house. Provided by subsidiaries.
	54. Customer services – Technical support	85931 - Telephone call centre services	In-house. Provided by subsidiaries.
2. Repair and maintenance	55. Repair and maintenance of machines for customers	87156 Maintenance and repair services of commercial and industrial machinery	Partly in-house and party outsourced. Service stations are set up mostly by retailers for maintenance. Complicated repairs will be brought to the company.

References

- Aldaba, R.M. and G.Pasadilla (2010). “The ASEAN Services Sector and the Growth Rebalancing Model.” ADBI Working Paper Series No. 246. ADBI: Tokyo. Retrieved from <http://www.adbi.org/working-paper/2010/09/07/4059.asean.services.sector.growth.rebalancing/>
- Grainger, A. (2008). “Customs and Trade Facilitation: From Concepts to Implementation.” *World Customs Journal*, 2(1), 17-30. Retrieved from http://www.worldcustomsjournal.org/media/wcj/-2008/1/customs_and_trade_facilitation_from_concepts_to_implementation.pdf
- OECD (2014). “Southeast Asia Investment Policy Perspectives.” OECD Publishing: Paris. Retrieved from <http://www.oecd.org/daf/inv/investment-policy/Southeast-Asia-Investment-Policy-Perspectives-2014.pdf>
- Tijaja, J. (2013). “Standards in Global Value Chains: Rationale, Role and Implications.” Fung Global Institute: Hong Kong. Retrieved from http://www.fungglobalinstitute.org/en/wp-content/uploads/WP_Standards_0.pdf