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The Rising Role of Re-exporting Hubs in Global Value Chains

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Abstract

The evolution of re-exporting hubs, entrepôts, is explored in this paper by looking at trade patterns of merchandise re-exports over the last 20 years through three key economies (Hong Kong, Singapore, and the United States), and their inter- and intra-regional linkages. The growth of re-exports of intermediate goods during this period suggests that these economies are playing an increasingly important role in global value chains (GVCs) by acting as hubs in regional supply chains. Findings also indicate that high volumes of intermediate goods that are re-exported appear in sectors in which GVCs have a strong presence, as in the case of semiconductors.

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I. Introduction

An entrepôt is a port or city that serves as a centralized location for trade, where traders specialize in matching buyers and sellers from different foreign economies. Entrepôts have always been an important feature of global trade, facilitating logistics and the exchanges of information between foreign trading partners such as the outposts and port cities of the maritime Spice Routes, dating to 2000 BC, and those along the Silk Road in the third century BC.[1] When technology was less advanced and communication costs were high, few could participate in global trade without intermediation through an entrepôt. Today, although advancements in technology and reductions in communication costs have drastically changed the preconditions for entrepôt trade[2] (or re-exports, as this paper will refer to this type of trade), it remains a crucial aspect of international merchandise trade. The rising value and share of re-exports in global trade raise questions about the role of re-export hubs in the modern trade landscape. To address these issues, three topics are investigated in this paper: the trade pattern of re-exports in the past two decades, the evolution of re-export hubs into regional supply chain hubs, and the role of services in re-export hubs as key enablers of modern supply chains.

The rest of the paper is organized as follows: section II provides an overview of the literature on re-exports and the recent literature on regional supply hubs; section III presents stylized facts of merchandise re-exports by select re-export hubs—Hong Kong, Singapore, and the United States—and highlights semiconductors, the key product in electronic components and boards (ECB)[3] re-exported by these economies; section IV discusses the development of semiconductor global value chains (GVCs)[4] and related trade; section V describes GVC-enabling services provided by these major re-export hubs; and section VI summarizes the major findings.

II. Literature Review

Despite the longstanding presence of re-exports in global trade, most international economic theories and trade models assume that trade occurs directly between producers and final users.[5] The omission of re-exports in international trade analysis not only presents an incomplete picture of the movement of goods, but also fails to recognize the value generated by re-exporting. Compared to direct exports, re-exports incur additional costs as a result of their extended trading

[1] UNESCO, *Silk Roads: Dialogue, Diversity & Development* (accessed October 23, 2019).
[2] This paper considers entrepôts as entities at the economy-level. See the appendix for a more detailed statistical definition of re-export trade.
[3] This sector includes products such as electronic integrated circuits (HS8542), electronic printed circuits (HS8534), diodes, transistors and semiconductors (HS8541), and other semiconductor related parts and components.
[4] Based on the value-chain reference model developed by Stacey Fredrick, this paper differentiates value chains from supply chains. Value chains refer to the entire process of bringing a product from a concept to end users. It includes six broad steps: research and development, design, production, logistics, marketing, and after-sale services. Supply chains mainly corresponds to the production step of value chains. It describes the physical movement of goods in the production process, with four basic stages: raw inputs, components and parts, final products, and distribution and sales. Frederick, "Development and Application of a Value Chain Research," 2010; Frederick, "Combing the Global Value Chain and Global I-O Approaches," September 29, 2014.
[5] Feenstra and Hanson, "Intermediaries in Entrepôt Trade," February 10, 2004, 3.

route through intermediary economies. These costs can be both direct, such as extra transport and storage costs, and insurance expenses, and indirect, such as the costs associated with the additional procedures and waiting time required to clear customs in the re-exporting economies. As a result, the price paid by the end user of re-exported goods is usually higher than that of directly exported goods, as it contains a markup to cover these additional trade costs. In the context of global supply chains and growing intermediate goods trade, these additional costs can be compounded when intermediate goods cross borders multiple times.[6] Despite this fact, the share of re-exports in global trade continues to grow in the age of GVCs, suggesting that the benefits of re-exporting are enough to offset the additional trade costs. The following review of the literature seeks to explain this phenomenon, highlighting the motivating factors behind re-exports.

Literature on Re-exports

There is limited economic literature on the dynamics of re-exports. This is likely indicative of the scarcity of re-export data, rather than a lack of interest in research. For example, in 2004, of the 210 reporters in the United Nations' (UN) Comtrade system—an international trade statistics database maintained by UN—118 had never reported data on re-exports.[7] Unsurprisingly, the majority of available re-export literature focuses on Hong Kong, the only economy that compiles and publishes high-quality, comprehensive re-export data containing information on both country of origin and destination at a detailed product level.

The literature that does exist focuses on the role of re-export hubs as intermediaries in international trade. This literature cites traders' distribution networks and market knowledge, efficiency gains from superior logistical infrastructure, opportunities for tax and tariff avoidance, and reliance on intermediaries to assist with trade financing as some of the major motivating factors of re-exports.

Filling in the Information Gap

As the existence of re-exports is predicated on the added value of a third party for intermediating merchandise trade flows, the literature on trade intermediaries offers valuable insight. Trade costs increase when buyers have limited knowledge of the quality of suppliers, or when suppliers possess limited information on the preferences of buyers. Intermediaries provide market knowledge to mitigate these costs by filling in information gaps for buyers and sellers. Studies found that intermediaries were often used by firms from countries that had little or no exposure to trading in certain destination markets,[8] and were typically a larger portion of total trade from source markets to destination markets with high fixed costs to entry.[9]

With a cluster of knowledgeable traders who employ extensive information exchange and product distribution networks, re-export hubs serve an intermediary role at the international level, facilitating goods exchange between buyers and sellers located in different countries. For instance,

[6] Diakantoni et al., "Accumulating Trade Costs and Competitiveness," January 23, 2017, 21–26.
[7] Andriamananjara, Arce, and Ferrantino, "Transshipment in the United States," April 2004, 3.
[8] Blum, Claro and Horstmann, "Facts and Figures on Intermediated Trade," May 2010, 423.
[9] Bernard, Grazi, and Tomasi, "Intermediaries in International Trade," December 2011, 17–20.

a study found that Hong Kong traders offered a range of services to match foreign buyers with Chinese suppliers. These services included evaluating and monitoring the quality of goods from particular Chinese suppliers, helping Chinese suppliers find markets abroad, and coordinating business activities in different countries (e.g., purchasing and shipping inputs, packaging, and distributing output).

These activities generate significant value added to the domestic economies. In the case of Hong Kong, its unique "middleman" role in China's trade with the world has generated a large income flow for the economy. The average markup on Hong Kong re-exports of Chinese goods was 24 percent during 1988–98. In 1998, re-exports of Chinese goods amounted to 47 percent of Hong Kong's gross domestic product (GDP), while the markup on these re-exports totaled 12 percent of Hong Kong's GDP.[10]

Providing Logistical Benefits

Another factor often cited as a driving force behind re-exports is the superior logistics services provided by international shipping hubs of re-exporting economies. Given that over 80 percent of the world's trade in goods is shipped by sea, an efficient port for maritime transport is crucial for economies seeking to be competitive players in global trade.[11] Exporters are drawn to doing business through these economies because of the logistical benefits their shipping hubs offer. In addition to the offer of multi-modal transport options, their well-functioning port facilities, frequent shipping schedules, services, and infrastructure also allow for the consolidation of products destined for the same market.[12] The increased logistical efficiency and the economies of scale achieved through these shipping hubs help lower transport costs, and ultimately reduce trade costs overall.

Transport costs has been found to have a large impact on re-exports. One study found that U.S. re-exports were more sensitive than domestic exports to transport cost variables, especially with regard to containerization, linearization, port efficiency, and price-fixing agreements.[13] Re-exporters that are able to minimize the impact of transport costs on trade volumes have a distinct competitive advantage. In a study of Hong Kong traders re-exporting Chinese goods, markups were found to be influenced not just by transport costs alone. Results suggested that Hong Kong traders had enough market power to price discriminate across destinations. For distant markets,

[10] Feenstra and Hanson, "Intermediaries in Entrepôt Trade," February 10, 2004, 4.
[11] UNCTAD, *Review of Maritime Transport 2017*, 2017, x.
[12] Song and Panayides, "Global Supply Chain and Port/Terminal: Integration and Competitiveness," 2008.
[13] Containerization refers to the transportation of goods by shipping container. Transport of goods by container helps to minimize interruption via different transport modes during the journey, as containers can be moved easily between ships, trucks, and trains. More than 50 percent of the value of goods moved internationally by sea are transported in containers on liner ships. Linerization refers to shipping by means of high-capacity, ocean-going ships that transit regular routes on fixed schedules. Liner vessels carry about 60 percent of the goods by value moved internationally by sea each year. World Shipping Council, "Container Shipping in Ten Steps" (accessed April 1, 2020); World Shipping Council, "How Liner Shipping Works" (accessed April 1, 2020); Andriamananjara, Arce, and Ferrantino, "Transshipment in the United States," April 2004, 5–8.

Hong Kong traders set lower markups to compensate for higher transport costs, allowing them to drive indirect trade through Hong Kong.[14]

Avoiding Taxes, Tariffs, and Quotas

Several papers identified the avoidance (within the law) of taxes, tariffs, and quotas as one of the major incentives for re-exporting. Multinational corporations have been found to exploit the differences in tax policy across countries to minimize tax payments,[15] with transfer pricing being one of the most common practices to do so.[16] In a transfer pricing scenario, an affiliate in a low-tax location inflates the value of its intra-firm exports by setting high transfer prices on products that are destined for another affiliate in a high-tax jurisdiction. In so doing, profits for the intra-firm sales are recorded in the low-tax location, minimizing the tax liability for the corporation overall.[17] Some papers have suggested that multinational corporations may route these intra-firm sales through re-export hubs with lower tax rates in order to capture the maximum amount of profits for the firm globally.[18] Indeed, of the top 10 re-exporting economies listed in table 1, 6 had corporate tax rates below or equal to the global median corporate tax rate.[19] One study found that the markups on Hong Kong re-exports originating in China are higher on products destined for markets with higher corporate tax rates, and cited this as evidence that firms are using re-exports to transfer income from abroad to Hong Kong, which has a comparatively low corporate tax rate.[20] In another paper on intra-firm transfers in France, researchers found the price of intra-firm exports fell with the corporate tax rate of destination markets after controlling for factors like distance and tariff rates that would affect the final price at market, which adds more evidence of the transfer pricing practices discussed above.[21]

Besides avoiding corporate taxes, minimizing the impacts of tariff and quotas is another motivation for indirect goods trade through re-export hubs. For example, the African Growth and Opportunities Act (AGOA) has led to Chinese apparel being exported to AGOA-eligible countries for minimal processing before being exported again to the United States. This arrangement allowed

[14] Feenstra and Hanson, "Intermediaries in Entrepôt Trade," February 10, 2004, 9–10, 28.
[15] de Mooij, Keen, and Perry, "Taking a Bite out of Apple?" September 14, 2014.
[16] OECD, *Multi-Country Analysis of Existing Transfer Pricing Simplification Measures,* June 6, 2012.
[17] Internal firm transactions should be valued at market price according to the arm's length principle (i.e. an international consensus on the valuation of cross-border transactions between affiliated enterprises for tax purposes). However, the multiple calculation methodologies available for calculating an arm's-length price allow firms to maximize the difference in valuation of intra-firm exports across different markets. OECD, *OECD Transfer Pricing Guidelines*, July 2017.
[18] Feenstra and Hanson, "Intermediaries in Entrepôt Trade," February 10, 2004, 31; Ollus and Simola, "Finnish Re-exports to Russia," 2007, 6, 15–16.
[19] Tax Foundation, "Corporate Tax Rates Around the World" (accessed March 1, 2020).
[20] Feenstra and Hanson, "Intermediaries in Entrepôt Trade," February 10, 2004, 9–10, 25–27.
[21] In this paper, "total exports" and "re-exports" refer to merchandise trade. Davies et al., "Knocking on Tax Haven's Door," March 2018, 23–27, 36.

Chinese exporters to effectively avoid quotas placed on Chinese apparel exports destined for the U.S. market.[22]

Traders can also use bonded warehouses or foreign trade zones (FTZs) to avoid tariffs and quotas, when initially importing the goods into the country. In the case of the United States, merchandise imported into a bonded warehouse or FTZ and re-routed to another country would be recorded in trade statistics as U.S. re-exports if it is exported from the bonded warehouse or FTZ without undergoing substantial changes in form or condition or enhancement in value by further manufacturing.[23] In this instance, re-exporting can provide traders more flexibility when managing costs related to uncertain timing of filled quotas or the implementation of new tariffs.[24]

Reducing Upfront Fixed Trade Costs

Recent research has found that re-exporting may be motivated by a lack of a trade financing opportunities. Oftentimes, firms must fund a portion of the fixed cost of exporting upfront from by pledging collateral to an investor. Compared to direct exporting, exporting through intermediary firms incurs lower fixed costs by outsourcing tasks such as marketing and distribution, but higher variable costs in the form of additional transportation costs and intermediary fees. As a result, firms with capital constraints and limited access to credit—especially those in countries where the financial system is underdeveloped and contract enforcement is weak—that are unable to pledge collateral will rely more on domestic or foreign intermediaries to export. To this end, one study found that financially constrained exporting firms are more likely become indirect exporters, using foreign intermediaries to re-export their goods through Hong Kong.[25]

Recent Literature on Supply Chain Hubs

In the era of GVCs, lean inventory and short product cycles are the norm. Ensuring timely delivery to minimize production disruption, while maintaining the ability to respond to market changes quickly, is key to the success of multinational corporations and the global production networks they rely on. As such, regional logistic and trade hubs have become more important than ever. Countries that take advantage of their existing logistics and regulatory infrastructures are able to position themselves as regional supply-chain hubs by redistributing inputs to producers in the region, offering logistical solutions to exporting regional outputs globally, as well as providing GVC-enabling business and financial services. The emerging role of re-export hubs in global and

[22] While not technically re-exports, the minimal assembly required of AGOA partner countries to process these apparel goods for export to the United States and the duty-free access these products enjoyed as a result is very similar to re-exports in practice. Rotunno, Vézina, and Wang, "The Rise and Fall of (Chinese) African Apparel Exports," November 2013; Edwards and Lawrence, "AGOA Rules: The Intended and Unintended Consequences of Special Fabric Provisions," September 2016.
[23] U.S. Census, "Guide to Foreign Trade Statistics" (accessed April 15, 2020); USITC, "A Note on U.S. Trade Statistics," August 22, 2014.
24 CRS, "U.S. Foreign-Trade Zones: Background and Issues for Congress," December 19, 2019, 16.
[25] Chan, "Financial Frictions and Trade Intermediation: Theory and Evidence," 2019, 568, 588.

regional value chains has been discussed in recent literature on the structuring of regional supply chains. Although these studies do not provide direct explanations or linkages to entrepôt trade, they offer insights as to the position of some re-export hubs in regional supply chains.[26]

The level of global production fragmentation depends on the trade-off between lower production costs and higher transaction costs. By locating different stages of production in countries where production costs are lower, firms reduce the marginal production costs. However, they incur higher international transaction costs, as they are obliged to move components and parts across borders multiple times along the production process. Firms also incur higher expenses on services that are used for managing the movement of goods and for facilitating the flow of information along a value chain. Thus, the magnitude of transaction costs is a critical determinant of the optimal level of production fragmentation, as well as the configuration of supply chains.[27] The increasing volatility of international markets, variability in demand, changes in tariff rates, and risk of disruption of supply activities all require the design of supply chains to be more cost efficient, agile, and resilient.[28] To meet such demands, hub economies have emerged, providing integrated services solutions to supply chain management, and addressing various needs for logistics, distribution, business, and financial services.

As the prominence of hub economies in regional supply chains grows, networks of inter- and intra-regional trade centered around hub economies form. Increased trade through a hub economy begets more investment in its infrastructure and services sectors, which in turn further increases its competitive advantage. This process is augmented when hubs have trade-liberalizing arrangements outside the regional economy, as was the case with Singapore when its 2004 free trade agreement with the United States went into effect.[29] The impact of trade-facilitating arrangements in a node economy within highly-interconnected regional supply chains can be extended to both upstream and downstream actors, as exporters can reach destination markets and importers can access inputs more expeditiously. The trade of intermediate products can doubly benefit in these instances, as they are either embodied in final goods or in new intermediate products.[30]

The correlation between the growth of intermediate trade and the development of GVCs has been widely discussed in other literature.[31] Global value chains became longer from 1995–2011,[32] at the same time as communication and transportation costs fell and production became more modularized. As a result, GVC-related intermediate trade increased rapidly. The OECD found that

[26] Beņkovskis, Bērziņa, and Zorgenfreija, "Evaluation of Latvia's Re-exports," March 21, 2016.
[27] De Backer and Miroudot, "Mapping Global Value Chains," December 19, 2013, 47.
[28] Yi, "Can Vertical Specialization Explain the Growth of World Trade?" February 2003; Cedillo-Campos et al., "Supply Chain Dynamics and the "Cross-Border Effect," June 2014.
[29] Chong and Hur, "Small Hubs, Large Spokes and Overlapping Free Trade Agreements," December 30, 2008, 1628–29.
[30] Diakantoni et al., "Accumulating Trade Costs and Competitiveness," January 23, 2017, 4.
[31] Jones, Demirkaya, and Bethmann, "Global Value Chain Analysis: Concepts and Approaches," April 2019.
[32] Wang et al., "Characterizing Global Value Chains," March 2017.

70 percent of international goods and services trade was for production in GVCs, with goods trade mainly comprised of intermediate inputs such as raw materials, parts, and components.[33]

Based on recent literature on regional supply chain hubs, this paper proposes that in recent years, the role of re-export hubs has evolved from traditional shipping and distribution centers into regional supply chain hubs. The hubs concentrate on intermediate goods trade and generate value by providing services to facilitate supply chain activities. Section III explores this hypothesis by presenting stylized facts of merchandise re-exports from three key economies.

III. Analysis of Trade through Key Re-export Hubs

This section selects three key re-export hubs, Hong Kong in East Asia, Singapore in Southeast Asia, and the United States in North America. These economies are selected because of the availability of their re-export data, their prominence in global merchandise re-exports (table 1), the importance of re-exports in their merchandise trade (figure 1 and 2), and their strategic locations in the regions with the most dynamic supply chains.[34]

Table 1. World's top 10 re-exporting economies (by value of re-exports) in 2016, U.S. dollars

Country	Value of re-exports
Hong Kong	$491,062,634,702
United States	$224,163,771,762
Netherlands	$205,514,988,250
Singapore	$175,914,825,728
United Arab Emirates	$58,632,032,591
Canada	$36,045,514,458
Italy	$13,558,735,784
Saudi Arabia	$7,962,733,570
Oman	$7,817,095,834
Cyprus	$1,933,974,963

Source: UN Comtrade; Centraal Bureau voor de Statistiek Netherlands; Government of Singapore, Department of Statistics.
Note: Data are reported as available. Statistics on re-exports from European Union (EU) countries are largely absent from Comtrade statistics (Italy, shown above, is the exception). Some countries report re-exports separately: in the Netherlands, for example, companies are required to specify trade to the national statistical agency as export or re-export. Guo, Webb, and Yamano, "Towards Harmonised Bilateral Trade Data," February 25, 2009, 12. For the most part, however, the flow of goods through the EU customs union is not tracked with the granularity of other economies. Part of this stems from dissimilarities in the recording of trade data among EU nations and countries like Slovenia and the Netherlands that exclude quasi-transit trade from their international trade in goods statistics. For more information, see Roos, "International Transport and Trade Statistics" (accessed April 1, 2020).

[33] OECD, "Trade Policy Implications of Global Value Chains," December 2018.
[34] This selection is not meant to be exclusive, and the availability of re-export data is one of the key factors. Overall, re-exports data remain sparse. In 2015, only 43 of the 151 economies in UN Comtrade reported re-export data, and only 97 economies reported any re-export data any year between 1995 and 2015. Other economies with large re-exports volume, such as the Netherlands and Singapore, do not report re-exports in the UN Comtrade database, though the Netherlands publishes re-export data by the Standard International Trade Classification (SITC) industry classification on the CBS website: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83028NED/table?ts=1582832900288.

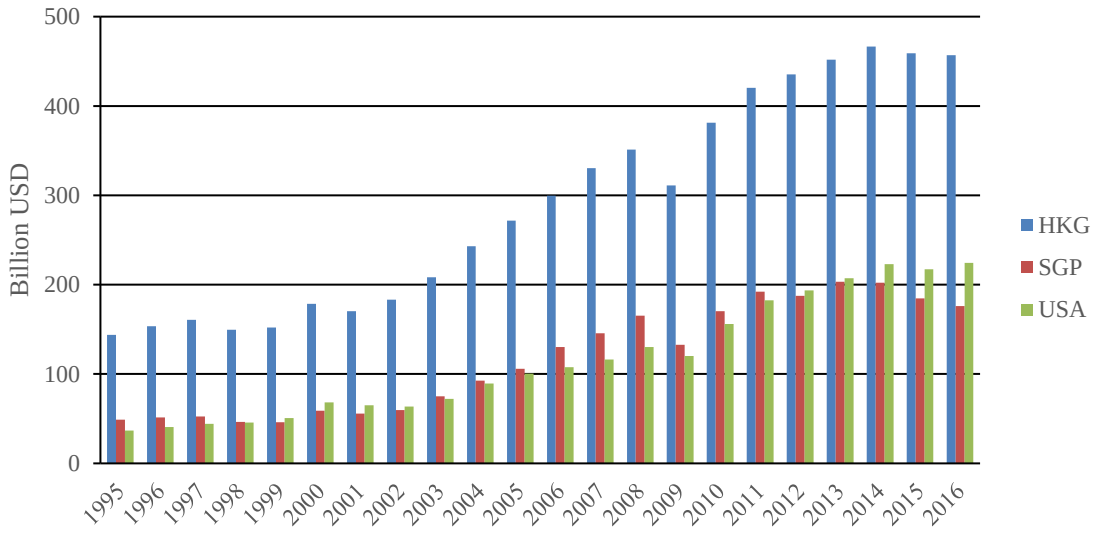
Three sets of detailed re-export data from official sources are used in this section: (1) Hong Kong re-export data for years 1995–2016 at the Harmonized System (HS) 6-digit level by country of origin and destination from the Hong Kong Census and Statistics Department, (2) Singapore re-export data for years 2005–14 at the HS 6-digit level by country of destination come from the Singapore Department of Statistics, and (3) U.S. re-export data for years 1995–2016 at the HS 6-digit level by country of destination come from the U.S. Census Bureau.[35] This section also applied the end use classification, jointly developed by U.S. International Trade Commission (USITC) and the Organisation for Economic Co-operation and Development (OECD), to differentiate products by end use re-exported by these economies.[36]

The data from these sources indicate that (1) intermediate products make up the largest share of re-exports by end use through these economies (see figure 3), (2) intra-regional trade accounts for a significant share of re-exports of intermediate goods ("intermediate re-exports") through these economies, and (3) inter-regional intermediate trade links between these three economies are evident. These findings suggest that re-exports through these economies have become concentrated on intra- and inter-regional intermediate trade in recent years. These economies have increasingly acted as the regional supply chain hubs that facilitate intermediate trade flows within and across regions, corresponding to the rapid development of global and regional supply chains in the last two decades.

[35] We were able to obtain the 2005–14 re-export data at the HS 6-digit level for Singapore, the 1995–2016 re-export data at the HS 6-digit level for Hong Kong. Although U.S. re-export data at the HS 6-digit level were available up to 2018 during the final drafting stage, we used the 1995–2016 re-export data for the United States to match the same timeframe as other two economies.

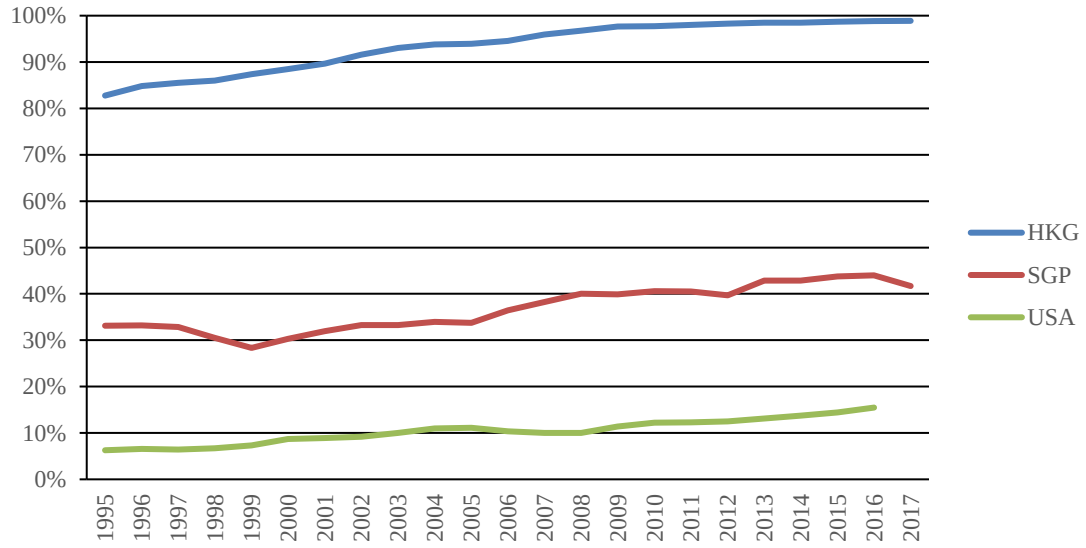
[36] U.S. International Trade Commission staff developed the USITC-OECD End Use Classification in collaboration with OECD. The classification differentiates merchandise goods by three major end use categories: consumer, capital, and intermediate goods. Product end use is assigned at the 6-digit level of Harmonized System Codes. UN Statistics Division (UNSD) Broad Economic Category (BEC) Rev. 5 incorporated this set of data.

Figure 1: Total volume of re-exports in Hong Kong (HKG), Singapore (SGP), and the United States (USA), billion U.S. dollars



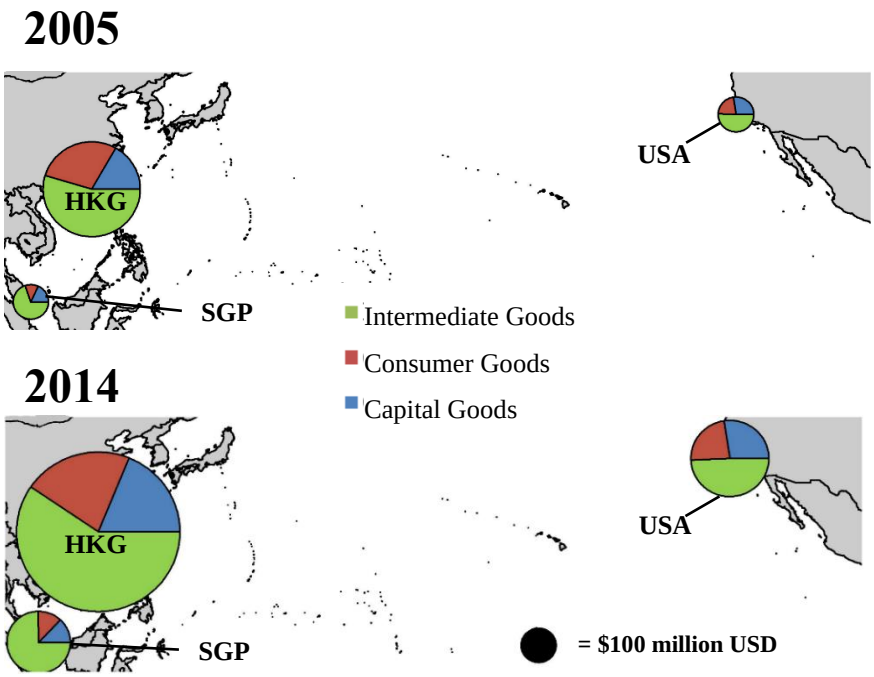
Source: Government of Hong Kong, Census and Statistics Department; Government of Singapore, Department of Statistics; U.S. International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).
Note: The detailed re-export data for Hong Kong and Singapore were acquired directly from the sources, and therefore are not publicly available. For the underlying data table, see appendix table C.1.

Figure 2: Share of re-exports in Hong Kong (HKG), Singapore (SGP), and the United States (USA) out of total merchandise exports



Source: Government of Hong Kong, Census and Statistics Department; Government of Singapore, Department of Statistics; U.S. International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).
Note: The detailed re-export data for Hong Kong and Singapore were acquired directly from the sources, and therefore are not publicly available. For underlying data table, see appendix table C-2.

Figure 3: Value of end use of re-exports in Hong Kong (HKG), Singapore (SGP), and the United States (USA), 2005 and 2014



Source: Government of Hong Kong, Census and Statistics Department; Government of Singapore, Department of Statistics; U.S. International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).

Note: The detailed re-export data for Hong Kong and Singapore were acquired directly from the sources, and therefore are not publicly available. For the underlying data table, see appendix tables C-3, C-5, C-7.

Hong Kong

Re-exports have driven Hong Kong's growth in total exports. From 1995 to 2016, the value of Hong Kong re-exports increased by 217.7 percent, while the value of its domestic exports declined by 81.4 percent (appendix tables C.1 and C.2). Hong Kong re-exports data indicate that Hong Kong serves as a major re-export hub in East Asia, primarily facilitating cross-border intermediate product movement between China and other Asian economies. Hong Kong's largest intermediate re-exporting sector was computer, electronic, and optical products, with the majority of trade in electronic components and boards (ECBs).[37]

In 2016, nearly 99 percent of Hong Kong merchandise exports was in the form of re-exports. Hong Kong re-exports of intermediate goods grew more than fourfold from $63.0 billion in 1995 to $282.0 billion in 2016. The share of intermediate products in Hong Kong re-exports increased

[37] ECBs correspond to International Standard Industrial Classification (ISIC) revision 4, sector number 261, while the broader manufacture of computer, electronic, and optical products corresponds to ISIC rev. 4 sector number 26. See appendix B for more information on ISIC classification of sectors and sub-sectors.

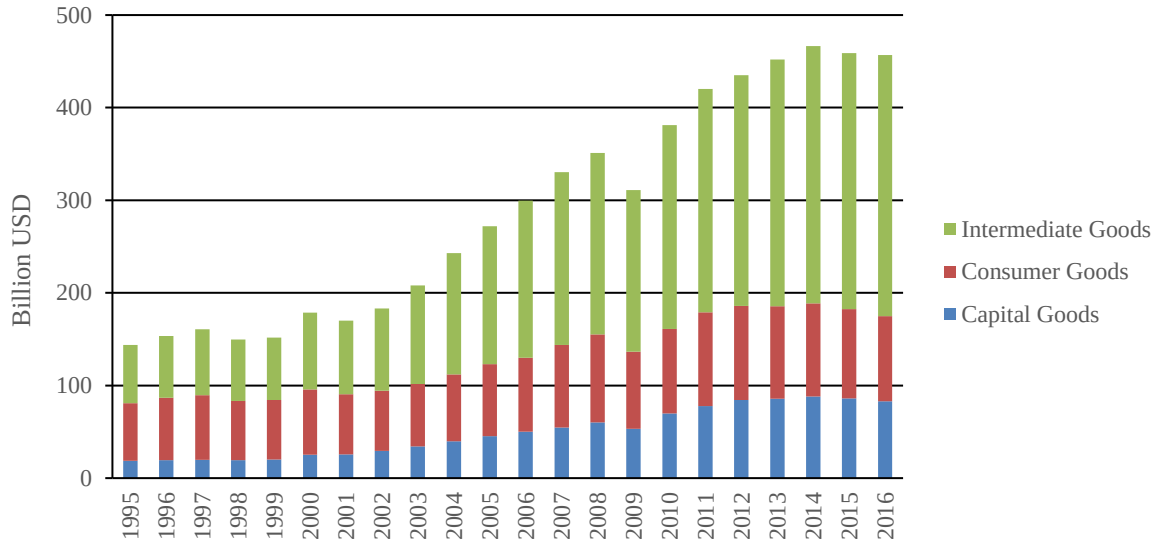
from 43.8 percent in 1995 to 61.7 percent in 2016. By comparison, the share of consumer goods in Hong Kong re-exports decreased from 43.2 percent in 1995 to 20.1 percent in 2016, while the share of capital goods in Hong Kong re-exports increased from 13.0 percent in 1995 to 18.2 percent in 2016 (figure 4).

Computer, electronic and optical products[38] had the largest increase during this period (figure 5) and accounted for 67.5 percent of intermediate re-exports through Hong Kong in 2016. Within this sector, ECBs alone accounted for 43.5 percent of Hong Kong intermediate re-exports in 2016. Other top sectors included electrical equipment and other manufacturing (table 2).

In 2016, East Asia accounted for 77 percent of Hong Kong intermediate re-exports, both as the source and destination region. Southeast Asia was another important destination and source region, supplying 10 percent and receiving 6 percent of Hong Kong intermediate re-exports. China was the largest source and destination country for Hong Kong intermediate re-exports. It provided more than 50 percent and received 70 percent of Hong Kong's intermediate re-exports. Other top sources for Hong Kong intermediate re-exports included Taiwan (13 percent), South Korea (8 percent), Japan (6 percent), and Malaysia (4 percent). Other top destinations included the United States (4 percent) and India (3 percent).

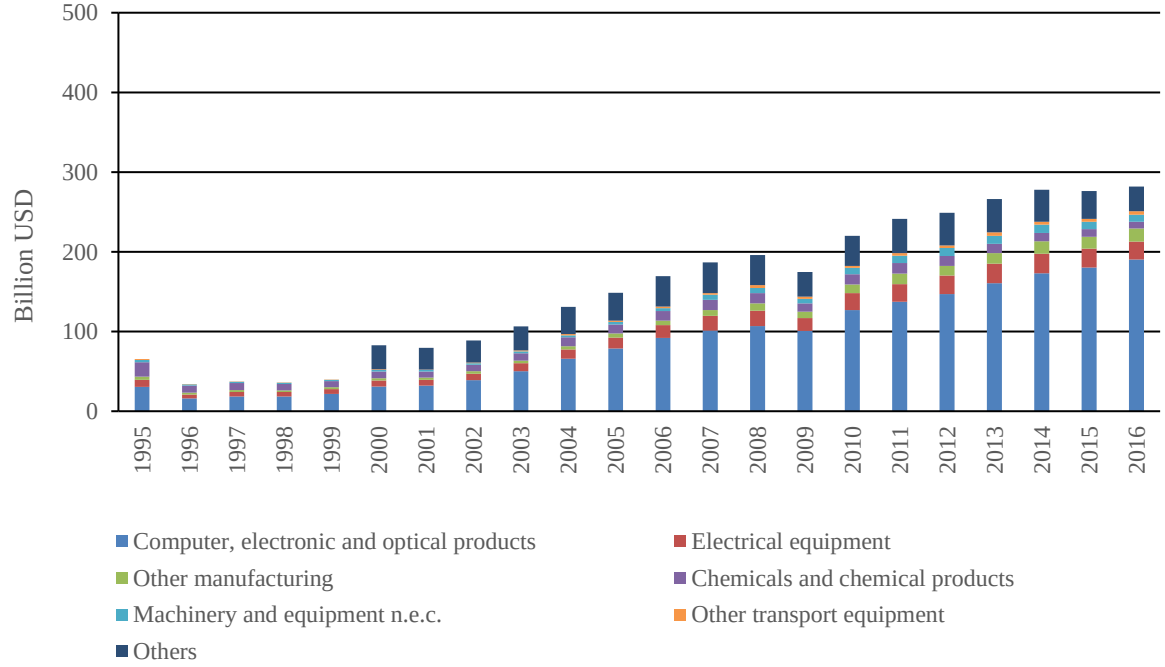
[38] The sectoral information in this paper is defined by International Standard Industrial Classification revision 4 (ISIC Rev.4). Please see appendix B for the detailed information for these highlighted top re-exporting sectors.

Figure 4: Hong Kong re-exports by end use, billion U.S. dollars



Source: Government of Hong Kong, Census and Statistics Department. For underlying data table, see appendix table C.3.

Figure 5: Major intermediate re-exports from Hong Kong by sector, billion U.S. dollars



Source: Government of Hong Kong, Census and Statistics Department. For underlying data table, see appendix table C.4.

Table 2. Top sectors and subsectors in Hong Kong intermediate re-exports, 2016

ISIC code		Volume (billion)	Share (%)
26	Computer, electronic, and optical products	$190.3	67.5
	261–electronic components and boards (ECBs)	$122.6	43.5
	263–communication equipment	$45.9	16.3
	262–computers and peripheral equipment	$15.0	5.3
27	Electrical equipment	$22.6	8.0
	271–electric motors, generators, transformers, and electricity distribution and control apparatus	$12.0	4.2
32	Other manufacturing	$16.4	5.8
	321–jewelry, bijouterie, and related articles	$13.7	4.9

Source: Government of Hong Kong, Census and Statistics Department

Singapore

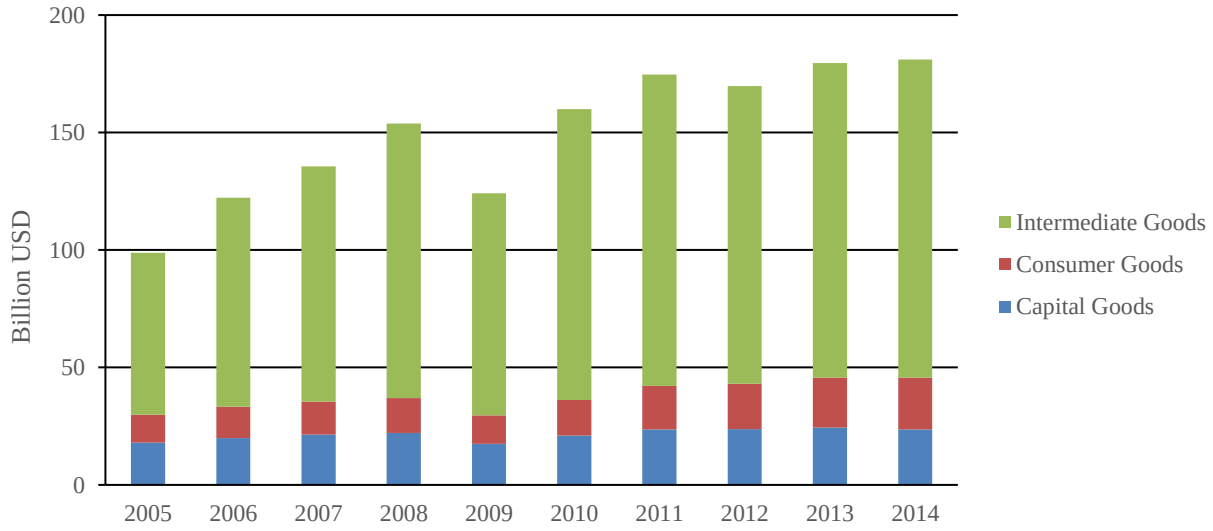
From 1995 to 2016, the value of Singapore's re-exports increased by 260.4 percent, while the value of its domestic exports increased by 127.0 percent (appendix table C.1 and C.2). Singapore's re-export data indicate that Singapore serves as a major re-export hub in Southeast Asia, primarily facilitating cross-border intermediate product movement between East Asia and Southeast Asia, and within Southeast Asia. Like Hong Kong, Singapore's largest intermediate re-exporting sector was computer, electronic and optical products, with most of the trade in ECBs.

In 2016, about 44 percent of Singapore's merchandise exports were in the form of re-exports. Singapore re-exports of intermediate goods experienced rapid growth over the last decade, nearly doubling in value from $68.9 billion in 2005 to $135.3 billion in 2014. Intermediate products accounted for about 75 percent of Singapore's re-exports in 2014, increasing from 70 percent in 2005. By comparison, the share of consumer goods in Singapore's re-exports remained unchanged at 12 percent, while the share of capital goods declined from 18 percent to 13 percent during this period (figure 6).

Computer, electronic, and optical products had the largest increase from 2005–14 (figure 7), accounting for 56 percent of Singapore intermediate re-exports in 2014, with most of the trade in ECBs. Other top sectors included coke and refined petroleum products, machinery and equipment, chemicals and chemical products, and other transport equipment (table 3).

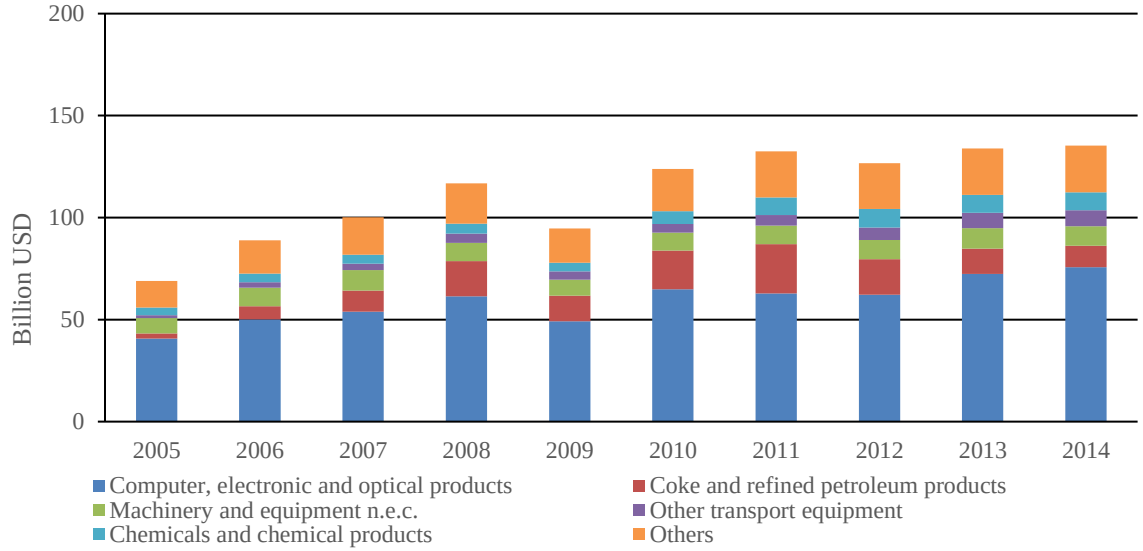
East Asia and Southeast Asia were the two largest regional destinations for Singapore's intermediate re-exports, with shares of 49 and 32 percent, respectively. Top destinations for Singapore intermediate re-exports included Hong Kong (18 percent), China (16 percent), Malaysia (12 percent), Indonesia (9 percent), the United States, (4.5 percent), Thailand (4.2 percent), Taiwan (4.0 percent), and Vietnam (3.7 percent). Singapore's re-export data do not provide information on country of origin.

Figure 6. Singapore re-exports by end use, billion U.S. dollars



Source: Government of Singapore, Department of Statistics. For underlying data table, see table C-5.
Note: The detailed Singapore re-export data available to us are from 2005 to 2014 only.

Figure 7. Major intermediate re-exports through Singapore, billion U.S. dollars



Source: Government of Singapore, Department of Statistics. For underlying data table, see table C-6.

Table 3. Top sectors and subsectors in Singapore intermediate re-exports, 2014

ISIC code		Volume (billion)	Share (%)
26	Computer, electronic and optical products	$75.8	56.0
	261–electronic components and boards (ECBs)	$70.1	51.8
19	Coke and refined petroleum products	$10.5	7.8
	192–refined petroleum products	$10.5	7.8
28	Machinery and equipment n.e.c.	$9.5	7.1
20	Chemicals and chemical products	$8.8	6.5
	201–basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms	$6.6	4.9
30	Other transport equipment	$7.8	5.8
	303–air and spacecraft and related machinery	$6.9	5.1

Source: Government of Singapore, Department of Statistics
Note: n.e.c.= not elsewhere classified.

United States

From 1995 to 2016, the value of U.S. re-exports grew by 513.4 percent, while the value of its domestic exports increased by 124.8 percent (appendix table C.1 and C.2). Data on U.S. re-exports highlight the role of the United States in facilitating cross-border intermediate product movement between Canada and Mexico. Such movement may be due in part to the North American Free Trade Agreement (NAFTA), which went into effect in 1994. Research has suggested that the implementation of NAFTA led to an uptick in intra-NAFTA trade of intermediate goods, and that following the agreement, the overall increase in trade volume between NAFTA partners was driven in large part by tariff reductions in the electrical machinery, communication equipment, and auto sectors, which maintained higher-than-average pre-NAFTA tariff rates.[39]

Many of these same products that saw the biggest boost from NAFTA are featured prominently in U.S. re-exports today. Computer, electronic, and optical products, over a half of which are in the form of ECBs, are the most re-exported intermediate products in the United States. However, the share of ECBs in U.S. re-exports has declined significantly in the past two decades, from 30.4 percent of all U.S. re-exports in 1995 to only 7.4 percent in 2016. Compared to Hong Kong and Singapore, U.S. intermediate re-exports are much less concentrated on ECBs.

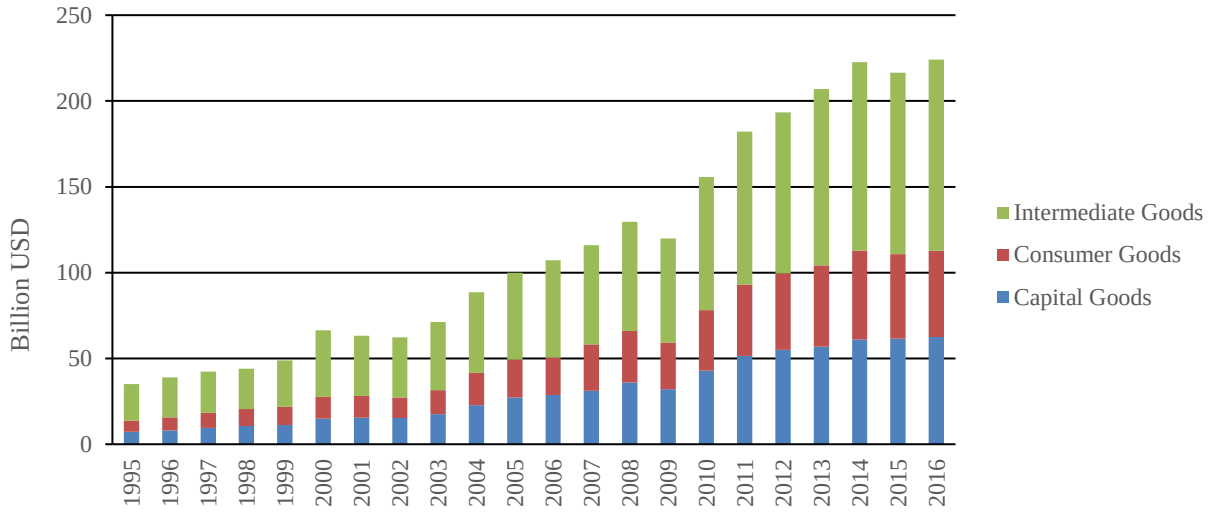
In 2016, about 16 percent of U.S. merchandise exports were in the form of re-exports. U.S. re-exports of intermediate goods grew nearly fivefold, from $21.2 billion in 1995 to $111.2 billion in 2016. Intermediate products accounted for 49.7 percent of U.S. total merchandise re-exports in 2016, though that share decreased from 60.4 percent in 1995. By comparison, the share of consumer goods in U.S. re-exports increased from 18.6 percent to 22.4 percent, while the share of capital goods increased from 21.0 percent to 27.9 percent during this period (figure 8).

[39] Caliendo and Parro, "Estimates of the Trade and Welfare Effects of NAFTA," January 2015.

Computer, electronic, and optical products had the largest increase during this period by value (figure 9). In 2016, it accounted for the largest share, 26.7 percent of intermediate re-exports through the United States, declining from 62.6 percent in 1995. Within this sector, ECBs alone accounted for 14.1 percent of U.S. intermediate re-exports in 2016. Other top sectors in 2016 included other manufacturing; other transport equipment; electrical equipment; machinery and equipment; and motor vehicles, trailers, and semi-trailers (table 4).

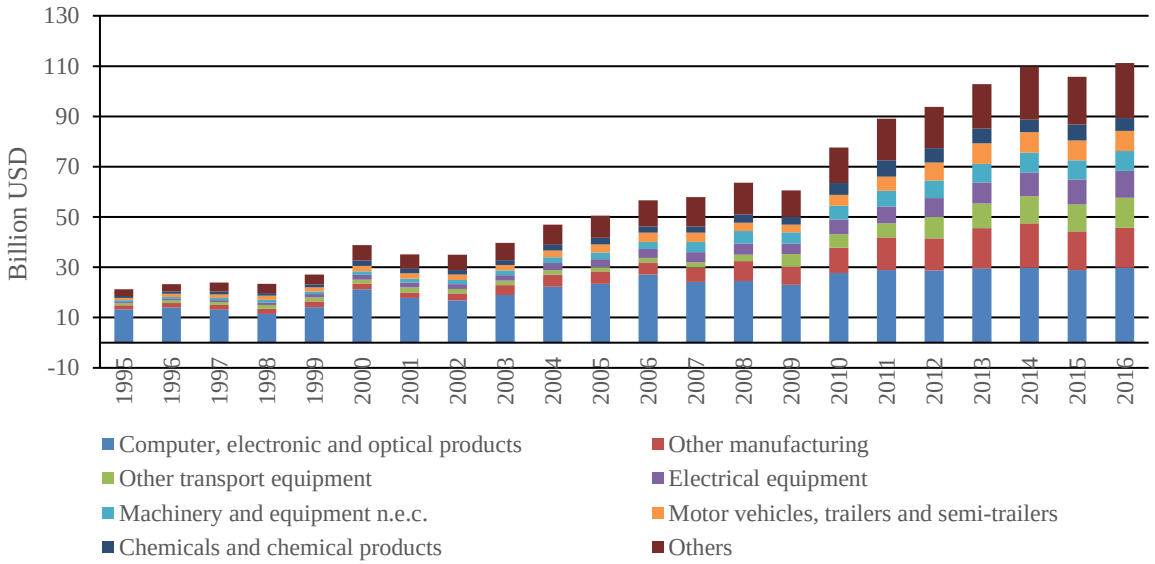
The largest regional destination for U.S. intermediate re-exports in 2016 was North America, with a share of 45 percent, followed by the EU28 (17 percent), East Asia (13 percent), Southeast Asia (6 percent), and the rest of the world (19 percent). Top destinations for U.S. intermediate re-exports included Mexico (28 percent), Canada (17 percent), Hong Kong (4.2 percent), China and India (both around 3.6 percent), Israel (3.4 percent), Germany (3.2 percent), and the United Kingdom (3.1 percent).

Figure 8. U.S. re-exports by end-use, billion U.S. dollars



Source: U.S. International Trade Commission DataWeb/ U.S. Department of Commerce. For underlying data table, see appendix table C-7.

Figure 9: Major intermediate re-exports through the United States, billion U.S. dollars



Source: U.S. International Trade Commission DataWeb/ U.S. Department of Commerce. For underlying data table, see appendix table C-8.

Table 4 Top re-exporting sectors and their shares in U.S. intermediate re-exports, 2016

ISIC code		Volume (billion)	Share (%)
26	Computer, electronic and optical products	$29.7	26.7
	261–electronic components and boards (ECBs)	$15.7	14.1
	262–computers and peripheral equipment	$8.7	7.9
32	Other manufacturing	$16.0	14.4
	321–jewelry, bijouterie and related articles	$13.4	12.0
30	Other transport equipment	$11.9	10.7
	303–air and spacecraft and related machinery	$11.7	5.1
27	Electrical equipment	$10.7	10.5
	271–electric motors, generators, transformers and electricity distribution and control apparatus	$6.6	5.9
29	Motor vehicles, trailers, and semi-trailers	$8.1	7.3
28	Machinery and equipment n.e.c.	$7.9	7.1

Source: U.S. Census Bureau

The re-exports data illustrate that ECBs[40] made up the most re-exported intermediate product in each of these three economies. Electronic integrated circuits,[41] also called semiconductors or chips, are the key ECB products re-exported by Hong Kong (comprising $98 billion, or 82 percent of

[40] As noted in footnote 3, this sector includes products such as electronic integrated circuits (HS8542), electronic printed circuits (HS8534), diodes, transistors and semiconductors (HS8541), and other semiconductor related parts and components.
[41] HS8542.

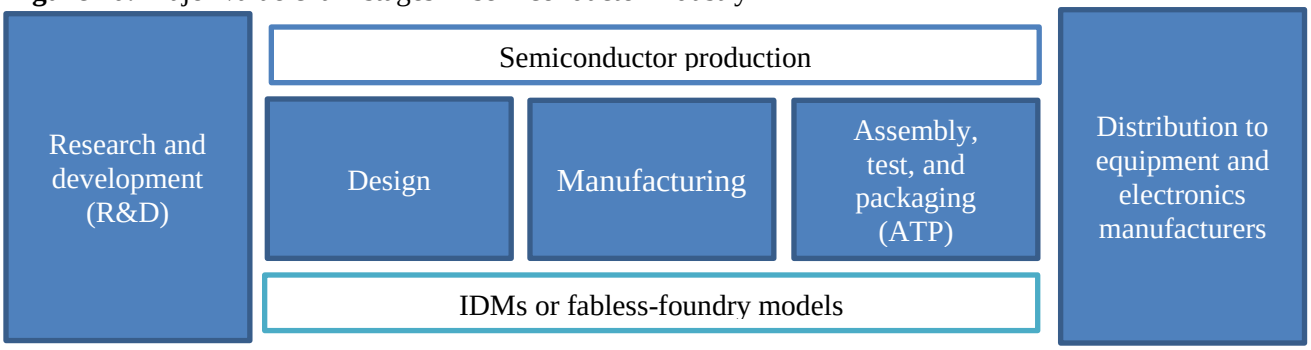
Hong Kong's ECB re-exports in 2016), Singapore ($63 billion or 90 percent of Singaporean ECB re-exports in 2014), and the United States ($12 billion or 75 percent of U.S. ECB re-exports in 2016). The development of semiconductor supply chains is the driving force behind the changes in re-export trade patterns in these economies. Section IV below focuses on the global semiconductor trade and value chain development in an effort to understand the role of re-exports within regional supply chain hubs.

IV. Semiconductor Trade within Global Value Chains

To respond to rapid technological advances in the industry and high consumer demand for products that use semiconductors as inputs, semiconductor supply chains have had to adapt on a global scale. The physical presence of the integrated circuit (IC) manufacturing process and the demand for IC products around the world has a direct impact on the development of global semiconductor production network, the corresponding supply chains, as well as international trade flows.[42] The consistent demand for better capabilities, reliability, and speed requires not only heavy investment in research and development (R&D) and design, but also efficient and low-cost manufacturing, testing, assembling and packaging, and distribution. It also puts pressure on supporting services to ensure a seamless operation process and supply chain linkages.

Semiconductor value chains consist of five major stages: research and development; design; manufacturing; assembly, test, and packaging (ATP); and distribution (box 1). The middle three stages consist of semiconductor production (figure 10).

Figure 10: Major value chain stages in semiconductor industry



Source: Adapted from Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 7.

[42] For more information on integrated circuits, see Rainer, "How Electronic Components Work," February 8, 2018.

Box 1: The Semiconductor GVC Ecosystem

Semiconductor GVCs consist of five major stages: research and development (R&D); design; manufacturing; assembly and test; and distribution.[a]

- ***R&D***: Driven by rapid technology advancement needs, the semiconductor industry is one of the most R&D-intensive industries in the world.
- ***Design***: Research outcomes are turned into chip designs with specifications to meet particular needs.
- ***Manufacturing***: The process of manufacturing designed chips is also called semiconductor device fabrication. This consists of hundreds of sequential processing steps that create ICs, a wafer typically made of silicon. Between different steps of IC manufacturing, various tests are often required to ensure that the components, as well as the final chips, are defect-free and can deliver the expected performance.
- ***Assembly, test, and packaging[b] (ATP)***: This stage is usually labor intensive and thus often outsourced to third-party semiconductor packaging and test services (OSAT) located in low-labor cost countries.
- ***Distribution***: Semiconductors are usually distributed to and used by original equipment manufacturers or original design manufacturers to integrate into final electronic products.

[a] Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 4–7.
[b] Semiconductor packaging involves enclosing IC in a form factor that can fit into a specific device. Since a semiconductor chip, or integrated circuit (IC), is mounted on a circuit board or used in an electronic device, it needs to go through an electrical packaging process to be molded into the appropriate design and form. Once the packaging process is completed, the package test will determine if the package works properly. Samsung, "Eight Major Steps to Semiconductor Fabrication, Part 9: Packaging and Package Testing," June 17, 2015.

Two operating models dominate semiconductor GVCs: integrated device manufacturers (IDMs) and fabless foundries. Initially, almost all semiconductor companies operated as IDMs, performing these production steps at in-house factories (also known as "fabs") located in the same country. This model drives efficiency from vertical integration. However, in response to rising production costs, niche companies that specialized in one or more steps of the production process emerged and a new type of production arrangement, the fabless-foundry model, became popular. Fabless companies engage solely in the design, while they outsource downstream production activities to foundries (contract semiconductor manufacturers with no design capabilities) and ATP firms, many of which are located in other countries.[43] This model drives efficiency from the delineation of tasks and specialization.[44] Large semiconductor companies, such as Intel and Samsung, remain

[43] VerWey, "Global Value Chains: Explaining U.S. Bilateral Trade Deficits in Semiconductors," March 2018.
[44] Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 4–7.

IDMs and perform in-house production, though their factories are now often located in non-home countries where production costs are lower.

The evolution of semiconductor GVCs drives the changes in global semiconductor trade patterns. As the semiconductor GVC has lengthened and the international production network has expanded, cross-border semiconductor trade exploded and the number of countries participating in the semiconductor trade increased. In 1995, global semiconductor trade[45] was valued at $121.6 billion, and was primarily carried out by two countries—the United States and Japan. In 2016, the value of global semiconductor trade increased to $1.1 trillion, consisting of more than a dozen major participating countries.[46] Among the most notable "newcomers" were Hong Kong, Taiwan, South Korea, Malaysia, Singapore, and China. In 2016, Hong Kong was the largest exporter, accounting for one-fifth of global semiconductor exports, all of which were in the form of re-exports. In the same year, China and Hong Kong were the largest importers, together accounting for more than half of global semiconductor imports (China 37 percent and Hong Kong 19 percent) (tables 5 and 6).[47] The majority of Hong Kong's semiconductor imports were then re-exported to China.

The changes in the global semiconductor trade patterns reflect the shifting specializations of countries participating in the semiconductor GVCs. Lead firms in the United States tend to focus on high value-added activities such as R&D and design, while they locate or outsource downstream production activities to other countries with lower production cost. As a result, the U.S. share in global semiconductor trade has declined in the past two decades, though U.S. firms continue to capture the largest share of revenue generated from semiconductor value chains. Taiwan has emerged as a hub for semiconductor manufacturing. It is home to the world's two largest contract chipmakers (Taiwan Semiconductor Manufacturing Company and United Microelectronics Corporation), manufacturing 25–30 percent of integrated circuits globally,[48] and capturing 18 percent of global revenue from semiconductor value chains.[49] South Korea, led by two IDMs, Samsung and SK Hynix, accounted for 16 percent of global revenue from semiconductor value chains. Although Japan has lost the global leadership in the semiconductor industry it held in the mid-1990s, several Japanese firms retain strong positions in the industry. China has been catching up in the semiconductor supply chains by expanding its capacity in fabless design work, foundry services, and assembly and test (table 7).[50]

The re-export trend observed in section III correlates with the development of semiconductor GVCs. First, semiconductors are small but high in value, and traded extensively, which contributes to ECB's high share in re-exports. Second, the international production fragmentation increases

[45] Cross-border trade is comprised of total exports and general imports.
[46] IHS Markit, Global Trade Atlas (accessed August 1, 2019).
[47] IHS Markit, Global Trade Atlas (accessed August 1, 2019).
[48] Fulco, "Taiwan Remains Top Hub for Semiconductor Manufacturing," September 24, 2018.
[49] Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 11.
[50] Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 9, 11.

cross-border movements of components and parts, which contributes to the rapid growth in ECB re-exports. Third, two factors contribute to semiconductors making up the largest share of re-exported products globally: (1) the vigorous test requirement in semiconductor manufacturing process, and (2) the practice of outsourcing or relocating labor-intensive semiconductor assembly and testing (often called outsourced semiconductor assembly and test, or OSAT) in Asian countries such as Malaysia, China, and Singapore. This is due, in part, to the fact that tests typically do not transform the physical aspect of semiconductors, thus making them qualified as re-exports in trade classification.[51]

Although the top re-exported intermediate product for Hong Kong, Singapore, and the United States is semiconductors, these countries differ in their respective roles as regional supply chain hubs. Hong Kong does not have its own semiconductor production capacity. Instead, it mainly acts as the facilitator of semiconductor movements between China and other major GVC players in the Asia-Pacific region, such as Taiwan, South Korea, and Singapore. China has become the world's top producer and exporter of consumer electronics, and therefore, the country is the largest downstream user of semiconductors.

Table 5. Global semiconductor exports, 1995–2016, by value and share

	1995	**2000**	**2005**	**2010**	**2016**
World (billion $)	$63.5	$207.1	$271.0	$377.5	$496.2
Share of global exports (%)					
Hong Kong	<1%	5%	10%	15%	20%
Taiwan	<1%	9%	10%	12%	15%
Singapore	<1%	14%	18%	20%	14%
China	1%	1%	5%	8%	12%
South Korea	<1%	10%	9%	10%	11%
USA	50%	26%	15%	10%	7%
Malaysia	<1%	7%	7%	6%	5%
Japan	45%	15%	11%	9%	5%
EU28 (external trade)	n.a.	n.a.	7%	4%	4%
Rest of world	5%	13%	7%	6%	7%

Source: IHS Markit, Global Trade Atlas (accessed August 1, 2019).
Note: n.a. = not available.

[51] See appendix A for the statistical definition of re-exports.

Table 6. Global semiconductor imports, 1995–2016, by value and share

	1995	2000	2005	2010	2016
World (billion $)	$58.1	$214.5	$337.5	$474.7	$617.7
Share of global exports (%)					
China	4%	6%	24%	33%	37%
Hong Kong	<1%	7%	11%	15%	19%
Singapore	<1%	12%	11%	11%	9%
Taiwan	<1%	10%	8%	7%	6%
USA	62%	20%	6%	5%	5%
South Korea	<1%	8%	6%	5%	5%
Malaysia	<1%	10%	7%	6%	4%
EU28 (external trade)	n.a.	n.a.	8%	5%	3%
Japan	19%	8%	6%	4%	3%
Mexico	4%	4%	3%	2%	2%
Rest of world	12%	14%	10%	7%	7%

Source: IHS Markit, Global Trade Atlas (accessed August 1, 2019).

Table 7. Global revenue distribution of semiconductor value chains, 2015, by value and share

	World	USA	Taiwan	South Korea	Japan	China	Singapore
IDM	$232 billion	51%	2%	28%	11%	<1%	
Fabless	$103 billion	62%	18%	<1%	2%	10%	
Foundry	$50 billion	10%	73%	6%	2%	7%	
OSAT	$27 billion	17%	54%		5%	12%	12%
Total	$412 billion	47%	18%	16%	7%	4%	<1%

Source: Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 9, 11.

Note: The IDM and fabless categories describe IC revenue across the entire global market. The foundry and OSAT categories describe semiconductor revenue across the top 10 companies in their respective sectors.

Despite China's recent effort to ramp up its semiconductor manufacturing capacity, due to outdated technology and insufficient talents, China's IC manufacturing still lags behind. Thus, China relies heavily on imports of ICs.[52]

Singapore and the United States, on the other hand, have developed or retained considerable semiconductor production capacities of their own. Singapore is home to 14 wafer fabrication plants

[52] PR Newswire, "Global and China $578 Billion Integrated Circuit Industries Markets, 2014–2018 & 2019–2023," June 5, 2019.

and 15 semiconductor assembly and test units.[53] Located next to Malaysia, a country specialized in the assembly and testing of semiconductor devices, and other upcoming Southeast Asian participants (e.g., the Philippines, Thailand, and Vietnam), Singapore acts as a major regional hub that facilitates semiconductor movement between East Asia and Southeast Asia as well as within Southeast Asia. As the largest player in semiconductor GVCs with also considerable testing capability, and sandwiched between Canada and Mexico, the United States serves as a connecting node within the North America as well as with the Asia-Pacific region.

V. The Role of Services Sectors within Re-export Hubs

The case of semiconductors illustrates that with the development of GVCs the number of participating countries in international trade can increase significantly. The increase in international production fragmentation poses challenges to managing supply chains and coordinating operating activities at different stages of the production process, especially for highly competitive industries where high speed and low cost are key. As a result, there is a need for hub economies that provide GVC-enabling services to facilitate cross-border intermediate input flows and that support various manufacturing activities between different nodes in the supply chains. Re-export hubs fill in the role of regional supply chain hubs, not only due to their historical position in trade and shipping and their strategic locations, but also due to their strong services sectors that enhance the efficiency and functionality of supply chains.

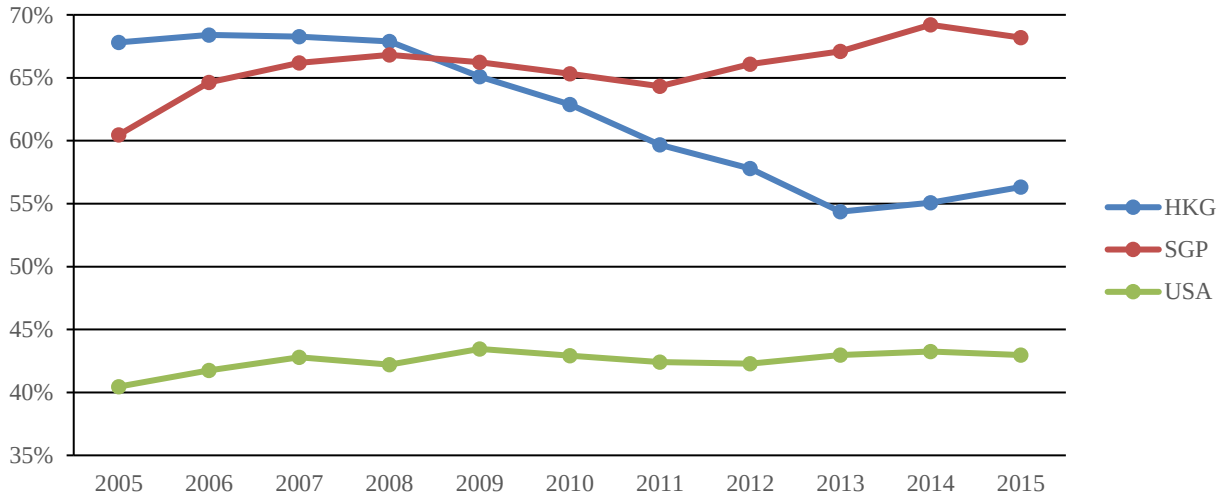
The increasingly important role of services in GVCs has been widely recognized. Several types of services, such as information and communication technology, supply chain management services, and logistics services, have been cited as essential enabling factors in the geographic dispersion of GVCs.[54] The very existence of GVCs is due to improvements in services sectors that have made the fragmentation and coordination of global production possible. Services constitute the vital connecting links in GVCs.[55] Leveraging the output of services sectors in GVCs permits efficient functioning of value chains, and allows for leaner inventories, shorter lead times, and faster response to customers.[56]

Integrating services such as finance, professional, and other business services in GVCs also helps firms to increase their competitiveness. Services enable firms to invest in new business opportunities and better production technology, exploit economies of scale in production, efficiently manage inventories, and make coordinated decisions with their suppliers and customers, all of which enhance firms' productivity and comparative advantage.[57]

[53] Semiconductor Industry Association and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 43–44.
[54] OECD and the World Bank, *Inclusive Global Value Chains,* August 2016, 78.
[55] World Bank, IDE-JETRO, OECD, UIBE, and WTO, *Global Value Chain Development Report 2017*, 2017, iii, 142–43; Lanz and Maurer, "Services and Global Value Chains," March 2, 2015, 2.
[56] OECD and the World Bank, *Inclusive Global Value Chains,* August 2016, 78.
[57] World Bank, IDE-JETRO, OECD, UIBE, and WTO, *Global Value Chain Development Report 2017,* 2017, 142.

Coincidentally, Hong Kong, Singapore, and the United States are all service-oriented economies[58] and the global leading services exporters.[59] GVC-enabling services[60] accounted for a substantial share of these economies' services exports (figure 11). Unfortunately, data limitations make it difficult to show to what extent services from these three re-export hubs are used to facilitate semiconductor trade or GVCs. At an aggregate level, trade in value added (TiVA) measures, a statistical approach which traces the origin of value added in gross exports as a way to measure GVCs, indicates that the domestic service value added share in gross exports grew for these three economies from 2005–16, confirming the service linkage in these economies' exports (figure 12).[61] Although not conclusive, these data suggest that strong services sectors in these economies could have contributed to their rising roles as regional supply chain hubs.

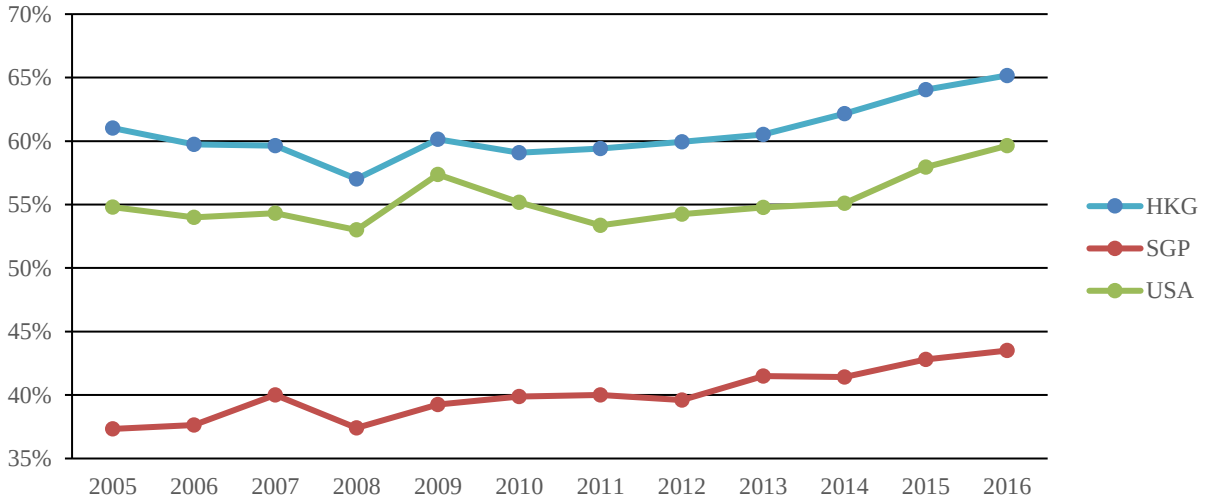
Figure 11. The share of GVC-enabling services exports in total services exports, 2005–16



Source: Author's calculation based on World Trade Organization (WTO), "International Trade Statistics, Trade in Commercial Services" (accessed April 15, 2019). For underlying data table, see table C-9.

[58] Services accounted for 89 percent of Hong Kong GDP, 70 percent of Singapore's GDP, and 77 percent of U.S. GDP in 2017. World Bank, "National Accounts Data" (accessed July 8, 2019).
[59] Hong Kong, Singapore, and the United States were ranked no. 15, no. 9, and no. 1, respectively, of the world's largest services exporters in 2017. IMF, "Balance of Payments, Analytic Presentation by Country" (accessed July 8, 2019).
[60] Based on the literature reviewed above, this paper defines the following four major Extended Balance of Payments Services Classification (EBOPS) categories as GVC-enabling services: freight transport services, financial services, telecommunication services, and other business services.
[61] OECD, "Trade in Value Added Database, 2018 Release" (accessed August 6, 2019).

Figure 12. The share of domestic services value added in gross exports, 2005–16



Source: Organisation for Economic Cooperation and Development (OECD), "TiVA Database, 2018 Release." For underlying data table, see table C-10.

VI. Conclusion

The development of GVCs is visible in the trends throughout key re-export hubs. In the last two decades, intermediate products accounted for the rising volume and share of re-exports by Hong Kong, Singapore, and the United States, largely driven by the evolution of GVCs. These three economies have played an increasingly important role in GVCs by acting as regional supply chain hubs that provide services to facilitate the movement of intermediate goods within the region and across the regions where international production network is intense. This phenomenon is more pronounced in sectors in which GVCs have a strong presence, as is the case with semiconductors. Given the increasing importance of GVCs in global trade, it is necessary to develop a better understanding of the role that re-export hubs play in GVCs and the international production network, and take into account the unique nature of re-exports in any international trade related research work or policy discussions.

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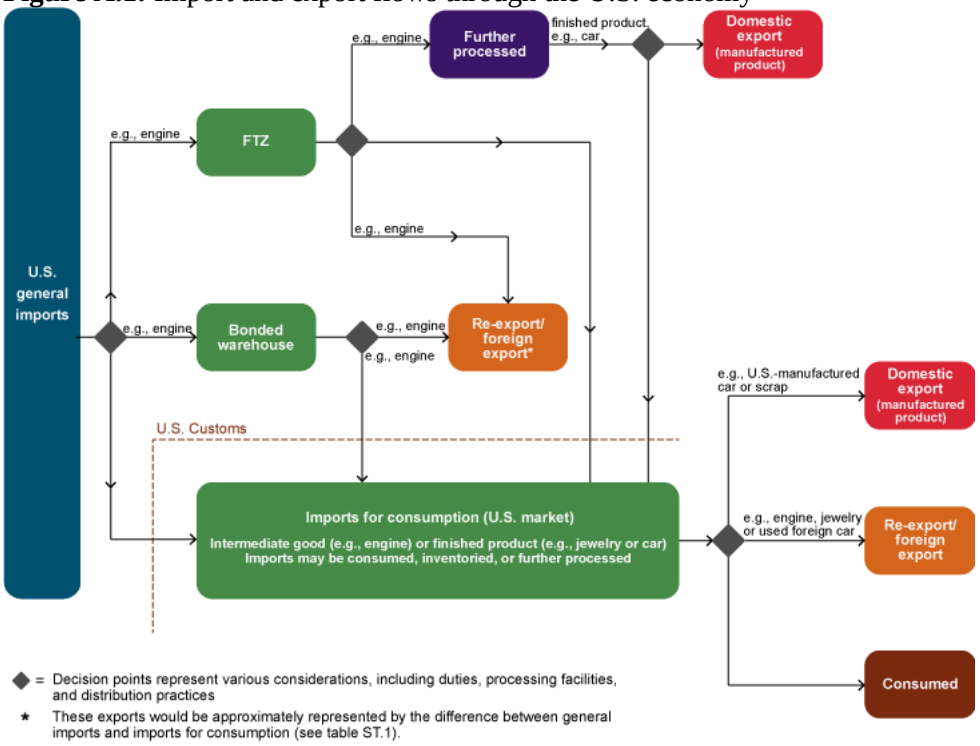
Appendix A: Re-export Definition and Data

Most countries report gross exports, which is the sum of domestic exports and re-exports.[62] The distinction between domestic exports and re-exports lies in the source of exported goods. If exported goods are produced domestically, such international transactions are considered as domestic exports. If exported goods are produced in foreign countries, such international transactions are considered as re-exports.

In light of global production fragmentation and global supply chains, the origins of goods are not always clearly or easily distinguishable. The UN defines re-exports as "exports of foreign goods in the same state as previously imported," implying that these previously imported goods undergo little domestic processing before being re-exported. The U.S. Census Bureau provides a more detailed definition of re-exports as "exports of goods of foreign origin that (1) have previously entered the U.S. customs territory, a Customs bonded warehouse, or a U.S. free trade zone (FTZ), and (2) at the time of exportation, have not undergone any substantial change in form or condition or any enhancement in value by further manufacturing in the U.S. customs territory or U.S. FTZs." (figure A.1).[63]

Figure A.1: Import and export flows through the U.S. economy



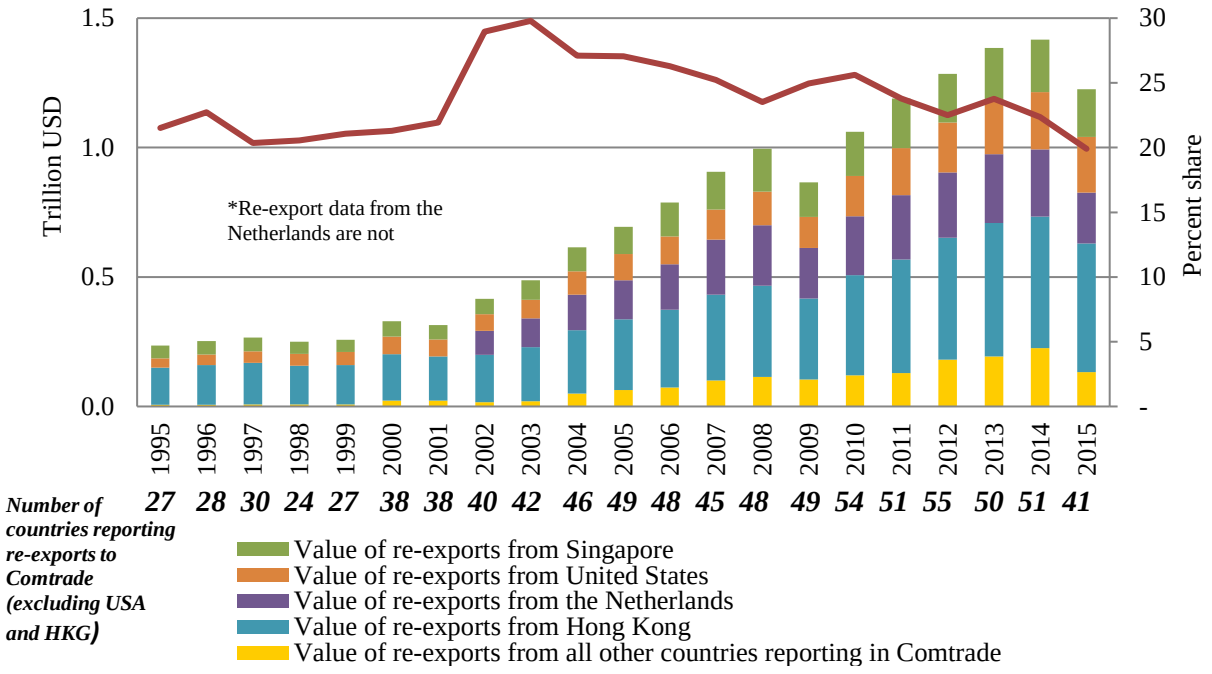
Source: Lundquist, "Trade Shifts, Special Topic: Trade Metrics," June 2015.

[62] The re-exports explored in this paper are for merchandise trade only, as specified by their HTS code.
[63] U.S. Census Bureau, "Trade Definitions" (accessed March 1, 2020). See figure A.1. in the appendix for mapping of how these different types of re-export flows in the U.S. economy.

There are two main categories of re-exports: new products that are never consumed, and used products that have been consumed before being re-exported. Both of these types of products must be made abroad, and cannot be subject to substantial transformation.[64] Substantial transformation does not include simple processing such as sorting, packaging, testing, and services activities such as marketing and shipping, however. Re-exporting is distinct from transshipment, where goods are shipped through from one foreign country to another without being acquired by an owner in the transiting country.[65]

Although the UN recommends that countries record domestic exports and re-exports separately for analytical purposes, only a handful of countries report re-export data. Even with limited re-export data available, the value of re-exports grew significantly from $186 billion in 1995 to $1.69 trillion in 2015 (figure A.2).[66] Since many countries—including the two major entrepôt economies, the Netherlands and Singapore—either don't record or don't report re-exports statistics to UN Comtrade, the actual value of re-exports is likely much higher. Globally, based on the UN Comtrade data, re-exports account for at least 23.6 percent of total exports in 2015. For some economies, the shares of re-exports are much higher. For instance, re-exports accounted for over 97.4 percent of Hong Kong total exports, 54 percent of the Netherlands' exports (in 2015), and over 50 percent of Singapore total exports.[67]

Figure A.2: Value of global re-exports and share in total exports for reporting economies, 1995-2015



Source: UN Comtrade, Centraal Bureau voor de Statistiek Netherlands, Government of Singapore, Department of Statistics.

[64] Lundquist, "Trade Shifts, Special Topic: Trade Metrics," June 2015.
[65] OECD, "Item 7 c): Identifying and Measuring Re-Exports and Re-Imports," STD/NAES/TASS/ITS(2006)18, September 5, 2006, 2.
[66] UN Comtrade (accessed March 5, 2019).
[67] Authors' calculation based on trade statistics published by Department of Statistics Singapore.

Appendix B: Top Re-exported Products by International Standard Industrial Classification Revision 4

Table B.1 Top re-exported products by International Standard Industrial Classification Revision 4

2-digit major Category	3-digit subcategory
19–Manufacture of coke and refined petroleum products	191–Manufacture of coke oven products
	192–Manufacture of refined petroleum products
20–Manufacture of chemicals and chemical products	201–Manufacture of basic chemicals– fertilizers and nitrogen compounds– plastics and synthetic rubber in primary forms
	202–Manufacture of other chemical products
	203–Manufacture of man-made fibers
26–Manufacture of computer– electronic and optical products	261–Manufacture of electronic components and boards
	262–Manufacture of computers and peripheral equipment
	263–Manufacture of communication equipment
	264–Manufacture of consumer electronics
	265–Manufacture of measuring, testing, navigating and control equipment; watches and clocks
	266–Manufacture of irradiation, electromedical and electrotherapeutic equipment
	267–Manufacture of optical instruments and photographic equipment
	268–Manufacture of magnetic and optical media
27–Manufacture of electrical equipment	271–Manufacture of electric motors– generators– transformers and electricity distribution and control apparatus
	272–Manufacture of batteries and accumulators
	273–Manufacture of wiring and wiring devices
	274–Manufacture of electric lighting equipment
	275–Manufacture of domestic appliances
	279–Manufacture of other electrical equipment
28–Manufacture of machinery and equipment n.e.c.	281–Manufacture of general-purpose machinery
	282–Manufacture of special-purpose machinery
29–Manufacture of motor vehicles– trailers and semi-trailers	291–Manufacture of motor vehicles
	292–Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
	293–Manufacture of parts and accessories for motor vehicles
30–Manufacture of other transport equipment	301–Building of ships and boats
	302–Manufacture of railway locomotives and rolling stock
	303–Manufacture of air and spacecraft and related machinery
	304–Manufacture of military fighting vehicles
	309–Manufacture of transport equipment n.e.c.
32–Other manufacturing	321–Manufacture of jewelry– bijouterie and related articles
	322–Manufacture of musical instruments
	323–Manufacture of sports goods
	324–Manufacture of games and toys
	325–Manufacture of medical and dental instruments and supplies
	329–Other manufacturing n.e.c.3290–Other manufacturing n.e.c.

Source: UN Statistics Division, International Standard Industrial Classification Revision 4.
Note: n.e.c.=not elsewhere classified.

Appendix C: Data Underlying Figures

Table C.1 Total volume of re-exports, 1995–2016, billion USD

Year	Hong Kong	Singapore	United States
1995	143.8	48.8	36.6
1996	153.3	51.5	40.7
1997	160.8	52.6	44.4
1998	149.7	46.6	45.8
1999	151.9	46.0	50.6
2000	178.6	59.0	68.1
2001	170.2	55.6	65.0
2002	183.3	59.5	63.7
2003	208.1	75.0	72.3
2004	243.1	92.7	89.4
2005	271.8	105.8	100.4
2006	299.5	130.2	107.7
2007	330.5	145.5	116.4
2008	351.0	165.3	130.3
2009	311.1	132.9	120.2
2010	381.2	170.2	155.9
2011	420.3	192.1	182.4
2012	435.2	187.5	193.6
2013	451.9	203.2	207.4
2014	466.5	202.3	223.0
2015	459.0	184.8	217.2
2016	456.8	175.9	224.5

Source: Government of Hong Kong, Census and Statistics Department; Government of Singapore, Department of Statistics; U.S. International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).

Note: The detailed re-export data for Hong Kong and Singapore were acquired directly from the sources, and therefore are not publicly available.

Table C.2. Share of re-exports in total merchandise exports, percentage, 1995–2016

Year	Hong Kong	Singapore	United States
1995	82.8	33.1	6.3
1996	84.8	33.2	6.5
1997	85.5	32.8	6.5
1998	86.0	30.5	6.7
1999	87.4	28.3	7.3
2000	88.5	30.3	8.7
2001	89.6	31.9	8.9
2002	91.6	33.2	9.2
2003	93.0	33.2	10.0
2004	93.8	34.0	10.9
2005	94.0	33.8	11.1
2006	94.5	36.4	10.4
2007	95.9	38.2	10.0
2008	96.8	40.0	10.0
2009	97.7	39.9	11.4
2010	97.7	40.6	12.2
2011	98.0	40.5	12.3
2012	98.3	39.7	12.5
2013	98.5	42.8	13.1
2014	98.5	42.8	13.8
2015	98.7	43.7	14.4
2016	98.8	44.0	15.5

Source: Government of Hong Kong, Census and Statistics Department; Government of Singapore, Department of Statistics; U.S. International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).
Note: The detailed re-export data for Hong Kong and Singapore were acquired directly from the sources, and therefore are not publicly available.

Table C.3 Hong Kong re-exports by end use, billions USD, 1995–2016

Year	Capital Goods	Consumer Goods	Intermediate Goods
1995	18.7	62.2	63.0
1996	19.3	67.6	66.4
1997	19.8	69.9	71.1
1998	19.3	64.0	66.3
1999	20.2	64.1	67.6
2000	25.5	70.3	82.9
2001	25.8	64.7	79.7
2002	29.4	65.0	89.0
2003	34.3	67.3	106.5
2004	39.8	72.1	131.1
2005	45.4	77.8	148.7
2006	50.1	80.0	169.5
2007	54.8	88.9	186.9
2008	60.0	95.2	195.8
2009	53.3	83.1	174.7
2010	69.7	91.4	220.1
2011	77.9	101.1	241.3
2012	84.5	101.6	249.1
2013	85.6	100.1	266.3
2014	88.0	100.8	277.7
2015	86.1	96.4	276.5
2016	83.0	91.8	282.0

Source: Government of Hong Kong, Census and Statistics Department.
Note: The detailed re-export data for Hong Kong were acquired directly from the source, and therefore are not publicly available.

Table C.4 Volume of intermediate re-exports through Hong Kong by industry sector (ISIC rev. 4), 1995–2016, billions USD

Year	26 – Computer, electronic and optical products	27 – Electrical equipment	32 – Other manufacturing	20 – Chemicals and chemical products	28 – Machinery and equipment n.e.c.	30 – Other transport equipment	Other sectors	Total
1995	30.4	8.9	4.2	17.9	2.7	1.4	60.4	125.9
1996	16.3	4.8	2.1	8.8	1.6	0.7	32.1	66.4
1997	18.7	5.3	2.3	8.9	1.5	0.7	33.6	71.1
1998	18.6	5.5	2.2	7.9	1.5	0.6	30.1	66.3
1999	21.7	6.0	2.4	7.7	1.5	0.6	27.8	67.6
2000	30.9	7.5	2.9	8.7	1.9	0.6	3.1	55.6
2001	32.0	7.5	2.7	7.6	1.9	0.6	27.4	79.7
2002	39.0	7.9	3.2	8.2	2.0	0.9	27.8	89.0
2003	50.4	9.7	3.5	9.3	2.1	1.4	30.2	106.5
2004	65.8	11.8	4.1	11.0	2.7	1.5	34.2	131.1
2005	78.7	13.7	5.2	11.4	3.2	1.5	35.0	148.7
2006	91.9	15.9	5.8	12.1	3.8	1.7	38.2	169.5
2007	101.1	18.5	7.3	12.9	6.4	2.0	38.8	186.9
2008	107.0	19.2	9.1	12.8	6.7	3.4	37.7	195.8
2009	100.8	15.9	8.1	10.4	5.9	2.9	30.7	174.7
2010	126.9	21.4	10.8	12.7	8.0	2.7	37.6	220.1
2011	137.3	22.0	13.3	13.3	9.2	3.4	42.8	241.3
2012	146.9	23.2	12.1	12.4	10.1	3.4	41.1	249.1
2013	160.6	24.7	13.2	11.4	10.4	4.1	41.9	266.3
2014	172.9	24.8	15.3	10.6	10.3	3.8	40.0	277.7
2015	180.1	23.8	15.1	9.5	9.2	3.8	34.9	276.5
2016	190.3	22.6	16.4	8.5	8.6	4.6	31.0	282.0

Source: Government of Hong Kong, Census and Statistics Department.

Note: The detailed re-export data for Hong Kong were acquired directly from the source, and therefore are not publicly available.

Table C.5 Singapore re-exports by end use, 2005–14, billions USD

Year	Capital Goods	Consumer Goods	Intermediate Goods
2005	18.0	11.9	68.9
2006	20.0	13.4	88.8
2007	21.4	14.0	100.2
2008	22.1	14.8	116.8
2009	17.5	12.1	94.6
2010	21.1	15.0	123.8
2011	23.6	18.6	132.4
2012	23.7	19.3	126.7
2013	24.4	21.2	133.8
2014	23.6	22.2	135.3

Source: Government of Singapore, Department of Statistics.

Note: The detailed re-export data for Singapore were acquired directly from the source, and therefore are not publicly available.

Table C.6 Major intermediate re-exports through Singapore by industry sector (ISIC rev. 4), 2005–14, billions USD

Year	26 – Computer, electronic and optical products	19 – Coke and refined petroleum products	28 – Machinery and equipment n.e.c.	30 – Other transport equipment	20 – Chemicals and chemical products	Other sectors	Total
2005	40.6	2.5	7.6	1.5	3.8	12.9	68.9
2006	50.1	6.4	9.2	2.6	4.2	16.3	88.8
2007	53.9	10.3	10.1	3.1	4.4	18.5	100.2
2008	61.4	17.3	8.9	4.5	4.9	19.8	116.8
2009	49.2	12.6	7.9	4.0	4.2	16.7	94.6
2010	64.9	19.0	8.7	4.2	6.3	20.7	123.8
2011	62.8	24.1	9.2	5.0	8.6	22.6	132.4
2012	62.2	17.4	9.4	6.2	9.1	22.5	126.7
2013	72.4	12.4	9.9	7.5	8.8	22.7	133.8
2014	75.8	10.5	9.5	7.8	8.8	22.9	135.3

Source: Government of Singapore, Department of Statistics.

Note: The detailed re-export data for Singapore were acquired directly from the source, and therefore are not publicly available.

Table C.7. U.S. re-exports by end use, 1995–2016, billion USD

Year	Capital Goods	Consumer Goods	Intermediate Goods
1995	7.4	6.5	21.2
1996	8.0	7.6	23.3
1997	9.5	8.8	24.0
1998	10.5	10.0	23.4
1999	11.2	10.6	27.1
2000	15.0	12.6	38.8
2001	15.6	12.5	35.1
2002	15.3	11.9	35.0
2003	17.4	14.0	39.7
2004	22.7	18.8	46.9
2005	27.2	22.2	50.5
2006	28.8	21.8	56.6
2007	31.1	27.1	57.8
2008	36.0	30.1	63.6
2009	32.1	27.2	60.6
2010	42.9	35.2	77.6
2011	51.5	41.5	89.1
2012	55.0	44.6	93.7
2013	56.8	47.5	102.8
2014	61.0	51.8	109.8
2015	61.5	49.3	105.8
2016	62.6	50.2	111.2

Source: U.S. Source: International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).

Table C.8 Major intermediate re-exports through the United States, 1995–2016, billion USD

Year	26 – Computer, electronic and optical products	32 – Other manufacturing	30 – Other transport equipment	27 – Electrical equipment	28 – Machinery and equipment n.e.c.	29 – Motor vehicles, trailers and semi-trailers	20 – Chemicals and chemical products	Other Sectors	Total
1995	13.27	1.63	0.71	0.55	0.71	0.91	0.83	2.59	21.20
1996	14.04	1.75	0.96	0.65	0.76	1.29	0.96	2.90	23.31
1997	13.14	1.87	1.09	0.80	0.92	1.43	1.16	3.56	23.96
1998	11.45	2.06	1.47	1.00	1.07	1.68	0.97	3.69	23.39
1999	14.07	2.34	1.69	1.23	1.06	1.60	1.22	3.89	27.10
2000	21.19	2.29	1.55	1.88	1.44	2.13	2.15	6.13	38.77
2001	17.85	2.08	2.07	1.87	1.63	2.18	1.74	5.73	35.14
2002	16.80	2.83	1.73	1.92	1.66	2.20	1.80	6.11	35.04
2003	18.90	4.06	1.69	2.23	1.94	2.14	1.91	6.80	39.67
2004	22.22	4.87	1.81	2.73	2.32	2.69	2.28	8.03	46.95
2005	23.46	4.94	1.65	3.20	2.61	3.22	2.62	8.83	50.53
2006	27.07	4.84	1.78	3.56	2.86	3.64	2.46	10.45	56.65
2007	24.16	5.68	2.12	4.08	4.00	3.69	2.52	11.59	57.84
2008	24.50	7.98	2.55	4.36	5.00	3.38	3.31	12.49	63.57
2009	23.04	7.14	5.12	4.19	4.41	3.03	3.12	10.51	60.56
2010	27.79	9.94	5.42	5.82	5.55	4.26	4.76	14.05	77.59
2011	28.82	13.05	5.63	6.64	6.29	5.66	6.39	16.63	89.11
2012	28.74	12.74	8.54	7.52	7.02	7.01	5.83	16.33	93.74
2013	29.46	16.14	9.73	8.43	7.35	8.19	5.87	17.59	102.77
2014	29.71	17.78	10.75	9.42	7.97	8.11	5.00	21.09	109.82
2015	28.83	15.39	10.72	9.91	7.71	7.81	6.36	19.04	105.77
2016	29.73	16.00	11.89	10.67	7.90	8.09	4.98	21.97	111.24

Source: U.S. International Trade Commission DataWeb/ U.S. Department of Commerce (access October 23, 2019).

Table C.9. Share of GVC-related services exports in total services exports, 2005–16

Year	Hong Kong	Singapore	United States
2005	67.8	60.5	40.5
2006	68.4	64.6	41.7
2007	68.3	66.2	42.8
2008	67.9	66.8	42.2
2009	65.1	66.2	43.5
2010	62.9	65.3	42.9
2011	59.7	64.3	42.4
2012	57.8	66.1	42.3
2013	54.4	67.1	43.0
2014	55.1	69.2	43.3
2015	56.3	68.2	43.0
2016	57.2	68.2	43.6

Source: Author's calculation based on World Trade Organization (WTO), "International Trade Statistics, Trade in Commercial Services" (accessed April 15, 2019).

Table C.10 Domestic services value added share of gross exports, 2005–16

Year	OECD average	Non-OECD average	Hong Kong	Singapore	United States
2005	49.8	28.8	61	37.3	54.8
2006	49.3	28.8	59.7	37.6	54.0
2007	49.6	29.2	59.6	40.0	54.3
2008	48.4	28.5	57.0	37.4	53.0
2009	50.9	30.7	60.2	39.3	57.4
2010	48.3	29.8	59.1	39.9	55.2
2011	47.5	28.9	59.4	40.0	53.4
2012	48.1	29.0	59.9	39.6	54.3
2013	48.7	30.5	60.5	41.5	54.8
2014	49.8	31.3	62.2	41.4	55.1
2015	50.6	34.5	64.1	42.8	57.9
2016	51.4	35.2	65.2	43.5	59.6

Source: OECD, "Trade in Value Added Database, 2018 Release" (accessed November 1, 2019).