

**THE EVOLUTION OF EMBODIED SERVICES IN MANUFACTURING EXPORTS
USING THE PHILIPPINE INPUT-OUTPUT TABLES (1985-2006)**

By

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CHAPTER I

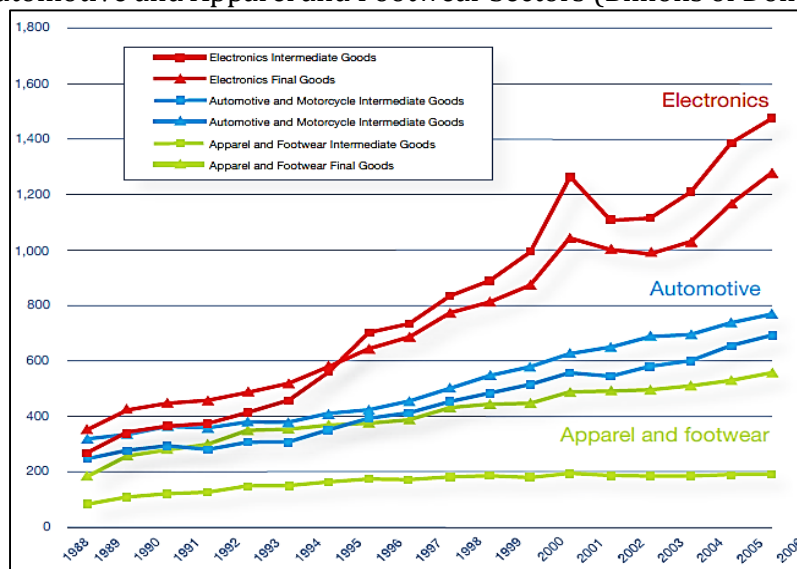
INTRODUCTION

Background of the Study

The information and communication technology (ICT) revolution in the 1980s, the technological innovations in transportation and communication, as well as reforms on trade liberalization and investment policy ushered in a breakthrough in international trade: the unbundling of factories and offices across and within countries, also known as the fragmentation of production. Firms are able to distribute their production stages to appropriate locations such that they are able to lower the costs of production. There has also been a dispersion of outward direct investment of multinational enterprises (Jongwanich, 2007). The choice of where to offshore operations depends on foreign countries' wage differentials, comparative advantage, and other factors affecting costs and the ease of doing business. There is also greater motivation to enter into multilateral and regional trade agreements because as goods-in-process cross multiple borders where tariffs and transportation costs are incurred repeatedly, reductions in trade barriers yield a multiplied reduction in the cost of producing a good.

These developments led to the formation of global production networks (GPNs). The sharp increase in the volume of trade in intermediate goods, or the components and subparts of unfinished products, reflects the rise of GPNs. This is especially evident in the case of sectors such as electronics, automotive and footwear and apparel, parts of which can easily be fragmented or produced in different locations and then transported in one location where the final product is assembled (UNCTAD, 2013). In the electronics sector, trade in intermediates has been exceeding trade in final goods since the late 1990s. In the automotive sector, the trend in the trade in intermediates has closely followed the trend in the trade in final goods (Figure 1).

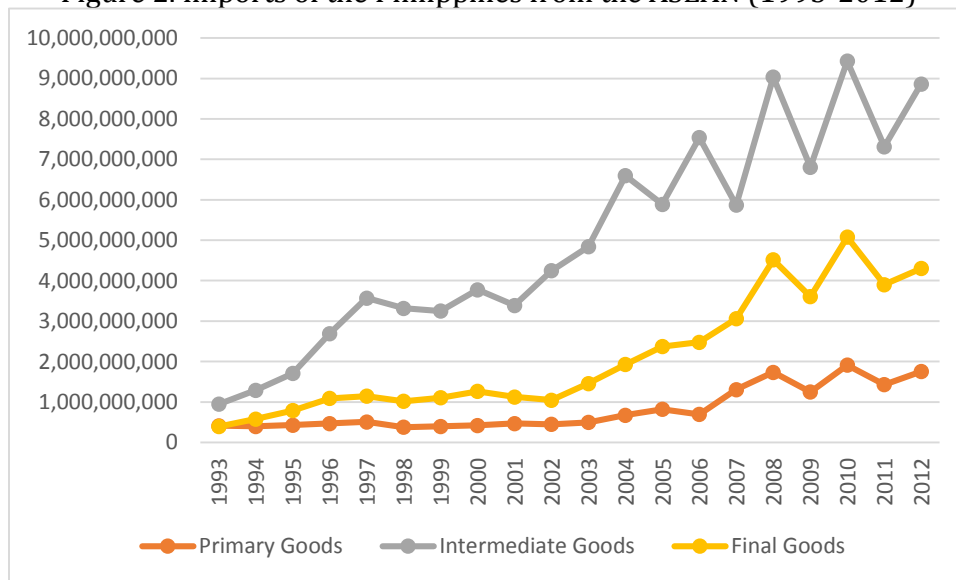
Figure 1. Trends in the World Trade of Intermediate and Final Goods in the Electronics, Automotive and Apparel and Footwear Sectors (Billions of Dollars)



Source: Sturgeon and Memedovic, 2010 in Miroudot, 2010

Increasing fragmentation of production led to lower prices of inputs due to increased competition (Okuno-Fujiwara in Martin, 2013) and higher efficiency in the production of inputs due to increased specialization (Rodriguez-Clare in Martin, 2013). Also, it was observed that the degree of dependence on this new form of international specialization is larger in East Asia relative to North America and Europe. Since the rise in regional trade agreements in the region, the region has been called “factory Asia” (Baldwin, 2011) to describe the sophisticated production networks in the region. As described by Inomata (2013), different segments in the production process are being relocated in an increasing number of locations within the East Asian region at a very fast pace. Nonetheless, the production system of East Asia is characterized by the “diversity and complementarity of its constituent countries, where each country specializes in a different stage of a production process according to its own comparative advantage”. Malaysia, Philippines, Singapore, and Thailand stand out in East and Southeast Asia for their heavy dependence on parts and components for export dynamism (Jongwanich, 2007). See for example, the sharp increase in the import of intermediate goods by the Philippines from the ASEAN, vis-à-vis our imports of primary and consumption goods, ever since the formation of the ASEAN Free Trade Area (AFTA).

Figure 2. Imports of the Philippines from the ASEAN (1993-2012)



Source: Research Institute of Economy, Trade and Industry (RIETI), 2014

The rise of GPNs also enabled an increase in the participation of developing countries in global trade. Factors like lower labor cost, lower rents, less stringent environmental regulation, etc. served as motivations for firms to locate some of their production processes in developing countries. This allowed greater interaction between developed and developing countries. For developing countries, this opened a new path of industrialization: one where nations no longer have to build their own supply chains at home, or the strategy characterized by import substitution; they can simply join an already existing international supply chain (Baldwin, 2011). In this case, a developing nation simply “receives” or “welcomes” offshored stages by preparing reasonably reliable workers and a hospitable business environment (Kimura, 2006).

Part of the hospitable business environment that developing countries prepare to “receive” or “welcome” offshored stages are producer services. In an era of production networks that cross borders, which implies great reliance on imported intermediate inputs, the production of exports have increasingly become dependent on a variety of key services like transportation and logistics services, as well as communications, insurance, finance, computer and information services, and other business services (Francois and Reinert, 1996). These are needed to link and coordinate dispersed production processes. In fact, part of the domestic value-added in an exported product are the services used to produce it. Such services are considered “embodied” or “carried” by goods which are exported across borders. Because of the increased dependence of manufacturing exports, especially those that are part of GPNs, on the said services, the competitiveness of exported goods is also determined by the efficiency of these services inputs (Kommerskollegium, 2013).

This study looks at the embodied services which were exported as they were used as inputs in manufacturing exports. Focus is given to the following producer services: transportation, storage and other services incidental to transport, communication, trade, real estate, financial services and other private business services. Using the 1985, 1990, 1994, 2000 and 2006 Philippine input-output tables, the embodied producer services in manufacturing exports are measured. The composition of embodied producer services in manufacturing exports based on the carrier exports and the importance of each embodied producer service in manufacturing exports is also examined. The trend of embodied or indirect services exports is also compared to the trend of disembodied or direct services exports. Lastly, the growth of embodied services exports, whether it was due to the growth of manufactured exports or because of the increase in the use of services in export production, is also analyzed.

Statement of the Problem

The study analyzes the evolution of the role of producer services in manufacturing exports in the context of increasing Philippine participation in GPNs. The composition and dynamics of embodied services in manufacturing exports will be discussed by answering the following specific questions:

1. To what extent are producer services embodied in manufacturing exports from 1985 to 2006? Which among the different manufacturing sectors served as carrier exports of embodied producer services? Which among the different producer services sectors have been increasingly embodied in the different manufacturing exports?
2. What has been the structure of services in relation to exports? Have services been exported more as direct or disembodied exports, or as indirect or embodied exports?
3. What caused the growth of embodied producer services in manufacturing exports?

Objectives of the Study

Looking at the change in the role of producer services sectors in the context of Philippine participation GPNs, this study aims:

1. To measure the embodied producer services in manufacturing exports from 1985 to 2006 and to examine its composition by identifying the services that are used most by manufacturing sectors and the carrier exports

2. To evaluate the evolution in the structure of services in relation to exports through the years by distinguishing between embodied services in manufacturing exports (services exported indirectly as inputs to manufacturing exports) and disembodied services exports (direct services exports)
3. To study the change in the role of services in the production structure of manufacturing exports as a source of growth of embodied producer services in manufacturing exports

Significance of the Study

This paper documents the evolution of the role of producer services in manufacturing exports from 1985 to 2006, considering the changes in the production structure of exports due to the participation of the Philippines in GPNs. Studies on Philippine participation in GPNs dwelled mainly on investments and trade in goods; however, the role of services, particularly the embodied component, are not as widely covered in the literature. Due to the increasing contribution of services in the Philippine economy, these sectors demand more attention from researchers.

Furthermore, while studies in the past have looked at the linkages of services in general with the rest of the economy in terms of aggregate output, this study extends the said literature by focusing on the embodied producer services in manufacturing exports. Also, this paper highlights the dichotomy between services indirectly exported as embodied in manufacturing exports, in contrast to services that are directly exported. Although some researchers have already measured the embodied services exports of the Philippines in the past, their analyses focused on a single time period, and did not delve deeper into the evolution of the embodiment of services in manufactured exports.

For policymakers, results of this research stress the importance of looking at the links between manufacturing and services, especially in the production of exports, and not just focusing on one of these two sectors, in crafting industry roadmaps, setting regulations and formulating trade policies. In particular, the negotiating stance in liberalizing sectors must always consider that “goods and services are now fully inter-twined and inseparable in production” (Stephenson, 2012) especially since the competitiveness of exported goods is determined by the efficiency of services. Encouraging the growth of the services sectors for example, may be seen as a result of, or as an instrument for the growth of manufactured exports sectors through spillover effects. Also, establishing the role of services in the GPNs of goods sheds light on other possible measures that need to be examined such as education, infrastructure, and technology transfer, in order to enhance access to GPNs and to maximize the gains of the Philippines from its participation in GPNs.

Scope and Limitation

This study looks at the structure of producer services in relation to the manufacturing of exports. Among the exports that use services, only the exports from the manufacturing sectors are included in this study. Focus was given to manufacturing exports because of their large share in the export basket especially starting in the 1990s and because of the importance of the manufacturing sectors to induce multiplier effects to the entire economy. Although services may also have their own GPNs, these were not included in this study. Rather, services that were

embodied in manufacturing exports were distinguished from services that were directly exported.

Not all services sectors are expected to have significant contributions in manufacturing exports. Hence, special focus was given to producer services, which, by definition are the services whose activities are more production-oriented than consumption-oriented. Broadly, unlike consumer services that are for private consumption, literature on producer services identify specific subsectors that have a major role in export production and manufacturing. These are transportation, storage, and other services incidental to transport, communication, trade, financial services and insurance, real estate and ownership of dwellings, and other private business services. The basis for their classification under producer services will be further discussed in the next chapters.

Among the methods that could be used to look at the export structure, inputs used in production and links between sectors, the input-output framework was selected for this study. While other methods like the production function approach only captures the direct linkage among sectors, only the input-output framework captures both the direct and indirect linkage among sectors. This feature of the input-output framework is crucial for this study because most of the linkages between services and manufacturing are indirect (see Appendix A). Tomlinson (1997) also highlighted how the input-output framework allows us to think of an economic system as a set of interlaced sectors in a network where the degree to which sectors can interact with each other could be assessed through the nodes of the network. It can also take account of supply and demand factors simultaneously.

However, a sector's knowledge or technology is assumed to be embodied in a sector's output, failing to capture disembodied spillovers. Also, sectoral output is treated as homogeneous. An underlying assumption is that the production structure of the manufacturing sectors is the same for exports and the goods sold in the domestic market. For some sectors, however, this may not be the case. For example, as noted by Urata and Kiyota, export production does not use much retail services or multilayered wholesale services when compared with production for the domestic market. Moreover, the input-output relations used in this study do not distinguish between domestic activities and imported inputs used in production.

Another limitation of using the input-output approach is that input-output tables span intermittent years. In this study, the Philippine input-output tables from 1985, 1990, 1994, 2000 and 2006 from the Philippine Statistics Authority were used. The 1985 table was selected as the starting point because literature from other countries showed that the effects of the ICT revolution and the international fragmentation of production began in the late 1980s. The succeeding input-output tables were included to show the changes in export structure through time. The 2006 table is the latest available input-output table in the Philippines, limiting the study to the said year.

There are also differences between input-output tables for different years. For example, some modern sectors that may already be in the 2006 table may not have been in the 1985 table. To address this, the tables had to be aggregated into 35 sectors. Because of this, the researcher was not able to look at more specific sectors from more disaggregated tables for the analysis. The details of the aggregation are further discussed in Chapter 3.

Also, the input-output tables used in the study are in current prices. Thus, in comparing between services embodied in the exports of different sectors, between embodied and disembodied services exports, and in looking at the contribution of different factors to the growth of embodied services in exports, the analysis was done in relative terms or as shares, ratios, and percentages, rather than absolute values.

Lastly, through a decomposition method based on the formula for the embodied producer services in manufacturing exports, its growth was attributed to the growth of exports, the growth of the service use intensity of manufacturing exports, or the interaction of both. In reality, however, there may be other factors affecting the growth of embodied producer services in manufacturing exports or the role of services in export production in general. Such factors include the governing policies and the rise in foreign direct investments on the manufacturing and producer services sectors. These factors were not explicitly identified in the formula based on relationships in the input-output framework. Rather, their effects on the embodied producer services in manufacturing exports are simply implied in the input-output identities.

Definition of Terms

1. *Indirect Services Exports or Embodied Services in Manufactured Exports* – services inputs used in the production of manufactured exports
2. *Direct or Disembodied Services Exports* – services exported directly through any of the four modes of delivering services internationally as defined by the World Trade Organization General Agreement on Trade in Services: cross-border trade, consumption abroad, commercial presence, and the movement of natural persons
3. *Producer Services* – services used in the production of other industries such as business services which include professional, information and intellectual activities that include computer services, bookkeeping, advertising, architecture, engineering, consulting and legal services (Hansen 1990, Coffey, et. al. 1996, Airoidi et. al. 1997); finance, insurance and real estate (or FIRE services); and finally, other services that are regularly consumed by firms and organizations such as transportation, storage and communication services (Sassen, 2001)
4. *Logistics* - part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements. (Heaver, 2004)
5. *Freight Forwarding* - arranging the transportation, storage, and handling of goods along with the processing of documentation between and within countries (Heaver, 2004)
6. *Transportation, Storage and Services Incidental to Transport* - activities related to providing passenger or freight transport, whether scheduled or not, by rail, road, water or air and auxiliary activities such as terminal and parking facilities, cargo handling, storage. (Philippine Statistics Authority)
7. *Trade Services (Wholesale and Retail Trade)* - resale or sale without transformation of new and used goods to retailers, to industrial, commercial, institution or professional users, to other wholesalers, and to government, wholesale merchant, industrial distributors, exporters and importers (Philippine Statistics Authority)
8. *Communication Services* – includes postal and courier activities and telecommunication services (Philippine Statistics Authority)

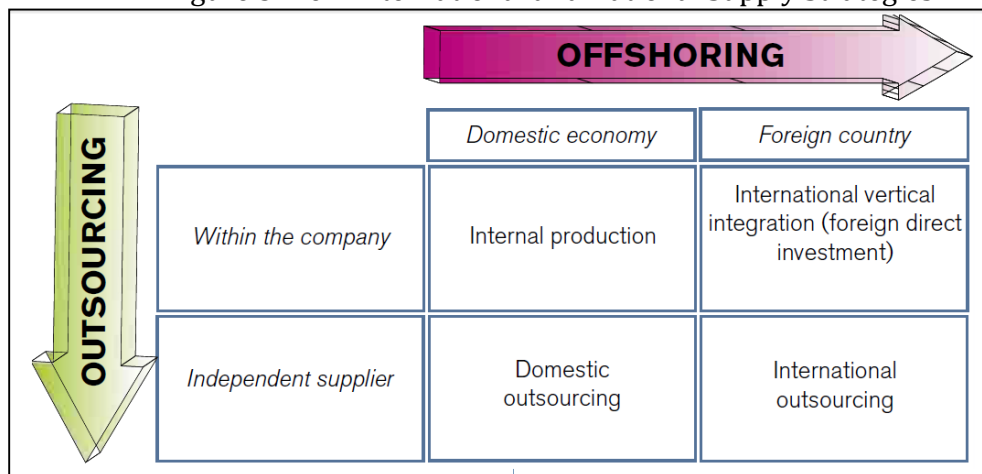
9. *Real Estate and ownership of dwellings* - includes buying, selling, renting and operating of self-owned or leased real estate such as apartment buildings and dwellings, non-residential buildings; developing and subdividing real estate into lots, etc. (Philippine Statistics Authority)
10. *Financial Services* - includes banking institutions, non-banking institutions, insurance, and other activities auxiliary to financial intermediation (Philippine Statistics Authority)
11. *Fragmentation of Production* - also unbundling (Baldwin, 2007) or splintering (Bhagwati, 1984) of production, when activities in the production of a good that used to be done under the roof of one factory is distributed to different production blocks within a country or in several countries (Jones and Kierzkowski, 1990)
12. *Indirect linkages* - when the output of sector A is used as an input to the output of sector B and the output of sector B is used as an input to sector C, then the linkage between sector A and C is considered indirect
13. *Outsourcing* - purchasing of material and service inputs from an independent provider instead of producing them in-house (Winkler, 2009)
14. *Offshoring* - also known as international outsourcing (Winkler, 2009)

CHAPTER II

REVIEW OF RELATED LITERATURE

Baldwin (2011) proposed that because of the ICT revolution which reduced transportation and communication costs, and the economic and regional integration of the recent decades, supply chains and production networks started to cross national borders. Fragmentation could occur both in the national level and international level (Figure 3). At the national level, a firm can either produce its inputs internally or outsource its inputs from an independent domestic supplier. At the international level, the choice is between vertical integration and international outsourcing. By choosing the former, the firm manufactures its inputs by putting up a subsidiary in another country; while the latter means purchasing inputs from or engaging in subcontracting arrangements with an independent foreign company (Miroudot, 2010). The choice of where to offshore operations depends on foreign countries' wage differentials, comparative advantage, and other factors affecting costs and the ease of doing business.

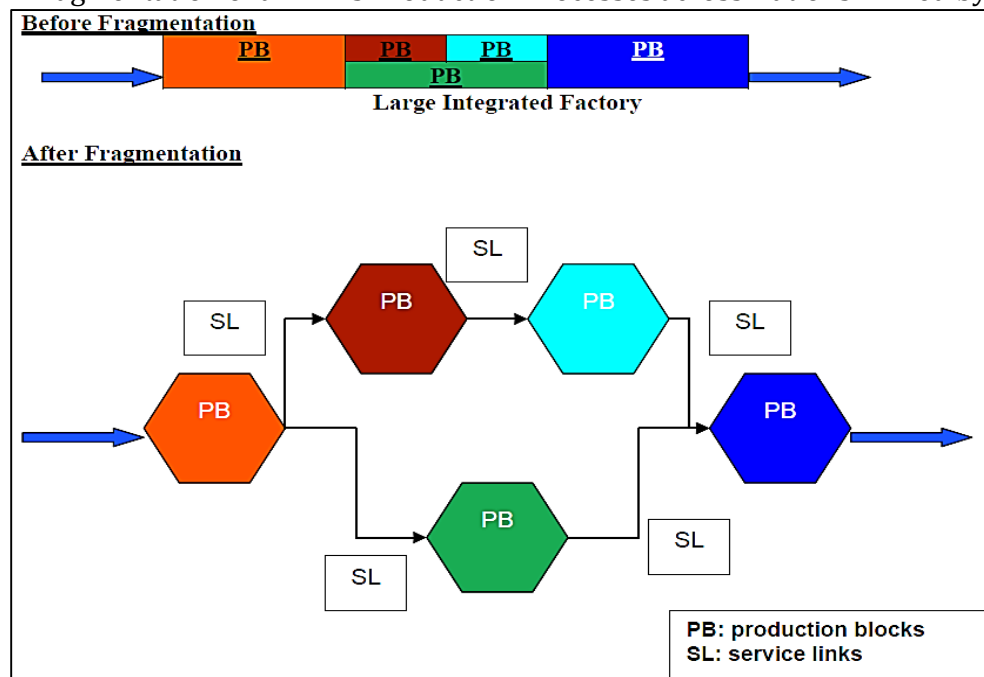
Figure 3. New International and National Supply Strategies



Source: Miroudot, 2010

Kimura (2006) observed how production costs are lowered upon fragmenting production processes into several production blocks that manufacture intermediates and locating them via foreign direct investment in appropriate places where there will be location advantages. Part of the location advantages is the presence of crucial service links like transportation and coordination. For example, efficient ports and airport services, along with information technology that lead to improved logistics, allow lead firms to coordinate dispersed activities and synchronize production and marketing (UNCTAD, 2002 and Heaver, 2004 in Austria, 2006). This was illustrated by Kimura (2006) in Figure 4.

Figure 4. Fragmentation of a Firm's Production Processes across Nations Linked by Services



Source: Kimura, 2006

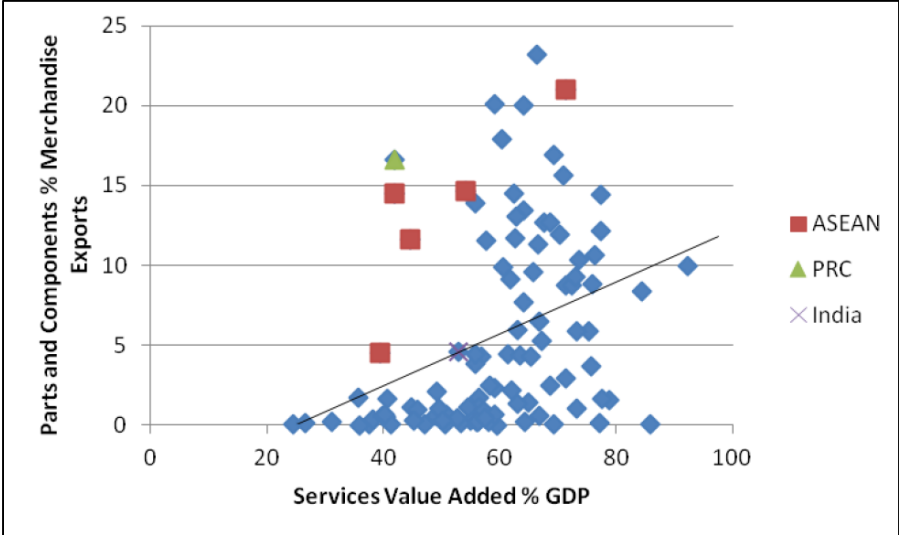
The formation of GPNs is also evident in the “trade-investment-services nexus” (Baldwin, 2011). More recent literature highlight the “trade-investment-services-know-how nexus” (OECD, WTO and World Bank, 2014) which made the rise of GPNs influential not just in determining future trade and FDI patterns but especially in tapping growth opportunities. This means that there is an international movement of capital and ideas as well as investment in production facilities, personnel training, technology and long-term business relationship. These are most evident in sectors like electronics and automotive industries because of the nature of their parts and components that could be “separately produced, easily transported, and assembled in low-cost locations” (UNCTAD 2013). On the other hand, extractive industries, though they have very low foreign value-added, serve as “fundamental starting point” of many GPNs. Also, services sectors such as telecommunications, finance, utilities, and business services, despite their relatively low content of imported inputs, still have crucial involvement in GPNs because of their role in exporting manufactures, or manufacturing exports. In fact, the urgency of improving the efficiency of these services is called for in forging GPNs (OECD, WTO and World Bank, 2014).

Baldwin (2011) also presented a framework which highlighted a nation's industrial competencies as a determinant for its participation in GPNs. Industrial competencies include specialized trainings, producer services, etc., as suggested by Amsden (2001). In particular, some generic capabilities needed for industry are: first, production capabilities like production management, production engineering, logistics, finance, etc.; second, project execution, capabilities like personnel training, undertaking feasibility studies, project execution, project engineering, procurement, etc.; and lastly, innovation capabilities like research and development. It would be observed that services generally fall under these competencies. The demand for these competencies is derived from the demand for industry. When the demand for industry grows, the demand for the competencies also grows. Generally, with international trade,

the demand for both industry and competencies grows, vis-a-vis when the demand is only limited by the domestic market. Baldwin also related how the growth in the supply of a country's industrial competencies could increase the technological sophistication of a country's exports. This means that a country must invest not just on strategic infrastructure but also on the education, skills and training of its labor force on the aforementioned industrial competencies.

Interestingly, Shepherd and Pasadilla (2012) looked at the services sector as a determinant of a country's ability to participate in GPNs, along with trade and investment policies. They looked at the correlation between the share of services value-added in GDP and the share of parts and components in a country's merchandise exports, which served as a proxy for its degree of participation in international production. In a cross-country analysis for the year 2007, they found that the relationship is moderately significant although the ASEAN countries and China could be considered "over-achievers" in the sense that their actual participation in GPNs is more than what could be explained by their services sectors. (Figure 5)

Figure 5. Participation in Production Networks vs. Services Sector Size, 2007



Source: Shepherd and Pasadilla, 2012

In a qualitative discussion of the role of local support structures for the competitiveness of the Philippines in GPNs for electronics, Austria (2006) also stressed the importance of service infrastructures, especially transport and logistics. The production chain is laden with time-sensitive intermediate inputs traded between countries. These require efficient air transport services. Moreover, less transit time also translates to lower costs of production because if logistics services are inefficient, firms will maintain higher inventories at each stage of production, requiring additional working capital. The experience of Newly Industrialized Economies (NIEs) like Korea and Taiwan showed that local support structures played an important role not only in increasing the competitiveness of these economies' electronics industry but also in enabling GPNs contribute to their economic development.

Development of Logistics

The expansion and increasing sophistication of logistics is a direct result of the expansion and increasing sophistication of the manufacturing industry, from which its demand is derived. Because of the changing nature of product markets, logistics have become a tool used by manufacturing firms to increase competitiveness. Heaver (2004) noted how the reduction of tariff and other trade barriers, improvements in the efficiency of transport services and the lower weight of high-value products led to a restructuring of multinational corporations from a regional to a global perspective. This also led to a more intense spatial competition, or the competition of products made in different locations for distant markets.

In a discussion on the logistics industry in East Asia, Heaver (2004) identified four pressures from supply chain management causing the changes in logistics. These are: sourcing in low-cost locations, supply chain visibility, just-in-time delivery, and postponement. Firms can only locate in countries with low-cost advantages if an efficient logistics services allows them to get products where they are needed. Supply chain visibility means that modern technology already allows sales information to be transmitted and the status of orders to be monitored in real time. To reduce inventory costs, just-in-time delivery emerged, allowing frequent, small-quantity deliveries that are timed to respond to the immediate needs of users. Postponement means some processes of production are delayed so that undifferentiated products are held in a centralized inventory, and differentiating processes are performed only when information about demands is obtained. These are all responses to changing consumer preferences especially when it comes to modern technology products such as electronics. Competition is increasingly becoming time-based and products compete based on customization and availability in markets.

As a result, there have also been structural changes in the logistics industry. Among these are the increasing role of freight forwarders, the mushrooming of specialized providers of more sophisticated and comprehensive services, the increased international presence of foreign logistics companies, and the vertical integration of providers of transport and courier services. Conventionally, freight forwarders arrange transportation, storage and handling of goods along with the processing of documentation between and within countries. Their role expanded to include systemizing online information about status and location of shipments. As a result, some specialized providers, especially software companies with IT capabilities, became third party logistics providers (3PLs). Eventually, knowledge-based companies specialized on the planning and management of logistics services and became fourth party logistics providers (4PLs). Foreign logistics companies also acquired or established strategic alliances with partners in developing countries to provide customers with a better global presence. An example of this is the acquisition of Royal Air Cargo Corporation of the Philippines (Heaver, 2004). Also, traditional providers of transport and courier services expanded their scope to include logistics. Examples of these are Lufthansa, UPS and FedEx.

Studies on the Role of Services in Trade

There have been a number of studies that focused on the composition of services trade, most of them using input-output tables which is based on the Leontief framework. Among the most recent was by ITS Global (2010) which looked at the services that were directly used as inputs in the production of goods and other service exports. The significant contribution of ITS Global in the embodied services literature is the identification of “carrier exports”, or the goods

and services which are exported across borders containing services inputs. In particular, they found that embodied services were concentrated in Australia's mining exports and to a somewhat lesser extent, manufacturing. They used a simple calculation to arrive at the embodied services in Australian exports with 2008 input-output tables. They simply computed for:

“estimates of the share of intermediate services inputs in the domestic output of each of the industry groups in the Input-Output Tables. These shares were then applied to the cross-border exports by each of the industry groups in question, as recorded in the Input-Output Table. This provided an estimate of the embodied services exports in that year, the sources of the ‘carrier exports’, and the sources of the services embodied in them.”

Using this method, they were able to estimate that the share of cross-border services and embodied services in Australia's services exports were at 60 percent and at 40 percent of total services exports, respectively. The disadvantage of the formula employed by ITS Global is its failure to capture the indirect flows of services. It only captures the services that were directly used as intermediate inputs used in producing the output of a certain industry.

On the other hand, an older study by Urata and Kiyota (2003) looked at services that were embodied in goods exports through direct and indirect linkages. They studied the services trade in East Asian countries, computed for the services trade embodied in goods trade using 1990 input-output tables, and compared these with values of disembodied services trade. They started with the balance of domestic production and consumption described in the formula:

$$Q \equiv AQ + D + EX - IM$$

where EX is the export vector, IM the import vector, D the domestic final demand vector, Q the output vector and A is the matrix of input-output coefficients a_{ij} . Note that input-output coefficients are computed as follows:

$$a_{ij} = \frac{X_{ij}}{X_j}$$

where X_{ij} is the intermediate demand flow from industry i to industry j and X_j is the total inputs used by industry j . The magnitude of production induced by exports can then be described as

$$Q_{EX} \equiv (I - A)^{-1}EX$$

and assuming that IM is exogenously determined, that of imports (import substitution) as

$$Q_{IM} \equiv (I - A)^{-1}IM$$

where $(I - A)^{-1}$ is the Leontief inverse or multiplier matrix. Using the Leontief inverse or multiplier matrix also takes into account the services that do not take a direct route to the receiving sector. This is because even the services used in producing the raw materials or

intermediates that make up a final product are accounted for. In short, both the direct and indirect flows from sector to sector can be estimated.

In the notations above for the input-output coefficients, the manufacturing sectors are denoted by industry j and the services sectors industry i . Based on these formulas, using the export and import vectors of goods (where exports and imports of services are zero) and using the values for services in the Leontief inverse matrix, Urata and Kiyota were able to arrive at trade in services embodied in goods trade. In this case, however, the assumption of the Heckscher-Ohlin model that the input-output relations or production technologies are identical between countries was applied for the computed services required for the production of import-competing goods.

Urata and Kiyota also came up with proportions of embodied service exports or imports in total (disembodied and embodied) service exports or imports for the countries studied: Japan, Singapore, Taiwan, Malaysia, the Philippines and China. The lowest proportion of embodied services exports in total services exports was exhibited by the Philippines at 0.24. According to the authors, this was due to the large share of semiconductors and electrical machinery in the goods exports of the Philippines, since these goods require only assembling operation and not much service content. It was also found that among services sectors, the proportion of embodiment in goods exports vis-a-vis total services exports were lower for transportation, telecommunications and finance because of the high tradability of these sectors.

For ease and reliability of comparison, Urata and Kiyota also computed for the magnitude of embodied services exports or imports resulting from the production of 1 million dollars' worth of goods exports or imports. They found that the magnitude of services embodied in goods trade was relatively larger for Japan, Singapore, Taiwan and Malaysia and smaller for the Philippines and China. This reflects the patterns of trade and the structure of production of the countries studied; this means that for the Philippines and China, services were not being used as significant inputs in their production, or at least not as much as in the other countries.

Pasadilla (2006) applied the formula presented by Urata and Kiyota (2003) for computing embodied services trade using the 1994 Philippine input-output table. She claimed that whereas countries with huge manufactured goods exports like Japan are expected to have very high embodied services exports relative to disembodied services exports, the case would not be the same for the Philippines. In fact, her results showed that in 1994, direct trade in services was almost double that of indirect service trade. The proportion of embodied services exports in total services exports was at 0.35. Looking at the Philippines' imports, the ratio of embodied service imports to total services imports was 0.76; this was because many of the country's imported goods come from developed countries where services value added already dominated the economy.

The proportion of embodied services exports in total services exports or the embodied services ratio for the Philippines as computed by Urata and Kiyota (2003) differed from that derived by Pasadilla (2006). While the ratio was 0.24 using the 1990 input-output table, it was already 0.35 using the 1994 input-output table. This change may be due to the change in the structure of the economy especially in relation to exports. This may also be due to the changes in the techniques of production during the time between the two periods. Attributing the change

in embodied services exports to any of the said reasons requires a decomposition analysis. However, there are no studies yet in the literature that did so.

Francois and Manchin (2011) took a step further in analyzing the role of services in exports by examining its embodiment on the basis of domestic value-added in exports, which separated imported intermediate inputs from domestic ones. Since they used a panel of global input-output data or a set of global social accounting matrices spanning intermittent years from 1992 to 2007 which are available through the GTAP database, they were able to see not just the direct and indirect contribution of services to value-added contained in a given country's exports, but also the contribution of third-country value added in services. Their results for global trade and production (by aggregating the inter-country input-output tables into one table for the entire world) showed that from 1992 to 2007, the ratio between the value-added of services in other industries over the gross exports of services has been above consistently above 1 for the services sectors, while for the manufacturing sectors, consistently below 1. This implies that, most of the world's exports in services,

“on a value added basis, are embodied in exports of goods. Direct exports in services are small, globally, relative to indirect of embodied exports. Another point to note is that this ratio has not really changed since the early 1990s. In other words, though trade in services has grown rapidly, so has trade in goods.”

Pasadilla and Wirjo (2015), on the other hand, compiled an input-output table for a number of APEC economies through the OECD Structural Analysis (STAN) database. The countries that were included based on availability of data were Australia, Canada, Chile, China, Indonesia, Japan, Korea, Mexico, Chinese Taipei and the United States. They used a backward linkage analysis to look at how the growth in manufacturing leads to the growth of services in so far as services provide inputs to manufacturing. They found that in the mid-2000s, a unit increase in the manufacturing sector output would increase output of services sector would increase output of services sector by between 0.382 and 0.606 depending on the manufacturing sector. They also used the OECD-WTO Trade in Value-Added (TiVA) database to identify the service sector with the highest and the fastest-growing indirect exports through manufacturing. They found that business services had the highest share in total services value-added in manufacturing in 2009 and had the fastest-growing indirect exports through manufacturing. It overtook the sectors combining wholesale and retail trade and hotel and restaurants which had the highest share in total services value-added in manufacturing in 1995. Among the business services, research and development were deemed significantly important in GPNs especially in APEC economies which are already in the higher end of the chains for some sectors. Business services like legal and accounting services and engineering services also figured in the picture.

Philippine Export Promotion Strategy and Participation in GPNs

For the Philippines, the dawn of the 1980s marked the shift towards an export-led industrialization strategy. Keeping in mind “that a reform toward a more liberal and neutral trade policy is necessary to propel the economy to a higher level of industrialization”, the Philippines implemented trade policy reforms with the goal of encouraging investments, accelerating the growth of exports and diversifying industries (Songco, 2004 in Martin, 2013). This was done through tariff reform programs, liberalization of import restrictions, realignment

of indirect taxes and rationalization of export promotion measures, granting of tax incentives to those who have undergone a specific degree of export processing, diversification of export product mix and markets. This was also reflected in the rising importance of manufactured goods in the Philippine export basket. The share of manufacturing to total exports significantly increased from 50% during 1991-1995 to more than 90% during 1996-2006.

In particular, focus was given to what was then considered as non-traditional manufactured products. These were selected based on the consistent comparative advantage of the Philippines to the world and were identified as priority sectors in the export promotion program of the Development Plan for 1984 to 1987: electronics, garments, furniture, fresh and processed food, gift and housewares, footwear and leather goods and construction services. As a result, these goods comprised 66% of the Philippine export basket in 1988 (Martin, 2013). From 1990 until 2000, more importance is given to machinery and electronics.

Another initiative undertaken was the establishment of export processing zones (EPZs) and special economic zones (SEZs) which were areas specifically developed for manufacturing purposes. These zones have special provisions for basic infrastructure utilities, communications, services and other requirements of specific industries. The Philippine Economic Zone Authority (PEZA), Subic Bay Metropolitan Authority (SBMA), and Clark Development Corporation (CDC) also granted generous incentives like the basic income tax rate of 5% of gross income, and tax and duty free importation of capital equipment, spare parts, and raw materials inputs. Eventually, various economic zones in Laguna, Cavite, Tarlac and other areas were also developed. Most of these zones became sites for electronics and semiconductor manufacturing (Austria, 1998; Martin, 2013). The activities in these zones consistently registered trade surpluses, despite their import-intensive nature.

As a result, between 1991 and 1995, Balisacan (2003) observed that there was a shift in focus from labor-intensive to capital and technology-intensive exports. Initially, the export commodities wherein the Philippines was “considered to have comparative advantage are low-technology industries: food, textiles, wearing apparel, footwear, wood products, furniture and fixtures and plastic products” (De Dios and Abrenica 1990). But at the end of the period, the commodities wherein the Philippines exhibited comparative advantage were high-technology exports like communication equipment and semiconductors as well as electrical machinery.

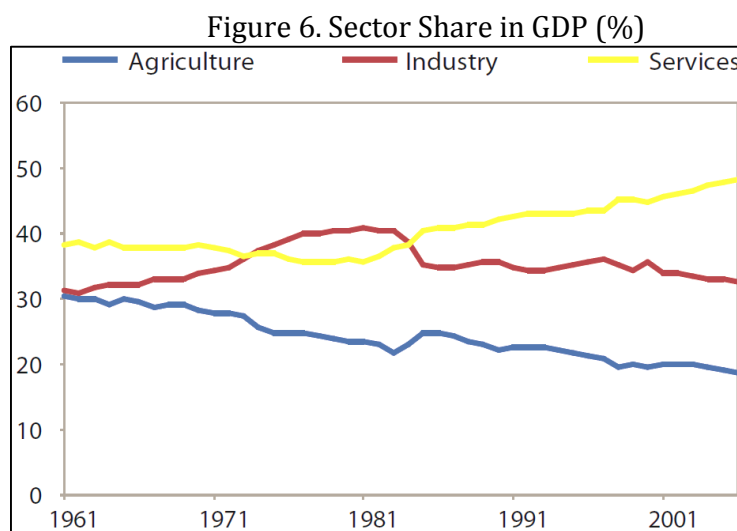
In 1992, more than half of Philippine manufacturing exports were network products: 62% of which were parts and components while the remainder were final assemblies. In terms of imports, 48% of manufacturing imports in 1992 were network products, 69% of which were parts and components (Athukorala, 2010 in Martin, 2013). Between 1992 and 1996, about 47% of total investments were already concentrated in electrical machinery, especially semiconductors (de Dios, 2002 and Aldaba 1994 in Martin, 2013). The share of parts and components in total manufacturing exports has increased rapidly, reaching over 40% between 2000 and 2006.

“These trends are indicative of the underlying shift in the country’s comparative advantage from agriculture to manufactures, and, within manufactured exports, to labor-intensive and capital/technology-intensive exports” (Balisacan, 2003). This reflects a shift in commodity composition, starting with products like apparel and footwear that require only technologically simple labor-intensive production, and moving towards “a range of more capital-

intensive, technologically sophisticated items, especially electrical and nonelectrical machinery.” (Jongwanich 2007)

The Philippine services sector and its linkages with the economy, manufacturing sector, and export production

In terms of contribution to the Philippine economy, the share of services in the economy was already larger than those of agriculture and manufacturing since the 1990s. Figure 6 shows exactly when services overtook industry. As of 2012, the services sector already comprised 57 percent of total gross value added, while agriculture only represented 11 percent and industry 32 percent (NSCB, 2013).



Source: ADB, 2007

In terms of contribution to GDP growth, from 1950 to 1980, industry was the fastest growing sector and largest contributor to GDP growth. This changed during the 1980s to the 2000s when it was already the services sector that became the fastest growing sector and the largest contributor to GDP growth. (Table 1)

Table 1. Annual Average GDP Growth and Contribution of Major Production Sectors to GDP Growth (%)

	GDP Growth Rate	Agriculture		Industry		Services	
		Growth Rate	Contribution to GDP Growth	Growth Rate	Contribution to GDP Growth	Growth Rate	Contribution to GDP Growth
1951–1960	6.4	5	25.5	7.5	34.1	7	40.4
1961–1970	4.9	4.3	26	5.7	37	4.8	37
1971–1980	5.9	4.1	17.6	7.9	49.6	5.3	32.8

1981–1990	1.8	1.2	16.3	0.6	8.5	3.4	75.3
1991–2000	3.1	1.9	12.9	3.1	35.3	3.7	51.9
2001–2006	4.6	3.7	15.9	3.2	22.6	6.1	61.5

Source: ADB, 2007

However, when looking at the importance as a growth-inducing sector, manufacturing still had greater forward and backward linkages and multipliers than services, based on a study by Pasadilla and Liao (2006) using the 1994 input-output table (Table 2). Their results show that for every unit change in final demand in manufacturing, overall output increases by 2.5, while in the case of a unit change in services demand, economic output increases by only 1.8. Nonetheless, the scenario may have changed since 1994, especially since the 1990s and the succeeding decades were marked by improvements in the market structures of the services sectors.

Table 2. Linkages and Multipliers by Sector based on 1994 Philippine Input-Output Table

Sector	Forward Linkages	Backward Linkages	Multipliers
Agriculture	0.8461	0.9778	1.7277
Manufacturing	1.8011	1.6867	2.5333
Services	1.1313	1.1461	1.8119

Source: Pasadilla and Liao (2006)

The three-pronged policy of privatization, liberalization and deregulation by the Philippine government during the 1990s was supposed to help in heightening competition with the goal of greater efficiency in services sectors. For example, in early 1990s, the Foreign Bank Liberalization Act, which allowed the entry of ten foreign banks in the country, was expected to facilitate technology transfer in the banking sector. Come 1995, more policies were enacted: the liberalization of the telecommunications industry, the privatization of water services, the deregulation of the shipping industry, and the improvements in air transport (Philippine Institute for Development Studies, 2008).

The Philippine telecommunication sector is notable for the greater reduction in its accounting rates and retail prices than in most countries that liberalized their telecommunication sector (Fink, Mattoo and Rathindran, 2001 in Goswami, Mattoo and Saez, 2012). This was after the Philippine telecommunication sector was liberalized in 1993 and competition in local-long distance services in 1995 and international simple resale was permitted which increased competition in the industry and hence improved the quality and efficiency of telecommunication infrastructure (World Bank, 2010 in Goswami, Mattoo and Saez, 2012). As a result, lower communication costs shifted the comparative advantage of the Philippines toward the more communication-intensive BPO industry.

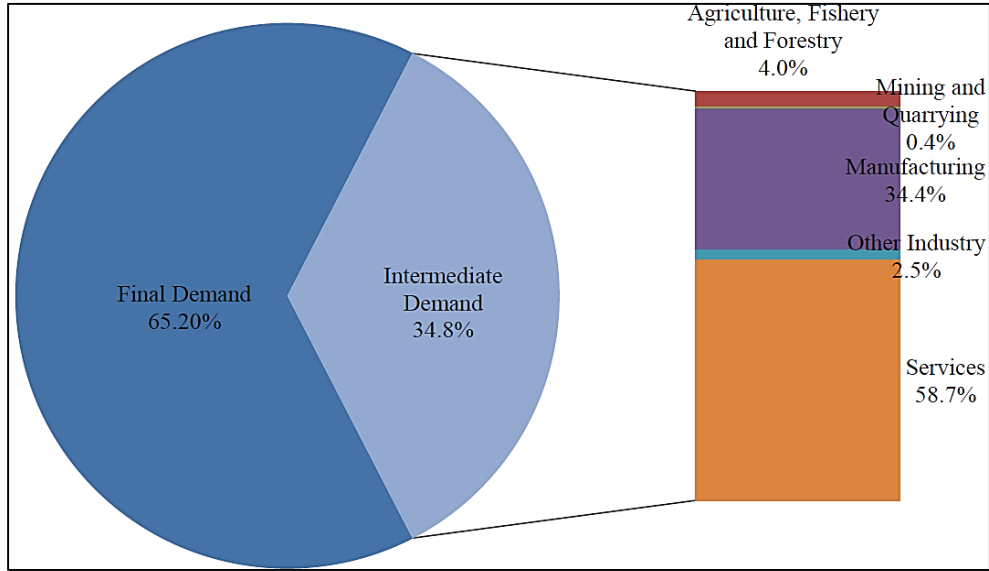
On the role of services in linking the Philippines to GPNs, it is fitting to look at the electronics industry, which has been the Philippines' leading exports since the 1990s. The rise of electronics exports was also due to the three-pronged policy of privatization, liberalization and deregulation by the Philippine government during the 1990s which, aside from the reforms in

domestic service markets, also included tariff reductions, government incentives for investors, and the development of EPZs and SEZs. For most electronic firms that are located in EPZs and SEZs, they benefit from incentives such as exemptions from payment of local taxes and licenses, contractor's taxes, wharfage fees and export tax; tax deductability of labor training expenses, organizational and operating expenses; streamlined government procedures, infrastructure services and good transport links to ports and seaports that are normally not available outside the zones (Austria, 2006). The competitiveness of industrial parks like those in Subic and Clark rely much on good logistics, which includes the presence of seaport, airport, infrastructure and service logistics industries like freight forwarders.

Pasadilla and Liao (2007) looked at whether the link between manufacturing and services has strengthened during periods of liberalization. They hypothesized that tariff reductions and policy reforms would increase pressure for local firms to become efficient and, consequently, to outsource some of the service inputs instead of producing them in-house. In effect, they expected the share of services as an input to the production of manufactures to increase. To see this, they used three different approaches. First, they employed an extended Cobb-Douglas or KLEMS (capital-labor-energy-materials-services) production function. With this, they found that the share of services as input to the production of manufactures actually decreased between 1983 and 1998. The limitation of this method, however, is that only the direct contribution of services in production is taken into account. Second, they analyzed linkage and spillover effects using Philippine input-output tables for 1985, 1988, 1994 and 2000. Unlike the extended production function, the use of the input-output framework captures both the direct and indirect interindustry linkages. The results for this portion somehow supported those of the earlier method in that the sectoral dependency of manufacturing and services declined between the 1980s and the 1990s. However, the ratio did increase with the use of the 2000 input-output table. Lastly, they utilized regression analysis to see whether the service use intensity of manufacturing industries may be attributed to other factors like policy shifts or tariff rates. With this, they found that the tariff rates and policy shifts did not explain much of the service use intensity of manufacturing sectors. The authors cautioned that the data used in the study might have not yet captured the supposed link between the manufacturing and services through the phenomenon of "splintering" or as an effect of the changes in trade and industry policies.

To give a more recent picture of the role of services in the economy, Serafica (2014) turned to the 2006 Philippine input-output table. The study particularly sheds light on the distribution and allocation structure of the services sector. In 2006, 65 percent of the total demand for services is used for final consumption (no further transformation) while 35 percent is for intermediate consumption (used to produce goods and services). Among the sectors using services as intermediate inputs, the service sector was also the most prominent, accounting for almost 60 percent of intermediate demand (Figure 7). This was followed by the manufacturing sector where 31.4 percent of intermediate demand for services is attributed.

Figure 7. Composition of Total Demand for Services based on 2006 Philippine Input-Output Table



Source: Serafica (2014)

While the figure above shows the most important industry destinations of services, Table 3 below shows the share of the service sector as a source of input for the other industries. The most intensive user of services is also the services sector, at 62.15 percent of total intermediate inputs. The lowest share of services as an intermediate input is in other industries, and the manufacturing sector. However, an important reminder is that some services are recorded in non-service industries (e.g. agricultural services would be part of agriculture, ship repair would be part of manufacturing).

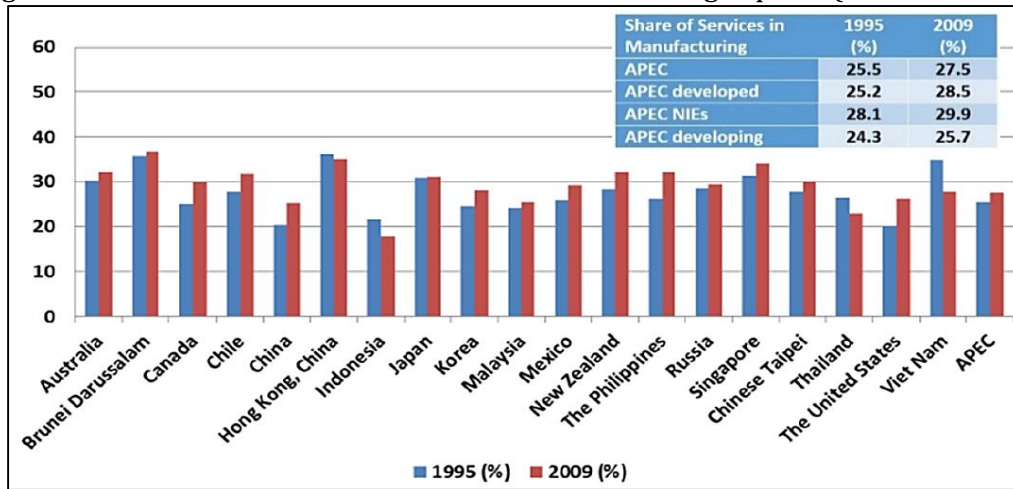
Table 3. Share of Services in Intermediate Inputs (2006)

Agriculture, Fishing and Forestry	Mining and Quarrying	Manufacturing	Other Industry	Services	All Sectors
26.23%	22.36%	17.71%	13.70%	62.15%	30.89%

Source: Serafica (2014)

In terms of services as inputs in manufacturing exports, Pasadilla and Wirjo (2015) observed that taking the Asia-Pacific Economic Cooperation (APEC) region as a whole, the share of services value-added in manufacturing exports grew faster at 149% from 1995 to 2009 than the growth of manufacturing exports at 131%. The member-countries that posted the largest increases in the share of services-value added in manufacturing exports were the United States, Canada and the Philippines. In 2009, around a third of the value-added in Philippine manufacturing exports are services (OECD-WTO TiVA database in Pasadilla and Wirjo, 2015). The shares of services value-added in manufacturing exports of each of the member-countries are shown in Figure 8.

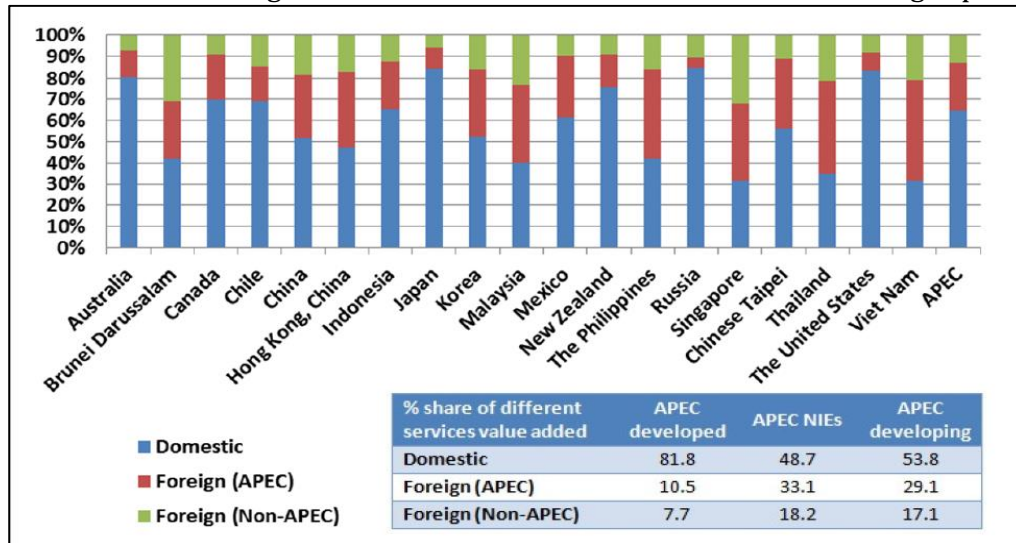
Figure 8. Share of services value-added in manufacturing exports (1995 and 2009)



Source: OECD-WTO TiVA database in Pasadilla and Wirjo, 2015

Services value-added in manufacturing exports could be further segmented into domestic and foreign services. Figure 9 shows the breakdown of services value-added for each of the APEC economies. For the Philippines, the share of domestic services was more than 40%. In terms of foreign services value-added in Philippine manufacturing exports, majority are from APEC members. The largest share of domestic services in services value-added was exhibited by Russia (85.1%) and the lowest was Singapore (31.3%).

Figure 9. Domestic and foreign share of services value-added in manufacturing exports in 2009

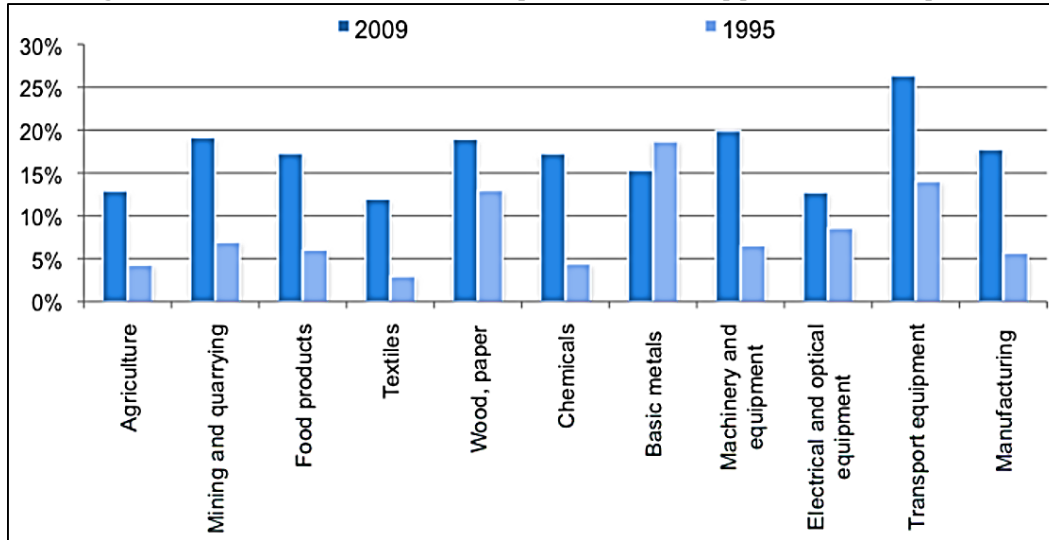


Source: OECD-WTO TiVA database in Pasadilla and Wirjo, 2015

Drake-Brockman (2014) showed that the dependence of other sectors, particularly exports, on services increased between 1995 and 2009 as reflected in the share of domestic services in the components of different export sectors (Figure 10). Among the developments in the services industry which may have led to the rise of domestic services components in Philippine goods exports is the rise of the modern logistics industry, which includes freight forwarders who specialize in arranging transportation, storage and handling of goods within and

between countries. Equipped with web-based capabilities, they program online systems through which shippers could monitor the status of their orders, thus allowing them to take early actions to minimize costs associated with delays in delivery (Heaver, 2004 in Austria, 2006).

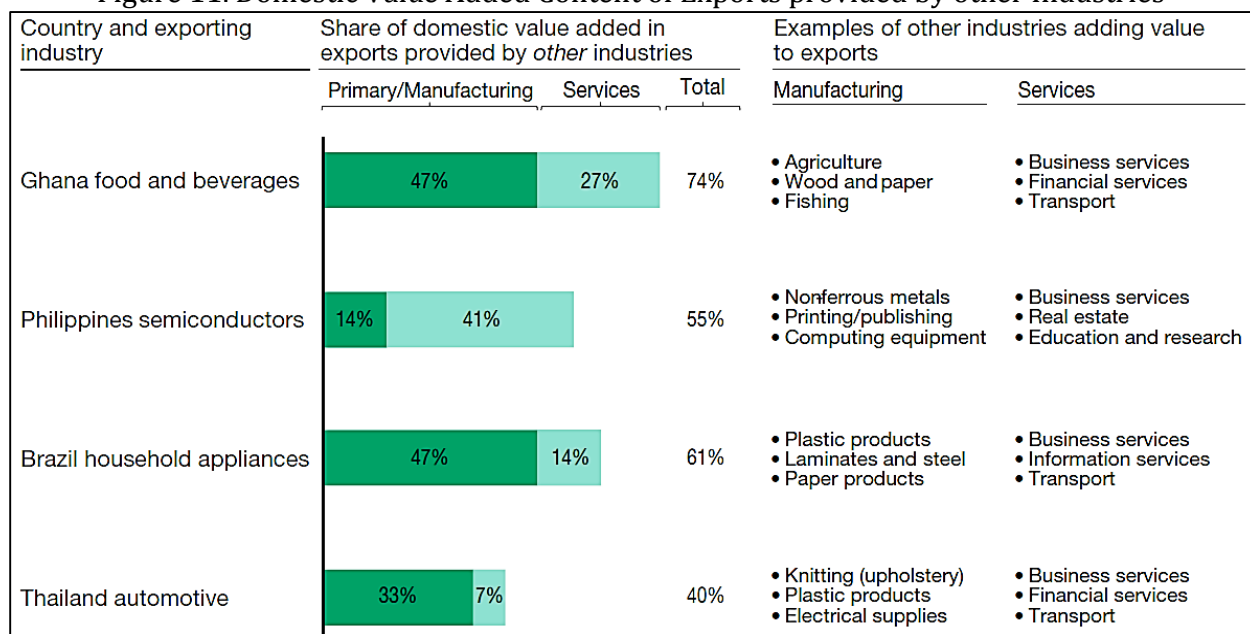
Figure 10. Domestic Services Components in Philippine Goods Exports



Source: OECD-WTO TiVA database in Drake-Brockman, 2014

UNCTAD (2013) cited the case of Philippine exports of semiconductors as having a large share of its domestic value-added content in 2010 coming from backward linkages with other sectors, especially services (Figure 11). The share of domestic value-added content in Philippine semiconductor exports is only 44%. Out of this, 55% comes from other industries while 45% comes from the local production of semiconductor companies. Most of the 55% of domestic value-added coming from other industries are provided by services, particularly business services, real estate, and education and research.

Figure 11. Domestic Value Added Content of Exports provided by other Industries



Source: UNCTAD, 2013

E. Summary of Related Literature and Contribution of the Study

In the 1980s, the ICT revolution, reduction in transportation and communication costs, and the heightened economic and regional integration allowed the unbundling of factories and offices across borders through the movement of capital and labor. From these changes sprang new generation theories about the path of industrialization: one where nations no longer have to build their own supply chains at home; they can simply join an already existing international supply chain. In this case, a developing nation simply “receives” or “welcomes” offshored or outsourced stages by preparing reasonably reliable workers and a hospitable business environment. At this point, production can be fragmented both in the national level and international level. The choice of where to offshore operations depends on foreign countries’ wage differentials, comparative advantage, and other factors affecting costs and the ease of doing business, especially service infrastructures for transportation, distribution and coordination. When producer services are used in the production of exports, they are called embodied services in manufactured exports.

There have been studies in the past that looked into the structure of Philippine services exports. Urata and Kiyota (2003) found using the 1990 input-output tables for East Asian countries that the proportion of embodied service exports to total service exports (disembodied and embodied) is only 0.24, the lowest among the countries they studied, because of the large share of semiconductors and electrical machinery, which require only assembling operation and not much service content, in the goods exports of the Philippines. Applying Urata and Kiyota’s formula for embodied services exports using the 1994 Philippine input-output table, Pasadilla (2006) found that the proportion of embodied services exports in total services exports was at 0.35, and that direct exports of services was almost double that of indirect export of services. The reason stated was the low manufactured goods exports of the Philippines for the period.

Through the years, however, with the succeeding technological innovations and the expansion of GPNs, the manufactured exports of the Philippines increased, along with their service content.

This study uses the method by Urata and Kiyota (2003) and Pasadilla (2006) to measure the embodied services exports of the Philippines. Urata and Kiyota (2003) used the 1990 input-output table to make cross-country comparisons of embodied services exports while Pasadilla (2006) used only the 1994 table to look at the services embodied in Philippine exports. On the contrary, in this study, five input-output tables were included: 1985, 1990, 1994, 2000 and 2006. This way, the changing role of services in exports as represented by the proportion of embodied service exports to total service exports (sum of disembodied and embodied), or the embodied services ratio, for the Philippines, could be seen.

However, while Urata and Kiyota (2003) and Pasadilla (2006) looked at services embodied in all goods exports which included even exports from the agricultural and mining sectors, this study only looks at the embodied services in exports from the manufacturing sectors. This study also looks at the source of the growth of embodied services exports. Urata and Kiyota (2003) attributed the low embodied services ratio to the large share of semiconductors and electrical machinery, which require only assembling operation and not much service content and Pasadilla (2006) attributed it to the low manufactured goods exports of the Philippines. This study attempts to decompose the growth of embodied services exports to the growth of manufactured exports or the increase in the use of services in export production. This way, it also serves as an extension of the study by Pasadilla and Liao (2007) on whether the link between manufacturing and services has strengthened, this time due to the participation of the Philippines in GPNs.

CHAPTER III

THEORETICAL AND CONCEPTUAL FRAMEWORK, EMPIRICAL METHODOLOGY

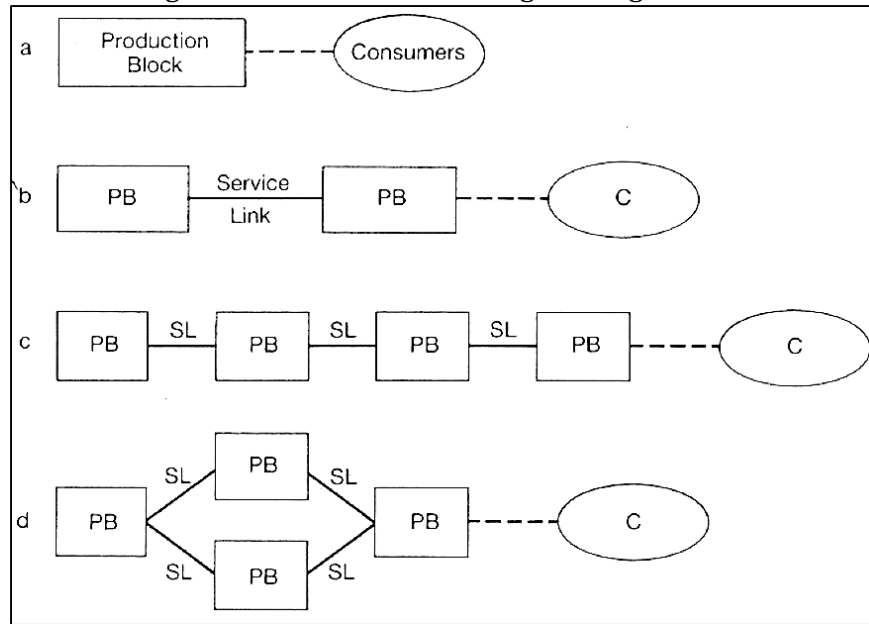
This chapter introduces the theory behind the fragmentation of production. The discussion includes the motivations for fragmentation, the events that triggered the formation of GPNs, and the role of services in a developing country's participation in GPNs. The methods employed by the researcher to meet the objectives of the study as well as the expected results based on the theory are also laid down in this chapter.

A. Theoretical Framework

The theory behind the growth of embodied services in manufactured exports was first introduced by Jones and Kierzkowski (1990) and was also cited by Kimura (2006), Kimura and Ando (2005), and Baldwin (2007). The original framework suggested by Jones and Kierzkowski is illustrated in Figures 12 and 13. Initially, every step in the production process was conducted under the roof of one factory. This is shown in Figure 12a, where there is only a single production block manufacturing a product before reaching the final consumer. Nonetheless, this does not mean that services do not contribute in any way to this mode of production. In fact, services still play the role of connecting producers to consumers through distribution and marketing operations, as shown by the dashed lines. Jones and Kierzkowski (1990) also clarified the assumption of increasing returns to scale as depicted in line 1 of Figure 13. Its vertical intercept represents fixed costs incurred in the setting up of the production block while its slope, though constant, represents the marginal costs of production.

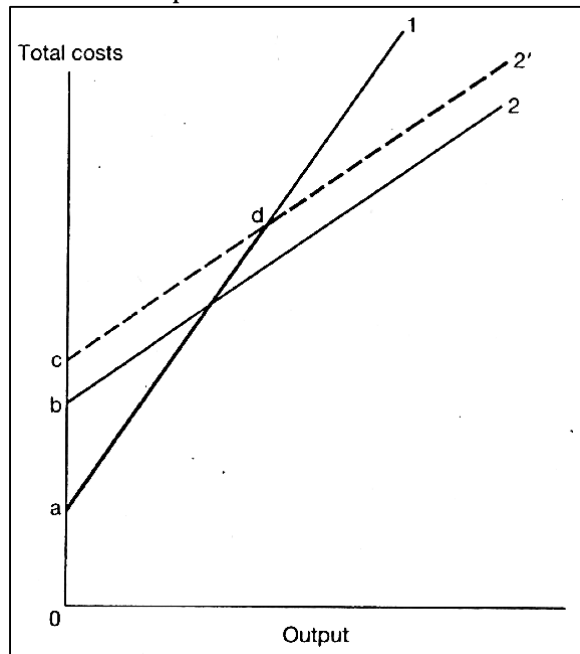
The fragmentation of a production block is illustrated in Figure 12b. The cost of production increases because of the fixed costs required in putting up additional production blocks. This is represented by line 2 in Figure 13, which has a higher intercept than line 1. There will also be additional role for services because of the need to link the two production blocks. The use of additional services adds to the cost of production, as depicted by line 2' (dashed lines), which is parallel to line 2 but has a higher intercept. The motivation for fragmenting production is the lower marginal cost incurred as output is increased, as shown by the smaller slope of lines 2 and 2' than line 1. Also, the decision to fragment depends on the cost saving in production if it were fragmented and the height of the service link cost (Kimura, 2005; Cheng, 2013). In Figure 13, the intersection of line 1 and line 2' at point d shows that if the amount of production already exceeds that point, it will be cheaper to distribute the production processes to different production blocks than to perform all the processes in one factory. This marks the fragmentation of production.

Figure 12. The Process of Fragmenting Production



Source: Jones and Kierzkowski (1990)

Figure 13. Total Costs and Output of Production before and after Fragmentation

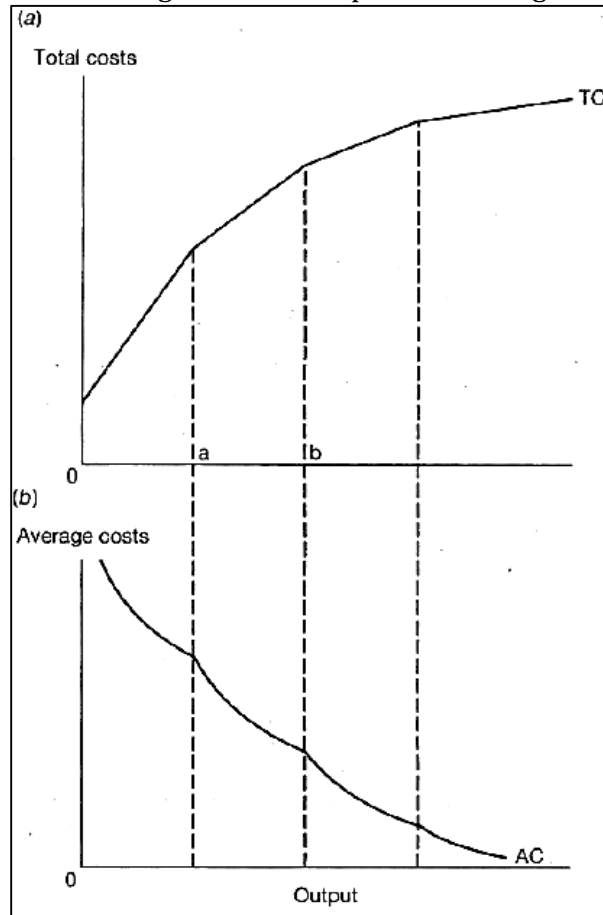


Source: Jones and Kierzkowski (1990)

Jones and Kierzkowski added that there may be an acceleration in the rate of decline in the costs of production every time there is a switch towards technologies that induce higher fragmentation. This is illustrated in Figure 14. More new firms could appear if various production blocks and service links can be utilized by more than one sector, or by more than one firm producing a differentiated product in the same sector. This was also discussed by Pamucku and de Boer (1999) as reflecting “the widening and deepening of interindustry relations”. One of

the causes of the increased division of labor among and within industries as described by Kubo (1985) and Kubo, de Melo, Robinson and Syrquin (1986) is the increasing prices of labor and capital relative to the price of intermediate products which become cheaper as they are externalized and purchased from other firms or industries.

Figure 14. Average Costs of Output under Fragmentation



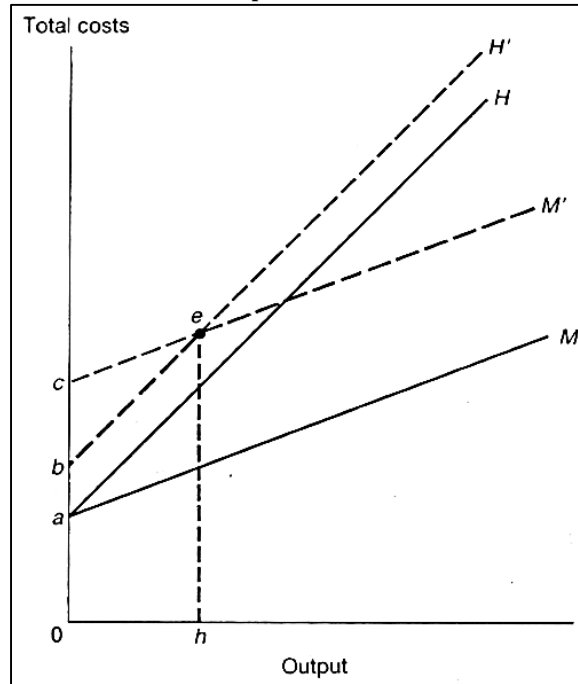
Source: Jones and Kierzkowski (1990)

While the increasing fragmentation of production is generally considered to be a natural consequence of industrialization, Kubo, de Melo, Robinson and Syrquin (1986) as well as Deutsch and Syrquin (1989) among others observed that development strategies and industrial policies are what determine the pace of structural transformation and the rate of change in intersectoral relations. In fact, it was emphasized that an outward-oriented strategy often accompanied a faster structural transformation. Also, because of the ICT revolution which reduced transportation and communication costs, and the economic and regional integration of the recent decades, the fragmentation of production occurred not just within a country but on a global scale. This led to the formation of GPNs.

Figure 15 illustrates the fragmentation of production and the role of service links on an international level. Lines H and H' demonstrate the total costs of having both production blocks in a home country and lines M and M' show the total costs of distributing the production blocks in two countries. Note that lines H' and M' depict total costs including service links. Moreover,

the fixed costs of service links needed to connect production blocks located in different countries are larger than the fixed costs of service links needed to connect production blocks in one country, as represented by the larger intercept of M' . However, the slopes of M and M' , or the marginal costs of distributing the production blocks in two countries upon taking account of comparative advantage, are still smaller than the slopes of H and H' , or the marginal costs having both production blocks in the home country.

Figure 15. Total Costs and Output with International Fragmentation



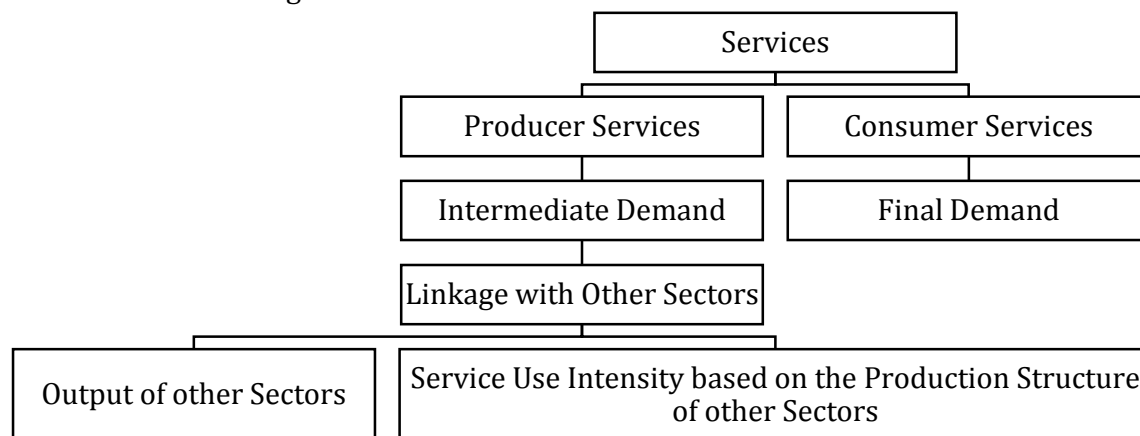
Source: Jones and Kierzkowski, 1990

Typically, the reduction in marginal costs upon distribution of production blocks in different countries occurs if some segments of the production process are located in developing countries where there are lower labor cost, lower rents, less stringent environmental regulation, etc. As a result, developing countries are able to participate in GPNs. This opened a new path of industrialization: one where nations no longer have to build their own supply chains at home, or the strategy characterized by import substitution; they can simply join an already existing international supply chain. In this case, a developing nation simply “receives” or “welcomes” offshored stages by preparing reasonably reliable workers and a hospitable business environment. Part of the hospitable business environment that developing countries prepare to “receive” or “welcome” offshored stages are producer services, especially infrastructure and logistics services that help in coordinating dispersed production such as telecommunications, internet, express parcel delivery, air cargo, trade-related finance, customs clearance, etc. (Baldwin, 2011). In the case of East Asia, Kimura (2005) noted that a competitive strategy among nations in the region was the development of industrial estates where the provision of producer services are much improved. As he observed, fragmented production blocks that locate in a developing country normally cluster together because the service links are accompanied by strong economies of scale.

B. Conceptual Framework

Demand for services may either be due to final demand or intermediate demand (Fuchs, 1968). When a service is driven more by final demand, it is considered a consumer service. When it is driven more by intermediate demand, it is considered a producer service (Yeh and Yang, 2013). This study focuses on producer services, which include the following: transportation, storage, and other services incidental to transport, communication, trade, financial services, real estate, and business services (Fuchs, 1968, Hansen 1990, Coffey, et. al. 1996, Airoidi et. al. 1997, Sassen, 2001, Yeh and Yang 2013, Cheng, 2014). Being driven by intermediate demand means that the demand for these services is derived from their linkages with other sectors. As such, demand for services grow when the output of the other sectors that use services grow, or when the relative importance of services in the production structure of these sectors grows. The relative importance of services in the production structure of other sectors is also called in the literature as service use intensity (ITS Global, 2010). This study highlights the linkage between producer services and manufacturing, where the importance of services in the production structure is expected to increase because of the fragmentation of production (Pasadilla and Liao, 2007).

Figure 16. Demand Structure for Services Sectors

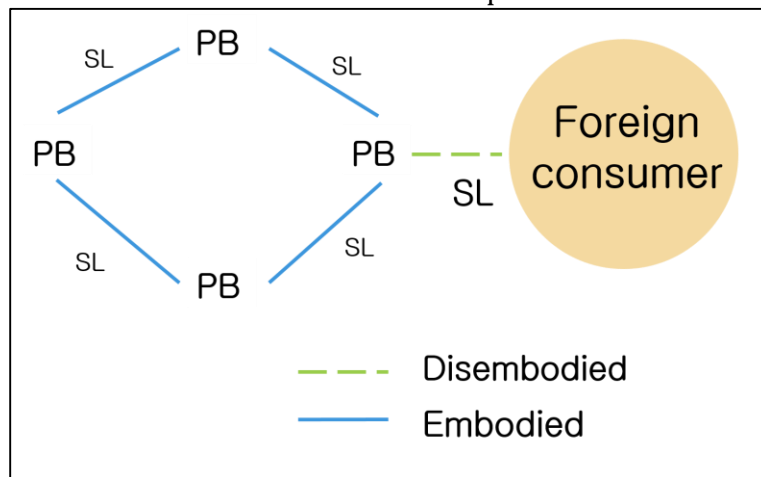


When production is fragmented, the role of services increases (Jones and Kierzkowski, 1990). This is better illustrated in the figure below. The first part shows that when production occurs under the roof of one factory or production block, then the only role of services is in the delivery of the final product to the consumer. As production is distributed to two production blocks, aside from serving as a link between the final production stage and the consumer, services are also crucial in connecting one production block to another. As the number of production blocks increases, the role of service links also increases. Eventually, more and more services are also outsourced to specialized providers instead of being performed in-house. These all led to the increase in the role of producer services in the production process.

When looking at services in the context of exports, a distinction has to be made between embodied services and disembodied services. Embodied services are the services that served as inputs in the production of exports. Disembodied services, on the other hand, are the services that were exported directly. When the service served as a link in local production, it is an

embodied service; when it connects production to the final consumer, it is a disembodied service. Figure 15 better illustrates the difference between embodied and disembodied services.

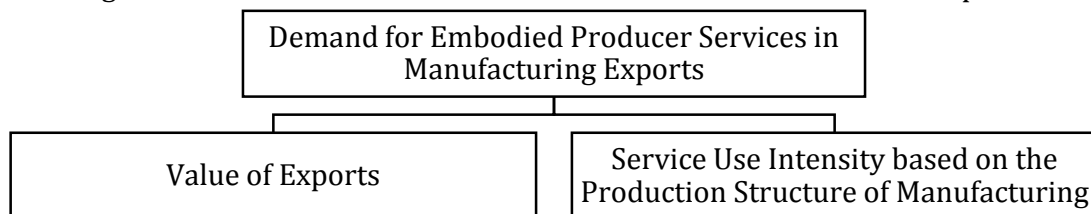
Figure 17. Embodied Services in Manufactured Exports versus Disembodied Services



Note: PB stands for production block; SL for service link

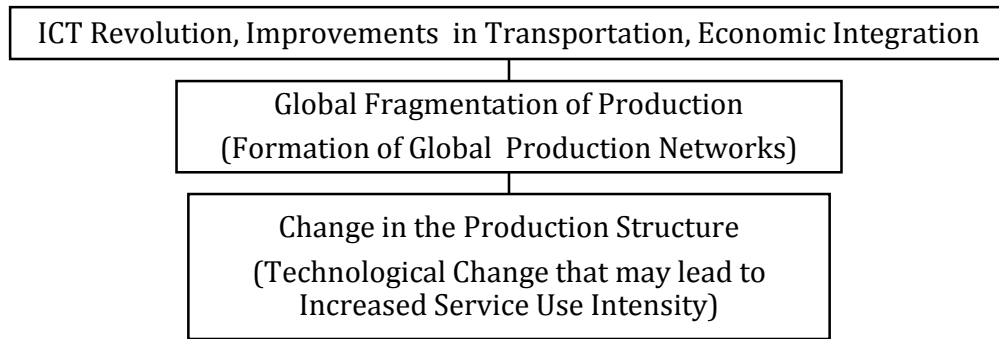
This study puts emphasis on producer services embodied in manufacturing exports. Since the demand for producer services stems from intermediate demand, the demand for embodied producer services is derived from the intermediate demand from the manufacturing of exports. In which case, the demand for embodied producer services in manufacturing exports comes from the exports of the manufacturing sector and the relative importance of services as an input in the production structure of the manufacturer of exports.

Figure 18. Factors of Demand for Embodied Producer Services in Exports



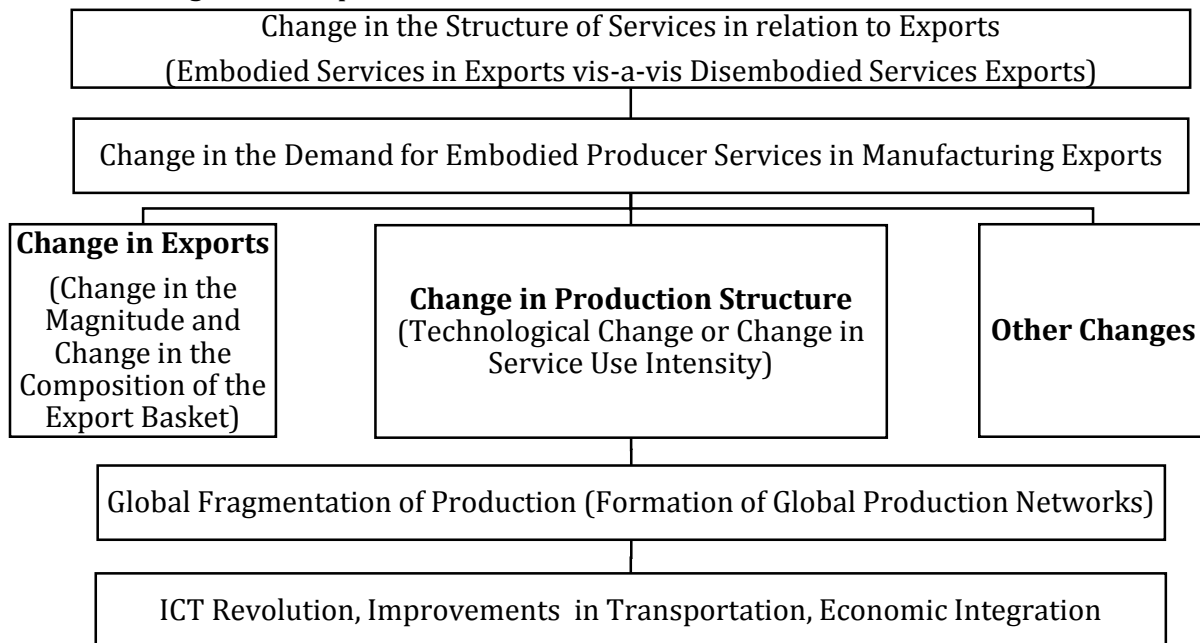
Starting in the 1980s, several forces changed the course of international trade. Among these were the ICT revolution, improvements in transportation, and initiatives for economic integration such as multilateral trade talks, bilateral and regional trade agreements. These greatly reduced transportation, communication and coordination costs and served as motivations to disperse different production processes in different countries to further reduce the cost of production. In this case, different parts and components may be manufactured in different parts of the world and then transported in one location for final assembly. This also led to a new development theory for industrialization of developing countries where instead of building their own supply chains at home, they can simply join an already existing international supply chain (Baldwin, 2007). This phenomenon is otherwise known as the “unbundling” or global fragmentation of production or the formation of GPNs.

Figure 19. Cause and Effect of Global Fragmentation of Production



With the global fragmentation of production, developing countries have to prepare these producer services to participate in GPNs. These services include transportation, storage and other services incidental to transport such as providing modern logistics systems, customs brokering, warehousing, materials and equipment handling; trade, which includes importing raw materials and exporting finished products; communications, which includes courier activities and telecommunication services; financial services, which includes banking and insurance; real estate; and business services which include both professional and other manpower services. Since in the context of GPNs, foreign manufacturing firms that locate in the developing country focus only on a specific production process or manufacturing a specific part or component, most non-core activities, especially services, are typically outsourced. Moreover, dependence on imported intermediate inputs from production blocks located in other countries requires producer services that link and coordinate dispersed production processes. These are reflected in the increased service use intensity of these manufacturing industries. Given this, the change in the demand for embodied producer services is seen as a result of the change in the production structure of exports, otherwise termed as technological change, which, in turn is an effect of the global fragmentation of production and a country's participation in GPNs.

Figure 20. Impact of GPNs on Demand for Embodied Producer Services



C. Empirical Methodology

This study looks at the embodied producer services in manufacturing exports in the context of Philippine participation in GPNs. To do so, the values of embodied producer services in manufacturing exports were measured using Philippine input-output tables for the years 1985, 1990, 1994, 2000 and 2006. The 1985 table was selected as the starting point because literature from other countries showed that the effects of the ICT revolution and the international fragmentation of production began in the late 1980s. The succeeding input-output tables were included to show the changes in export structure through time. The 2006 table is the latest available input-output table in the Philippines, limiting the study to the said year.

The said tables were aggregated into 35 sectors, retaining two primary sectors, 20 manufacturing sectors, three non-manufacturing industry sectors, and ten services sectors. The complete list of the sectors retained upon aggregation of the tables are shown in Table 4.

Table 4. List of Sectors Retained in the Aggregated Input-Output Tables

Primary (2)	1. Agriculture, Fishery and Forestry
	2. Mining and Quarrying
Manufacturing (20)	1. Food manufactures
	2. Beverage industries
	3. Tobacco manufactures
	4. Textile manufactures
	5. Footwear, wearing apparel
	6. Leather & leather products
	7. Wood & wood products
	8. Furniture & fixtures
	9. Paper & paper products
	10. Publishing & printing
	11. Rubber products
	12. Chemical & chemical products
	13. Products of petroleum & coal
	14. Non-metallic mineral products
	15. Basic metal industries
	16. Metal fabrication
	17. Machinery except electrical
	18. Electrical machinery
	19. Transport equipment
	20. Miscellaneous manufactures
Non-manufacturing industry (3)	1. Construction
	2. Electricity & Gas
	3. Water
Services (10)	1. Transportation, storage, and other services incidental to transport
	2. Communication
	3. Trade

	4. Financial services and insurance
	5. Real estate and ownership of dwellings
	6. Government services
	7. Private education
	8. Private health
	9. Private business services
	10. Other private services

Special focus was given to producer services, which, by definition are the services whose activities are more production-oriented than consumption-oriented. Broadly, unlike consumer services that are for private consumption alone, literature on producer services identify specific subsectors to have a major role in export production, especially manufacturing. These are transportation, storage, and other services incidental to transport, communication, trade, financial services and insurance, real estate and ownership of dwellings, and other private business services. For the smaller subsectors that comprise these producer services sectors, a detailed list based on the 70-sector 2006 Input-Output Table is shown in Table 5.

Table 5. Subsectors under Producer Services

Transportation, storage, and other services incidental to transport	Land Transport Water Transport Air Transport Storage and services incidental to transport
Communication (from the 240-sector table)	Postal and courier activities Telephone service includes telegraphs Wireless telecommunications Telecommunication services, n.e.c
Trade	Wholesale and retail trade; Maintenance and Repair of Motor Vehicles, Motorcycles, Personal and Household Goods
Financial Services	Banking Institutions Non-bank Financial Intermediation Insurance Activities Auxiliary to Financial Intermediation
Real Estate	Real Estate Ownership of Dwellings
Private business services (from the 240-sector table)	Renting of Machinery and Equipment Without Operator; Personal and Household Goods Hardware consultancy Software consultancy and supply Maintenance and repair of office accounting and computing machinery Other computer and related activities Research and development Call center activities Legal activities Accounting, bookkeeping and auditing activities; tax consultancy Market research and public opinion polling Business and management consultancy activities

	Architectural, engineering and other technical activities Advertising Labor recruitment and provision of personnel Investigation and security activities Miscellaneous business activities not elsewhere classified
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The exports of these producer services as embodied inputs in manufacturing exports were measured. The composition of embodied producer services in manufacturing exports was also examined by identifying the producer services that are most embodied in exports and the carrier exports of these producer services. The structure of producer services in relation to exports was also be analyzed by comparing the values of disembodied services exports and embodied services in manufacturing exports. Lastly, whether the change in the production structure of exports brought about by the global fragmentation of production caused the growth in embodied producer services in manufacturing exports will be tested through a decomposition method. Table 6 below illustrates the steps taken by the researcher to meet the objectives of the study. It is followed by the details on the formula used for the computations.

Table 6. Objectives of the Study and Corresponding Methodologies

OBJECTIVE	METHOD
To measure the embodied producer services in manufacturing exports from 1985 to 2006 and to examine its composition by identifying the services that are used most by manufacturing sectors and the carrier exports	Measurement of embodied producer services in manufacturing exports, shares of carrier exports of embodied producer services and shares of producer services to total embodied producer services in manufacturing exports
To evaluate the evolution in the structure of services in relation to exports through the years by distinguishing between embodied services in manufacturing exports (services exported indirectly as inputs to manufacturing exports) and disembodied services exports (direct services exports)	Computation of the embodied services ratio for total services, total producer services, and each producer service sector for each input-output table
To study the change in the role of services in the production structure of manufacturing exports as a source of growth of embodied producer services in manufacturing exports	Decomposition of the growth of embodied producer services

1. Value and composition of embodied producer services in manufactured exports

Suppose that there are $i(=1 \dots I)$ commodities, and the balance of production and consumption is written as

$$Q \equiv AQ + D + EX - IM$$

where Q is the output vector, D the domestic final demand vector, EX the export vector, IM the import vector, and A the matrix of input-output coefficients a_{ij} . Note that input-output coefficients are computed as follows:

$$a_{ij} = \frac{X_{ij}}{X_j}$$

where X_{ij} is the intermediate demand flow from industry i to industry j and X_j is the total inputs used by industry j . From the balance of production and consumption, Q is isolated in the left-hand side of the equation such that:

$$Q \equiv (I - A)^{-1}(D + EX - IM)$$

where is the Leontief inverse or multiplier matrix. The magnitude of production induced by exports can then be described as

$$Q_{EX} \equiv (I - A)^{-1}EX$$

For the computation of services embodied in goods trade, it is assumed that services industries are labeled $h+1$ to l in i . In other words, if l is less than or equal to h , sector i agriculture or manufacture whereas if i is greater than h , sector i is services. Let $EX'=[(0,0, ex'_3, ex'_4, \dots, ex'_h, 0 \dots, 0)]$ be the export vector of manufacturing sectors. Production induced by the manufacture of exports can be obtained as $Q_{EX'}$ and below:

$$Q_{EX'} \equiv (I - A_{ij})^{-1}EX' \equiv \textit{Embodied Services Exports}$$

Using this equation and taking the computed values for producer service sectors, the export of producer services that are embodied in goods trade is derived. To study the composition of embodied producer services in manufacturing exports, shares of producer services and shares of manufacturing to total embodied producer services in manufacturing exports were also computed.

2. Structure of services in relation to exports

The structure of producer services in relation to exports was analyzed by comparing the values of embodied services and disembodied services exports (Urata and Kiyota, 2003). This is done by computing the embodied exports ratio, or the share of embodied exports in the sum of embodied and disembodied exports.

$$\frac{\textit{Embodied Exports}}{\textit{Embodied Exports} + \textit{Disembodied Exports}}$$

This was applied for services as a whole, for the sum of producer services and for each producer service subsector. A ratio that is more than 0.5 means that services are exported more as embodied in manufacturing exports than as direct exports (Pasadilla, 2006).

3. Decomposition of the Growth of Embodied Services Exports

Decomposing the growth of embodied services exports (Terosa, 2015) begins with the original formula for measuring embodied services exports:

$$Q_{EX'} \equiv (I - A_{ij})^{-1} EX' \equiv \text{Embodied Services Exports}$$

From the original formula, let

$$(I - A_{ij})^{-1} = \text{multiplier or service use intensity of manufacturing sectors} = B$$
$$EX' = \text{value of manufactured exports} = X$$

The equation for measuring embodied services exports then becomes:

$$(1) \quad Q = BX$$

The embodied services exports for an initial year is:

$$(2) \quad Q_0 = B_0 X_0$$

And the embodied services exports for a final year is:

$$(3) \quad Q_1 = B_1 X_1$$

With the growth or change in embodied services exports being the difference between the values for the final year and the initial year:

$$(4) \quad \Delta Q = Q_1 - Q_0$$

And substituting equations (2) and (3),

$$(5) \quad \Delta Q = B_1 X_1 - B_0 X_0$$

We get the equation for B_1 :

$$(6) \quad \Delta B = B_1 - B_0$$

$$(7) \quad B_1 = B_0 + \Delta B$$

and for X_1 :

$$(8) \quad \Delta X = X_1 - X_0$$

$$(9) \quad X_1 = X_0 + \Delta X$$

Substituting equations (7) and (9) to equation (5):

$$(10) \quad \Delta Q = (B_0 + \Delta B)(X_0 + \Delta X) - B_0 X_0$$

Then the basic decomposition formula for the change in embodied services exports becomes:

$$(11) \quad \Delta Q_{EX} \equiv \Delta B X_0 + B_0 \Delta X + \Delta B \Delta X$$

where

$\Delta B X_0$ = change in service use intensity or change in production structure of the manufacturing sector

$B_0 \Delta X$ = growth of manufacturing exports

$\Delta B \Delta X$ = interaction term

Note that the growth per period was the growth between the initial year and the final year, not the average growth for each year within the period. Intuitively, the change in service use intensity or the change in production structure of the manufacturing sector leads to the growth of embodied services exports when an export sector increased its use of services in its production. On the other hand, the growth of embodied services exports based on the growth of manufacturing exports means that the export sectors using services grew, without necessarily changing their use of services for production. The interaction term does not have an implication that is as intuitive as the first two factors, but is nonetheless called for by the formula based on the mathematical foundations of decomposition analysis. This is still a rough decomposition given that the above three factors are still broad enough to encompass a number of actual changes that happened in the exporting industries and the service industries. However, this mathematical attempt to analyze the change in the embodied services exports is in itself already a contribution to the literature.

4. Structural Decomposition Analysis of Sectoral Output Growth

Another method that could support the earlier method in analyzing the growth dynamics of embodied producer services in manufacturing exports is the structural decomposition analysis of the output growth of producer service sectors. This analysis is based on demand-side factors, which, according to Mohammadi and Bazzazan (2006), is important in identifying the effects of government policies and structural changes. In particular, a sector's output growth is induced by changes in domestic demand, exports, imports and intermediate input use. This method was originally developed by Chenery (1960) and improved by Chenery, Shishido and Watanabe (1962), Syrquin (1976), Chenery (1979), and Chenery, Robinson and Syrquin (1986). Since then, it has been used by many researchers such as Celasun (1983), Kubo and Robinson (1984), Kubo, Melo and Robinson (1986), Forssell (1988), Urata (1988), James and Fujita (1990), Lee and Schluter (1993), Korres (1996), Zakariah and Ahmad (1999), Akita and Hermawan (2000) and Kumari (2005), Mohammadi and Bazzazan (2006) and many others.

Using the input-output framework, Chenery (196) equated the increase in production of a sector to the sum of the following effects:

- a. Domestic demand expansion which includes the direct demand for a sector and the indirect effects on the sector of the expansion of domestic demand for other sectors;
- b. Export expansion which also includes not just increased exports of one sector but also the increase in exports of other sectors;
- c. Import substitution which is induced by the increased proportion of demand in each sector supplied from domestic production and
- d. Technological change or intermediate demand expansion due to change in input-coefficients throughout the economy.

The decomposition begins with the basic material balance between supply and demand in an open Leontief system:

$$(1) \quad X = D + W + E - M$$

where X , D , W , E , and M are respectively vectors of gross output, domestic final demand (includes household consumption expenditure; government consumption expenditure; capital formation; and change in inventory), intermediate demand, export demand, and import. Noting that the intermediate demand of i -th sector can be determined by multiplying the input-output coefficients by total sectoral output as $W = AX$ (where A is the matrix of input-output coefficients).

The import ratio is also computed as:

$$(2) \quad m_i = \frac{M_i}{D_i + W_i}$$

Equation (2) can then be rewritten as:

$$(3) \quad \begin{aligned} X &= D + AX + E - m(D + AX) \\ &= (I - m)D + (I - m)AX + E \end{aligned}$$

Solving equation (3) for X , the gross domestic output necessary to satisfy a specific level of domestic final demand and exports is obtained. By putting $\mu = I - m$ (where μ represented the diagonal matrix of domestic supply),

$$(4) \quad \begin{aligned} X &= \mu D + \mu A X + E \\ X &= (I - \mu A^{-1})(\mu D + E) \end{aligned}$$

It is possible to solve for the increase in output (ΔX) in terms of increases in internal and external demand (ΔD and ΔE) and changes in two sets of parameters ($\Delta \mu$ and ΔA). Let $R = (I - \mu A^{-1})$:

$$(5)$$

$$\Delta X = R_1\mu_1\Delta D + R_1\Delta E + R_1\mu_1\Delta AX_0 + R_1\Delta\mu(A_0X_0 + D_0)$$

Where $R_1\mu_1\Delta D$ is the Domestic Final Demand Expansion Effect (DF Effect), $R_1\Delta E$ the Export Expansion Effect (EE Effect), $R_1\mu_1\Delta AX_0$ the Import Substitution Effect (IS Effect), and $R_1\Delta\mu(A_0X_0 + D_0)$ is the Technological Change Effect (TC Effect). The sectoral growth patterns can be assessed by comparing the size and direction of the four effects: If a certain sector's output growth can be largely explained by the EE effect, then its growth pattern can be considered the export-led type. Similarly, if growth can be explained mainly by the IS effect, then the growth pattern can be referred to as the import substituting type.

The subscripts 0 and 1 refer to initial and final years of a given period, respectively. For this part, the method was applied to the 1985 and 1994 tables for the pre-liberalization period; the 1994 and 2000 tables for the transition period and the 2000 and 2006 tables for the post-liberalization period.

Table 7 below illustrates the objectives of the study, the corresponding steps taken by the researcher, and the expected results based on the literature on services and GPNs. For the composition of embodied producer services in manufacturing exports, through time, products that are part of GPNs are expected to increase their shares as carrier exports. These are electrical machinery, other machinery and transport equipment, because exports from these sectors are mostly parts and components or final assemblies that are dependent on imported intermediate inputs (UNCTAD, 2013). The producer services that are expected to become increasingly important in the context of GPNs are transportation and logistics and communications, although other services like insurance, finance, computer and information services, and other business services (Francois and Reinert, 1996) are also crucial.

Looking at the evolution in the structure of services in relation to exports through the years, for services in general, the embodied services exports are expected to be larger relative to the disembodied services exports. This is based on the finding of Francois and Manchin (2011) that direct exports in services are small, globally, relative to indirect exports of embodied services because though trade in services has grown rapidly, so has trade in goods, especially as a result of the formation of GPNs. The producer service sectors where embodied services exports are expected to be higher than disembodied exports are the services that are most crucial in GPNs.

Since the formation of GPNs is considered as a change in the production structure which causes the increasing importance of services as an input in manufacturing, this factor is expected to be a major source of the growth of embodied producer services in manufacturing exports, especially in the periods of increasing participation of the Philippines in GPNs.

Table 7. Objectives of the Study, Corresponding Methodologies, and Expected Results

OBJECTIVES	METHODS	EXPECTED RESULTS
To measure the embodied services in manufacturing exports from 1985 to 2006 and to examine the composition of embodied	Measurement of embodied producer services in manufacturing exports, shares of carrier exports of embodied producer services	Through time, products that are part of GPNs increase their shares as carrier exports. The producer services that become

<p>producer services in manufacturing exports by identifying the services that are used most by manufacturing sectors and the carrier exports</p>	<p>and shares of producer services to total embodied producer services in manufacturing exports</p>	<p>increasingly important in the context of GPNs are transportation and logistics and communications because of their roles in connecting fragmented production blocks.</p>
<p>To evaluate the evolution in the structure of services in relation to exports through the years by distinguishing between embodied services in manufacturing exports (services exported indirectly as inputs to manufacturing exports) and disembodied services exports (direct services exports)</p>	<p>Computation of the embodied services ratio for total services, total producer services, and each producer service sector for each input-output table</p>	<p>In total, the share of embodied services exports in total services exports will increase with the participation of the Philippines in GPNs. This is especially true in the producer service sectors that are important in GPNs such as transportation and communications.</p>
<p>To study the change in the role of services in the production structure of manufacturing exports as a source of growth of embodied producer services in manufacturing exports</p>	<p>Decomposition of the growth of embodied producer services to change in production structure of manufacturing sectors (change in service use intensity), growth in manufacturing exports and interaction term; structural decomposition analysis of the output growth of producer services, where the factor of interest is the technological change effect</p>	<p>As the Philippines increases its participation in GPNs, the growth of embodied producer services in manufactured exports becomes driven mainly by the change in the production structure of manufacturing exports as they use more services. Based on the structural decomposition analysis, this could also be reflected by the increase in technological change effect.</p>

CHAPTER IV

RESULTS AND DISCUSSION

This chapter is divided into three main sections corresponding to the main objectives of the thesis. First, the composition of embodied producer services in manufacturing exports, based on the services that are most embodied and the manufacturing sectors that served as carrier exports from 1985 to 2006 will be discussed. Second, the structure of services in relation to exports will be evaluated by comparing between embodied services in manufacturing exports and disembodied services exports. Lastly, the sources of the growth of embodied producer services in manufacturing exports will be presented. Note that the presentation and interpretation of results are all in relative terms, or shares, ratios and percentages, to address the limitation of the input-output tables being in current prices.

Changes in the composition of embodied producer services in manufacturing exports

The changing composition of embodied producer services in manufacturing exports will be discussed from two perspectives: the shares of different manufacturing sectors as carrier exports of the embodied producer services, and the shares of different producer services in total embodied producer services. Knowing the composition of embodied producer services in manufacturing exports has a number of implications. On the demand side, the carrier exports of embodied producer services could determine the intermediate demand for the producer services. On the supply-side, knowing which services sectors are greatly embodied in manufacturing exports suggests which services have a crucial role in production and therefore must be taken into account in crafting the industry roadmaps for the manufacturing export sectors. It also suggests focusing on policies that would increase the efficiency and competitiveness of these service sectors because the competitiveness of exports depend on these service inputs.

The shares of different manufacturing sectors as carrier exports depends on two factors: the changes in the shares of sectors in the export basket, and the changes in the service use intensity of different manufacturing sectors. It is expected that with the participation of the Philippines in GPNs, both the shares in the export basket and the service use intensity of network products, i.e. electrical machinery, machinery, transport equipment, leads to the increasing role of these sectors as carrier exports of embodied producer services. The shares of each manufacturing export as a carrier of embodied producer services from 1985 to 2006 are shown in Table 8.

The composition of the carrier exports of embodied producer services reflects the manufacturing sectors prioritized in export promotion programs during different periods. For example, the identified priority sectors for the period around 1985 (Philippine Development Plan for 1984 to 1987 in Martin, 2013) figured as key carrier exports of embodied producer services based on the 1985 input-output table, the largest being electrical machinery (37% of embodied producer services in manufacturing exports), processed food (14%), footwear and wearing apparel (12%), furniture (5%), and other miscellaneous manufactures (5%). Other exports that carried considerable amounts of embodied producer services in 1985 were basic metals (15%), textiles (4%) and chemicals (4%).

As electronics and electrical machinery especially semiconductors gained more and more share in the Philippine export basket from 1990 onwards as a result of the influx of foreign firms locating in special economic zones, the importance of the said export as a carrier of embodied producer services also increased. In fact, its share as a carrier export more than doubled from 28% in 1994 to 65% in 2000. Although its share declined in 2006, it still served as the largest carrier export of embodied producer services. This also reflected the rise in the revealed comparative advantage of the Philippines in the said period for high-technology exports like electrical machinery, especially communication equipment and semiconductors, as observed by Balisacan (2003) and Abrenica and De Dios.

On the contrary, the other labor-intensive and low-technology exports that were deemed important in the late 1980s eventually diminished their role as carrier exports of embodied producer services through the years. Between 1990 and 2000, the share of low-technology exports such as processed food, textiles, wood and furniture products steeply declined. Each of these export sectors comprised only 1% and 2% of total embodied producer services in manufacturing exports in 2000 and 2006. The share of footwear and wearing apparel as a carrier export also declined from 14% and 15% in 1990 and 1994 to only 5% in 2000 and 2006.

For some medium-technology exports such as chemicals and basic metals, their shares as carrier exports also declined to only 1% and 2% of total embodied producer services in 2000, respectively. The share of basic metals increased to 6% in 2006, but this is still lower than its share in 1985. For the case of basic metals, this may also be due to the lower service use intensity of the sector in the late 2000s compared to the 1990s, as shown in the illustration domestic services components in Philippine goods exports in Figure 8, based on the OECD-WTO TiVA database as cited by Drake-Brockman (2014).

At the same time that the shares of the low-technology and medium-technology manufactures as carrier exports of embodied producer services declined, the shares of electrical machinery more than doubled, and of other machinery increased by more than five times from only 3% in 1994 to 17% in 2000. Exports of transport equipment, on the other hand, from carrying only 1% of total embodied producer services in 1985 and 1990, increased its share to 9% in 1994, decreased again to 2% in 2000, and then increased to 6% in 2006. These three sectors carried 66% of the embodied producer services exports in 2006.

Table 8. Composition of Embodied Producer Services in Manufacturing Exports through the years according to Carrier Exports

	1985	1990	1994	2000	2006
Processed Food, beverage and tobacco	14%	8%	9%	1%	10%
Textile manufactures	4%	6%	4%	1%	1%
Footwear, wearing apparel	12%	14%	15%	5%	5%
Wood and Furniture	5%	6%	4%	1%	2%
Chemical & chemical products	4%	4%	5%	1%	2%
Products of petroleum & coal	2%	2%	3%	1%	2%
Basic metal industries	15%	19%	10%	2%	6%
Other Machinery except electrical	1%	2%	3%	17%	14%
Electrical machinery	37%	31%	28%	65%	43%

Transport equipment	1%	1%	9%	2%	6%
Other Manufacturing	5%	7%	10%	4%	9%
Total Embodied Producer Services	100%	100%	100%	100%	100%

Among all the producer services embodied in manufacturing exports, the sector with the highest share was trade. In the context of GPNs, the role of trade may be in the importation of raw materials and equipment, and the exportation of finished products as well as unfinished parts. However, this finding has to be treated with caution because in using the national input-output table to compute for the embodied services exports, it was assumed that the production structure of exports is similar to the production structure of goods sold in the domestic market. As noted by Urata and Kiyota (2003), export production does not use much retail services or multilayered wholesale services when compared with production for the domestic market. Intal (2003) also commented that the distribution network of a country would only be relevant in the case of linking local inputs to the production of exports.

In 2006, the next most important producer service embodied in manufacturing exports was transportation, storage and other services incidental to transport where typical logistics services like freight forwarding, customs brokering and warehousing usually fall under. These are the usual services associated with connecting fragmented production blocks within and across countries. Exporting parts and components that are part of GPNs rely much on good logistics, which includes the presence of good transport links to ports and seaports, infrastructure and service logistics industries like freight forwarders (Austria, 2006).

The share of communication services as an embodied producer service in manufacturing exports increased by more than five times between 1985 and 2006 because of the significant technological improvements in the sector during the period. The sector itself evolved with the commercialization of internet connection and the rise of telecommunication networks. Preparing an internet-enabled environment is a prerequisite for participation in GPNs because of the need for coordinating fragmented production processes in real time especially in the case of parts and components that are more time-sensitive (Austria, 2006).

The share of financial services in total embodied producer services has been consistently declining from 1985 to 2006. As for real estate, it remained to have the smallest share as an embodied producer service in manufacturing exports. The share of private business services, on the other hand, started to increase in 1994, but declined in 2000 and 2006. This is in contrast to the case of business services in some APEC economies that were part of the study of Pasadilla and Wirjo (2015) whose indirect exports and value-added in manufacturing have increased between 1995 and 2009. The stark contrast between the case of business services in the Philippine and in other APEC economies may be due to the position of the Philippines in the low-end of the value-chain of GPN products, while other APEC economies are in the higher end of the value-chain.

Table 9. Composition of Embodied Producer Services in Manufacturing Exports through the years according to Producer Services Sectors

	1985	1990	1994	2000	2006
Transportation, Storage and other services incidental to transport	8%	20%	21%	10%	11%

Communication	2%	1%	4%	5%	10%
Trade	57%	55%	44%	68%	67%
Financial Services	24%	14%	16%	7%	5%
Real estate	3%	3%	4%	2%	3%
Other Private business services	6%	6%	11%	8%	4%
Total Embodied Producer Services	100%	100%	100%	100%	100%

Changes in the structure of services in relation to exports

There have been studies in the past that looked into the structure of Philippine services exports. Urata and Kiyota (2003) found using the 1990 input-output tables for East Asian countries that the proportion of embodied service exports to total service exports (disembodied and embodied) is only 0.24, the lowest among the countries they studied, because of the large share of semiconductors and electrical machinery, which require only assembling operation and not much service content, in the goods exports of the Philippines. Applying Urata and Kiyota's formula for embodied services exports using the 1994 Philippine input-output table, Pasadilla (2006) found that the proportion of embodied services exports in total services exports was at 0.35, and that direct exports of services was almost double that of indirect export of services. The reason stated was the low manufactured goods exports of the Philippines for the period. Through the years, however, with the succeeding technological innovations and the expansion of GPNs, the manufactured exports of the Philippines increased, along with their service content.

Although the current study used the same formula as Urata and Kiyota (2003) and Pasadilla (2006), some of the service sectors and export sectors included in the computations of the two previous studies were not included in the current study. In the two previous studies, they included electricity, gas, water and construction services in their definition of embodied services. In the current study, these were considered under industry and not under services. Moreover, Urata and Kiyota (2003) and Pasadilla (2006) looked at services embodied in all goods exports, which includes products from the agricultural and mining sectors. On the contrary, the current study is limited only to exports from the manufacturing sectors. Also, aside from looking at the structure in relation to exports of total services, the researcher also further narrowed down the computation of embodied services to the producer services already identified in the previous sections of the study. This was done by taking the share of embodied producer services exports in the sum of embodied and disembodied producer services exports. The share of embodied exports in the sum of embodied and disembodied exports was also computed for each producer service sector.

Despite the differences between the two previous studies and the current study, the differences in results are not that significant. For example, while the embodied services ratio or the proportion of embodied services exports in total services exports computed by Urata and Kiyota (2003) for the Philippines for 1990 was 0.24, in the current study, the resulting ratio for total embodied services for 1990 was 0.18 and the ratio for total embodied producer services was 0.22. Furthermore, while the embodied services ratio or the proportion of embodied services exports in total services exports computed by Pasadilla (2006) for the Philippines for 1994 was 0.35, in the current study, the resulting ratio for total embodied services for 1994 was 0.33 and the ratio for total embodied producer services was 0.37.

The most important finding for this section is the consistent increase in the embodied exports ratio for total embodied services, total embodied producer services (Table 10) and each of the producer service subsectors except private business services from 1990 to 2006 (Table 11). While there was no change in the total embodied exports ratios between 1985 and 1990, there was a gradual change between 1990 and 1994. Between 1994 and 2000, the embodied exports ratio for both total services and total producer services more than doubled. This means that while in 1994, direct exports of services was almost double that of indirect export of services, in 2000, the indirect export of services was already double that of direct export of services. Despite a slight decrease in 2006, the ratios are still large enough to show the relative importance of indirect export of services as embodied in manufacturing exports. This also emphasizes that policies on services sectors must emphasize the competitiveness of the embodied component. The slight decrease of the embodied exports ratio in 2006 might also indicate the beginning of an increasing trend in disembodied exports of services and producer services.

Table 10. Evolution of the Structure of Services in Relation to Exports as represented by the Embodied Exports Ratio

	1985	1990	1994	2000	2006
TOTAL EMBODIED SERVICES	0.18	0.18	0.33	0.68	0.65
TOTAL EMBODIED PRODUCER SERVICES	0.23	0.22	0.37	0.79	0.73

Note:

1. For total embodied services, the embodied exports ratio is the share of embodied services in manufacturing exports in the sum of disembodied services exports and embodied services in manufacturing exports.
2. For total embodied producer services, the embodied exports ratio is the share of embodied producer services in manufacturing exports in the sum of disembodied producer services exports and embodied producer services in manufacturing exports.

Although the embodied exports ratios have been consistently increasing from 1985 to 2006 for each of the producer service subsectors except other private business services, the shifts in the ratios per period differed per subsector. In 1985, the embodied exports ratios of the transportation, storage, and other services incidental to transport, communication, financial services and real estate services were much lower than the ratios of trade and business services. However, while there was already a large increase in the ratios of all the other subsectors in 1990, it was only in 1994 when the embodied exports ratio for communication services reached as high as 0.40. Come 2000, the ratios for all the producer services increased further except for business services. In 2006, all the producer services had ratios of more than 0.50 except for the business services. This may also be an indication of the trend of fast-growing disembodied exports of business services where majority are BPOs.

The large increase of the embodied exports ratio for communication services starting in 1994, like in the rise in the share of communication services in total embodied producer services, was also due to the significant technological improvements in the sector like the commercialization of internet connection and the rise of telecommunication networks. Communication services are crucial in coordinating fragmented production processes. Also, it may be a result of the liberalization of the sector starting in 1993. As competition in the industry was intensified and the quality and efficiency of telecommunication infrastructure improved,

along with the recent technological developments at that time, the use of communication services in the production of exports greatly increased. This may also be related to the decline in the embodied exports ratio of business services. One-third of the business services subsector in 2006 consists of call center activities, which are exported directly and are communication-intensive. The boom in services exports from call centers was an effect of the liberalization of the telecommunication industry (Goswami, Mattoo and Saez, 2012).

Table 11. Evolution of the Structure of each Producer Service Subsector in Relation to Exports as represented by the Embodied Exports Ratio

	1985	1990	1994	2000	2006
Transportation, storage, and other services incidental to transport	0.02	0.27	0.41	0.49	0.55
Communication	0.04	0.05	0.40	0.74	0.76
Trade	0.17	0.21	0.32	0.88	0.97
Financial Services	0.04	0.20	0.30	0.83	0.88
Real estate	0.07	0.32	0.70	1.00	1.00
Other Private Business Services	0.17	0.28	0.75	0.65	0.17

Note: The embodied exports ratio for each producer service sector is the share of embodied exports in the sum of embodied exports and disembodied exports of each producer service sector.

Changes in the production structure of manufacturing exports as a source of growth of embodied producer services

Based on the nature of embodied exports being a product of the magnitude of manufacturing exports and the service use intensity of manufacturing sectors, its growth could be attributed to the said two factors. The decomposition of the growth of embodied producer services in exports was done for each of the producer services sectors for four periods: the 1985 to 1990 period, the 1990 to 1994 period, the 1994 to 2000 period, and the 2000 to 2006 period. Note that the growth per period was the growth between the initial year and the final year, not the average growth for each year within the period. Results from the growth decomposition are summarized in Table 12, and are presented in terms of the percentage share of each source as a factor accounting for the growth of embodied producer services in exports. The factor with the higher contribution to the growth of each producer service sector in each period was italicized and in bold face. More details on the service use intensity, or the share of services as an input to manufacturing sectors, are in the Appendix.

For the three periods from 1985 to 2000, most of the growth of the embodied services for all producer service sectors could be explained by the growth in the magnitude of exports. This changed in the 2000 to 2006 period, during which, most of the growth of embodied exports of four producer services sectors was explained by the growth in service use intensity. The four sectors were transportation, storage and other services incidental to transport, communication services, trade and real estate. In the case of financial services and other private business services, however, the growth in service use intensity did not figure as a main contributor to growth in embodied services exports. These two sectors also had declining shares in the total embodied producer services in manufacturing exports as shown in Table 9 earlier.

The fact that the change in service use intensity only served as the main contributor to the growth of embodied producer services in manufacturing exports supports the finding of Pasadilla and Liao (2007) that the sectoral dependency ratio of manufacturing on services only increased in 2000. According to them, this may imply that the impact of fragmentation may have only occurred in the Philippines in the 2000s unlike in developed countries where the trend started earlier in the 1990s.

Table 12. Sources of Growth of Embodied Producer Services in Manufacturing Exports

1985-1990				
	Change in Service Use Intensity	Growth in Manufacturing Exports	Interaction Term	Total
Transportation, Storage and other Services Incidental to Transport	33%	31%	37%	100%
Communication	-16%	145%	-28%	100%
Trade	-1%	118%	-18%	100%
Financial Services	-130%	353%	-123%	100%
Real estate	-6%	122%	-15%	100%
Other Private business services	5%	101%	-6%	100%
1990-1994				
	Change in Service Use Intensity	Growth in Manufacturing Exports	Interaction Term	Total
Transportation, Storage and other Services Incidental to Transport	17%	70%	13%	100%
Communication	38%	19%	43%	100%
Trade	3%	105%	-8%	100%
Financial Services	25%	58%	17%	100%
Real estate	28%	44%	28%	100%
Other Private business services	33%	37%	30%	100%
1994-2000				
	Change in Service Use Intensity	Growth in Manufacturing Exports	Interaction Term	Total
Transportation, Storage and other Services Incidental to Transport	-42%	273%	-130%	100%
Communication	6%	115%	-21%	100%
Trade	3%	68%	30%	100%
Financial Services	-35%	371%	-236%	100%
Real estate	-67%	622%	-455%	100%
Other Private business services	-3%	177%	-74%	100%
2000-2006				
	Change in Service Use Intensity	Growth in Manufacturing Exports	Interaction Term	Total

Transportation, Storage and other Services Incidental to Transport	68%	14%	18%	100%
Communication	82%	15%	3%	100%
Trade	51%	20%	29%	100%
Financial Services	-19%	149%	-30%	100%
Real estate	70%	14%	16%	100%
Other Private business services	-210%	456%	-145%	100%

Among the four sectors, it was in the communication services sector where the role of the change in service use intensity in driving the growth of embodied services from 2000 to 2006 was the largest, as it explained 82% of the growth. This may be due to the increased use of IT-based systems in planning, managing and monitoring several stages in the production chain and the location of product shipments. The change in the production structure of manufacturing sectors also had a huge impact on the real estate sector where it explained 70% of the growth of its embodied services between 2000 and 2006. This may be due to the development of new economic zones and industrial parks that served as sites for foreign manufacturing firms especially electronics and semiconductor companies.

As for the transportation, storage and other services incidental to transport as well as trade services, the important role of increased service use intensity on the growth of embodied exports (explaining 68% and 51%, respectively) may be due to the structural changes in logistics during the period. As discussed by Heaver (2004), there has been an increasing role of freight forwarders, the mushrooming of specialized providers of more sophisticated and comprehensive services, the increased presence of foreign logistics companies, and the vertical integration of providers of transport services.

Among the different manufacturing exports, the sector that had the largest increase in service use intensity, driving the growth of the embodied services in its exports for the period 2000 to 2006 was the electrical machinery sector. This is understandable given that the parts and components exports coming from this sector require much sophisticated logistics due to their time sensitivity and deep integration in the GPN. Most EPZs and SEZs are sites for electronics and semiconductor industry clusters.

Table 13. Sectoral Sources of the Change in Service Use Intensity as a Driver of the Growth of Embodied Producer Services for period 2000 to 2006

	<i>Transportation, Storage and other services incidental to transport</i>	<i>Communication</i>	<i>Trade</i>	<i>Real estate</i>
Processed Food, Beverage and Tobacco	2%	1%	3%	1%
Textile manufactures	0%	0%	1%	1%
Footwear, wearing apparel	4%	2%	7%	8%
Wood and Furniture	1%	1%	4%	4%
Chemical & chemical products	1%	0%	1%	0%

Products of petroleum & coal	1%	0%	1%	0%
Basic metal industries	1%	0%	1%	1%
machinery except electrical	2%	8%	23%	21%
Electrical machinery	84%	86%	47%	56%
Transport equipment	1%	1%	3%	1%
Other Manufacturing	3%	2%	9%	6%
Total	100%	100%	100%	100%

The growth of service use intensity being a major source of the growth of some producer service sectors in the 2000 to 2006 period is also supported by findings from the decomposition of the growth of demand for producer services. While majority of the growth of producer services was still due to the expansion of domestic final demand, the export expansion effect and the technological change effect both gained shares in accounting for the growth of some producer service sectors (Table 14). The contribution of export expansion in producer services sector growth varied across sectors throughout the period studied. It had the biggest contribution to the growth of business services between 2000 and 2006. This reflects the impact of policies implemented during the period, like the liberalization of the telecommunications sector in 1993 which led to the boom of the Philippine BPO sector, or the growth of direct exports of business services. The export expansion effect also had a larger contribution to the growth of the transportation and storage, communication, financial services and real estate sectors in the 2000 to 2006 period compared to the preceding period. However, the factor with the largest contribution to the growth of the communication, trade, financial services and real estate sectors during the 2000 to 2006 period was the technological change effect. This means that during the said period, though export expansion also had a positive contribution, it was the change in the use of services by other sectors that greatly induced the e growth of these services sectors.

Table 14. Demand Sources of the Growth of Producer Service Sectors

1985-1994				
	<i>Domestic Final Demand</i>	<i>Export Expansion</i>	<i>Import Substitution</i>	<i>Technological Change</i>
Transportation and Storage	54%	27%	0%	19%
Communication	59%	28%	0%	12%
Trade	77%	34%	-1%	-10%
Financial Services	63%	31%	-1%	7%
Real estate and ownership of dwellings	99%	3%	0%	-2%
Private business services	63%	25%	-3%	15%
1994-2000				
Transportation and Storage	110%	17%	-17%	5%
Communication	89%	12%	-2%	8%
Trade	72%	31%	-3%	0%
Financial Services	113%	-6%	9%	6%

Real estate and ownership of dwellings	102%	1%	0%	0%
Private business services	67%	22%	-2%	8%
2000-2006				
Transportation and Storage	76%	33%	-2%	-8%
Communication	52%	18%	6%	24%
Trade	43%	16%	-4%	44%
Financial Services	72%	10%	3%	15%
Real estate and ownership of dwellings	67%	12%	-1%	22%
Private business services	25%	110%	-7%	-28%

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

This chapter presents the summary of findings and conclusion of the study, as well as the suggested policy implications and the recommendations for future study.

Summary of Findings

The shares of different manufacturing sectors as carrier exports depends on two factors: the changes in the shares of sectors in the export basket, and the changes in the service use intensity of different manufacturing sectors. With the participation of the Philippines in GPNs, network products, i.e. electrical machinery, machinery, transport equipment, had an increasing role as carrier exports of embodied producer services. These three sectors carried 66% of the embodied producer services exports in 2006. Although the share of electrical machinery as a carrier export declined in 2006, it still served as the largest carrier export of embodied producer services. On the contrary, there was a large decrease in the shares of other labor-intensive and low-technology exports such as textiles, wood and furniture products, and footwear and wearing apparel as carrier exports in 2006.

Among all the producer services embodied in manufacturing exports, the sector with the highest share was trade. However, the importance of wholesale and retail trade in the production structure of manufacturing sectors may only be true for goods sold in the domestic market but not so for exports. Thus, this finding has to be treated with caution. The next most important producer service embodied in manufacturing exports in 2006 was transportation, storage and other services incidental to transport which includes logistics services. The share of communication services as an embodied producer service in manufacturing exports also showed significant increase between 1985 and 2006 because of the significant technological improvements in the sector during the period. Logistics and communication services are the usual services associated with connecting fragmented production blocks within and across countries, especially in the case of exports that are heavily dependent on imported intermediate inputs. Contrary to the case of business services in some APEC economies that were part of the study of Pasadilla and Wirjo (2015) whose indirect exports and value-added in manufacturing have increased between 1995 and 2009, its share in the embodied producer services in Philippine manufactured exports was lower in 2006 than the earlier years. This may be because of the position of the Philippines in the lower end of the value-adding chain of GPN products, where the services used most are not the more knowledge-intensive business services but the services used in coordinating the importation of inputs such as logistics and communications.

As for the structure of services in relation to exports, there was a consistent increase in the embodied exports ratio for total embodied services, total embodied producer services and each of the producer service subsectors except private business services from 1990 to 2000. While in 1994, direct exports of services was almost double that of indirect export of services, in 2000, the indirect export of services was already double that of direct export of services. Despite a slight decrease in 2006, the ratios are still large enough to show the relative importance of indirect export of services as embodied in manufacturing exports. This also emphasizes that policies on services sectors must focus on the competitiveness of the embodied component. The slight decrease of the embodied exports ratio in 2006 might also indicate the beginning of an

increasing trend in disembodied exports of services and producer services due to the modernization and liberalization of communication services which led to the boom of BPOs.

For the three periods from 1985 to 2000, most of the growth of the embodied services for all producer service sectors could be explained by the growth in the magnitude of exports. This changed in the 2000 to 2006 period, during which, the growth in service use intensity accounted for most of the growth of embodied exports of transportation, storage and other services incidental to transport, communication services, trade and real estate. This supports the finding of Pasadilla and Liao (2007) that the sectoral dependency ratio of manufacturing on services only increased in 2000. Among the four sectors, it was in the communication services sector where the role of the change in service use intensity in driving the growth of embodied services from 2000 to 2006 was the largest. Among the manufacturing export sectors, it was the electrical machinery sector that largely increased its use of the said services sectors.

Conclusion

The relative importance of services in the production structure, or the service use intensity of other sectors, increases as production is fragmented. Starting in the 1980s, due to the ICT revolution, improvements in transportation, and initiatives for economic integration such as multilateral trade talks, bilateral and regional trade agreements, production was fragmented in the international level. This caused the formation of GPNs, which allowed greater participation of developing countries, like the Philippines, in international trade. Participation in GPNs requires key services that are needed to link and coordinate dispersed production processes. Such services are considered “embodied” or “carried” by goods which are exported across borders.

In this study, the 1985, 1990, 1994, 2000 and 2006 Philippine input-output tables were used to look at the evolution of embodied producer services in manufacturing exports. Focus was given to transportation, storage and other services incidental to transport, communication, trade, real estate, financial services and other private business services. The structure of services in relation to exports, the composition and the sources of growth of the embodied producer services in manufacturing exports were analyzed.

The changing composition of embodied producer services in manufacturing exports were discussed from two perspectives: the shares of different manufacturing sectors as carrier exports of the embodied producer services, and the shares of different producer services in total embodied producer services. Increasingly, producer services are being embodied and carried by the exports of products that are part of GPNs, especially electrical machinery. In the context of GPNs, this sector serves as a major driver of the intermediate demand for the producer services. On the supply-side, the services sectors which are greatly embodied in manufacturing exports are transportation, storage and other services incidental to transport, as well as communication services. These sectors link the manufacturing sectors to GPNs and therefore must be taken into account in crafting the industry roadmaps for the manufacturing export sectors. It also suggests focusing on policies that would increase the efficiency and competitiveness of these service sectors because the competitiveness of exports depend on these service inputs.

The structure of services in relation to exports also changed with the increasing participation of the Philippines in GPNs. As observed by Francois and Manchin (2011), the direct

exports in services are small, globally, relative to indirect exports of embodied services because though trade in services has grown rapidly, so has trade in goods, especially as a result of the formation of GPNs. More importantly, the change in the demand for embodied producer services is a result of the change in the production structure of exports, otherwise termed as technological change, which, in turn is an effect of the global fragmentation of production and the country's participation in GPNs.

Policy Recommendations

Crafting industry roadmaps, setting regulations and formulating trade policies should highlight links between manufacturing and services, especially in the production of exports. The demand for key producer services is affected by the demand from export production. This means that in trade negotiations and investment policies, manufacturing and services should be tackled together, instead of favoring one over the other. Moreover, manufacturing competitiveness is affected by restrictions and/or inefficiencies in services sectors. Attracting investments requires lower transaction and coordination costs which is facilitated by better logistics and efficient services. This heightens the impetus to develop services, ensuring their efficiency and competitiveness, especially those that are used most in manufacturing. In fact, encouraging investments and increasing competition in services sectors could help increase and deepen the integration of Philippine industries in GPNs. Liberalizing sectors and investing in infrastructures that improve connectivity must also foster coordination among players from the private and public sector, and even call for a unified effort among trading partners. This is especially true for transportation, logistics and communications which are crucial in the context of GPNs. Such services must also be given more weight and importance in any Free Trade Agreement.

Expanding the export production base in the country and upgrading in the value chains of various GPN products through the development of local supplier industries will also magnify the use of services. The services needed in joining the supply chain are different from the services needed in upgrading the supply chain. While joining the supply chain requires the use of services needed in coordinating dispersed production processes especially logistics and communications, upgrading and supply chains requires more knowledge-intensive business services like research and development. This implies the greater need for investments on educations, skills, and technology to facilitate the upgrading in the value chain. This calls for an industry wide cooperation, where both the government and the private sector play vital roles in adding value to our export goods.

Research Recommendations

While the focus of this study was the embodiment of services in manufacturing exports, the exports of other sectors also use services as inputs. The primary sectors, which are the agricultural and mining sectors, as well as the other services sectors, may also be important carrier exports and may be included in future studies. Moreover, separating the imported inputs from the domestic value-added in production may shed more light on the actual benefits of a country from participating in GPNs. Philippine exports contain much imported inputs which also have high services content. This means that a large portion of the services content of Philippine exports may also be imported. Looking at the domestic services content of Philippine exports may lead to clearer policy implications.

The analysis may also be more in-depth through a finer disaggregation especially of the services that are used as inputs in manufacturing. Looking at the relationships among more specific industries might be more beneficial in tackling policies and industry roadmaps. Case studies of specific industries to highlight the inter-industry linkages in each stage of the production process are also encouraged. Such industry-specific studies may also emphasize the position of the Philippines in GPNs, whether we have been upgrading in the value-adding chain or not. Regarding the services content of exports, product-specific case studies may also reveal the importance of in-house and bought-in services. Using the input-output tables only captured the bought-in services. Looking at both the in-house and bought-in services may lead to better insights on skills training, technology transfer and the motivations for outsourcing.

This study highlighted the ability of the input-output framework in capturing both the direct and indirect linkages among industries. Other methods, however, also have advantages and uses. For example, the impact of the link between manufacturing and services on productivity, might be shown better by extended production function models and other more sophisticated econometric models. Using econometric models may also allow room for the impact of other factors affecting a country's participation in GPNs like policies, investments and other macroeconomic variables. Also, while the latest available input-output table during the writing of this thesis was the 2006 table, using other methods may allow the use of more recent data that could also capture trends like the formation of GPNs in services, leading to the increased disembodied exports of services.

Because of the nature of national input-output tables, an assumption made in this study is that the production structure of the manufacturing sectors is the same for exports and the goods sold in the domestic market. This is, of course, quite far from reality. Looking at the input structure specific only to export production would be a great improvement of the study. The use of international input-output tables and international trade data would be advisable. There are also other international databases that are more comprehensive as they span more recent and frequent years and include a number of countries. There are the OECD-WTO TiVA database, the UNCTAD-Eora GVC database, and the World Bank Export Value-Added database, to name some. They also feature a host of indicators related to GPNs. The said datasets are usually available online.

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APPENDICES

A. Embodiment of Services in Manufactured Exports via Direct and Indirect Linkages

Majority of all the producer services were embodied via indirect linkages for both 1985 and 2006. This confirms that majority of the services are links in the production of exports as it is built up round by round. This also suggests that using other methods to look at the dynamics between services and the rest of the economy such as regression analysis which could only capture direct linkages are insufficient. Rather, the input-output analysis, which captures both the direct and indirect linkages, is a better empirical framework to examine services.

	1985		1990		1994		2000		2006	
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
Transportation and Storage	30%	70%	27%	73%	32%	68%	24%	76%	30%	70%
Communication	16%	84%	19%	81%	21%	79%	29%	71%	26%	74%
Trade	42%	58%	39%	61%	41%	59%	67%	33%	40%	60%
Financial Services	36%	64%	26%	74%	29%	71%	26%	74%	20%	80%
Real estate	10%	90%	18%	82%	36%	64%	23%	77%	22%	78%
Private education	6%	94%	27%	73%	35%	65%	5%	95%	8%	92%
Private health	20%	80%	23%	77%	7%	93%	1%	99%	67%	33%
Private business services	19%	81%	21%	79%	27%	73%	14%	86%	20%	80%
Other private services	23%	77%	19%	81%	17%	83%	50%	50%	24%	76%
TOTAL	36%	64%	32%	68%	33%	67%	53%	47%	35%	65%

B. Share of Services Sectors as Inputs in the Production Structure of Manufacturing Sectors

1985

IO Description	Food Manufactures	Beverage Manufactures	Tobacco Manufactures	Textile Manufactures	Footwear, wearing apparel	Wood & wood products	Furniture & fixtures	Paper & paper products	Publishing & printing	Leather & leather products
Transportation and Storage	0.0036	0.0055	0.0048	0.0091	0.0082	0.0023	0.0069	0.0064	0.0060	0.0012
Communication	0.0001	0.0002	0.0002	0.0003	0.0006	0.0001	0.0016	0.0010	0.0040	0.0001
Trade	0.0458	0.0998	0.1577	0.0616	0.0483	0.0101	0.2175	0.0501	0.0879	0.0288
Financial Services	0.0001	0.0002	0.0021	0.0199	0.0027	0.0004	0.0030	0.0006	0.0017	0.0015
Real estate	0.0000	0.0001	0.0001	0.0003	0.0008	0.0002	0.0022	0.0011	0.0055	0.0002
Private business services	0.0005	0.0195	0.0135	0.0030	0.0019	0.0002	0.0032	0.0042	0.0052	0.0003

1985 continued

IO Description	Rubber products	Chemical & chemical products	Products of petroleum & coal	Non-metallic mineral products	Basic metal industries	Metal fabrication	machinery except electrical	Electrical machinery	Transport equipment	Miscellaneous manufactures
Transportation and Storage	0.0106	0.0075	0.0133	0.0091	0.0028	0.0050	0.0044	0.0043	0.0127	0.0046
Communication	0.0006	0.0007	0.0005	0.0005	0.0004	0.0007	0.0006	0.0008	0.0018	0.0009
Trade	0.0846	0.0727	0.0724	0.0611	0.0464	0.0572	0.0497	0.0350	0.1151	0.0456
Financial Services	0.0037	0.0152	0.0023	0.0022	0.0032	0.0035	0.0291	0.0546	0.0058	0.0048
Real estate	0.0010	0.0013	0.0003	0.0006	0.0004	0.0009	0.0008	0.0012	0.0042	0.0007
Private business services	0.0039	0.0097	0.0036	0.0060	0.0015	0.0039	0.0035	0.0031	0.0106	0.0035

1990

IO Description	Food Manufactures	Beverage Manufactures	Tobacco Manufactures	Textile Manufactures	Footwear, wearing apparel	Wood & wood products	Furniture & fixtures	Paper & paper products	Publishing & printing	Leather & leather products
Transportation and Storage	0.0081	0.0104	0.0115	0.0076	0.0073	0.0152	0.0538	0.0140	0.0099	0.0120
Communication	0.0002	0.0007	0.0007	0.0003	0.0005	0.0010	0.0012	0.0011	0.0003	0.0012
Trade	0.0318	0.0335	0.0628	0.0302	0.0146	0.0862	0.0803	0.0539	0.0627	0.0608
Financial Services	0.0056	0.0050	0.0203	0.0087	0.0049	0.0185	0.0267	0.0111	0.0090	0.0064
Real estate	0.0007	0.0010	0.0003	0.0004	0.0024	0.0009	0.0012	0.0016	0.0003	0.0011
Private business services	0.0005	0.0046	0.0054	0.0017	0.0005	0.0073	0.0028	0.0022	0.0026	0.0039

1990 continued

IO Description	Rubber products	Chemical & chemical products	Products of petroleum & coal	Non-metallic mineral products	Basic metal industries	Metal fabrication	machinery except electrical	Electrical machinery	Transport equipment	Miscellaneous manufactures
Transportation and Storage	0.0053	0.0113	0.0019	0.0174	0.0087	0.0149	0.0082	0.0162	0.0262	0.0064
Communication	0.0003	0.0004	0.0000	0.0006	0.0002	0.0005	0.0018	0.0009	0.0006	0.0009
Trade	0.0304	0.0445	0.0019	0.0506	0.0652	0.0634	0.0421	0.0624	0.1013	0.0229
Financial Services	0.0045	0.0090	0.0002	0.0122	0.0060	0.0074	0.0081	0.0082	0.0209	0.0034
Real estate	0.0005	0.0009	0.0000	0.0031	0.0000	0.0008	0.0023	0.0015	0.0004	0.0018
Private business services	0.0013	0.0042	0.0001	0.0115	0.0019	0.0035	0.0045	0.0067	0.0070	0.0018

1994

IO Description	Food Manufactures	Beverage Manufactures	Tobacco Manufactures	Textile Manufactures	Footwear, wearing apparel	Wood & wood products	Furniture & fixtures	Paper & paper products	Publishing & printing	Leather & leather products
Transportation and Storage	0.0200	0.0197	0.0107	0.0201	0.0176	0.0434	0.0253	0.0171	0.0217	0.0173
Communication	0.0005	0.0011	0.0009	0.0014	0.0015	0.0018	0.0024	0.0004	0.0033	0.0019
Trade	0.0350	0.0422	0.0280	0.0376	0.0392	0.0627	0.0453	0.0605	0.0434	0.0765
Financial Services	0.0053	0.0082	0.0060	0.0146	0.0190	0.0113	0.0145	0.0075	0.0093	0.0225
Real estate	0.0027	0.0063	0.0032	0.0043	0.0047	0.0046	0.0073	0.0017	0.0080	0.0064
Private business services	0.0032	0.0206	0.0053	0.0075	0.0074	0.0038	0.0048	0.0036	0.0087	0.0035

1994 continued

IO Description	Rubber products	Chemical & chemical products	Products of petroleum & coal	Non-metallic mineral products	Basic metal industries	Metal fabrication	machinery except electrical	Electrical machinery	Transport equipment	Miscellaneous manufactures
Transportation and Storage	0.0203	0.0173	0.0447	0.0175	0.0075	0.0143	0.0126	0.0151	0.0115	0.0241
Communication	0.0016	0.0013	0.0003	0.0014	0.0005	0.0014	0.0200	0.0036	0.0005	0.0041
Trade	0.0677	0.0534	0.0856	0.0379	0.0650	0.0624	0.0720	0.0516	0.0376	0.0541
Financial Services	0.0139	0.0111	0.0189	0.0084	0.0088	0.0066	0.0224	0.0152	0.0037	0.0138
Real estate	0.0059	0.0044	0.0003	0.0060	0.0011	0.0054	0.0109	0.0052	0.0008	0.0133
Private business services	0.0039	0.0142	0.0054	0.0123	0.0053	0.0056	0.0141	0.0122	0.0027	0.0081

2000

IO Description	Food Manufactures	Beverage Manufactures	Tobacco Manufactures	Textile Manufactures	Footwear, wearing apparel	Wood & wood products	Furniture & fixtures	Paper & paper products	Publishing & printing	Leather & leather products
Transportation and Storage	0.0007	0.0012	0.0010	0.0015	0.0015	0.0013	0.0010	0.0001	0.0009	0.0001
Communication	0.0033	0.0058	0.0065	0.0056	0.0034	0.0035	0.0054	0.0044	0.0052	0.0014
Trade	0.0400	0.0208	0.0708	0.0521	0.0833	0.0859	0.0155	0.0103	0.0403	0.0984
Financial Services	0.0021	0.0035	0.0029	0.0048	0.0031	0.0027	0.0196	0.0027	0.0142	0.0026
Real estate	0.0013	0.0032	0.0015	0.0015	0.0011	0.0009	0.0025	0.0006	0.0027	0.0005
Private business services	0.0029	0.0181	0.0055	0.0046	0.0024	0.0016	0.0020	0.0018	0.0037	0.0005

2000 continued

IO Description	Rubber products	Chemical & chemical products	Products of petroleum & coal	Non-metallic mineral products	Basic metal industries	Metal fabrication	machinery except electrical	Electrical machinery	Transport equipment	Miscellaneous manufactures
Transportation and Storage	0.0009	0.0015	0.0001	0.0009	0.0011	0.0003	0.0167	0.0065	0.0008	0.0018
Communication	0.0053	0.0048	0.0063	0.0052	0.0037	0.0023	0.0079	0.0034	0.0051	0.0048
Trade	0.0724	0.0412	0.0095	0.0583	0.0963	0.0614	0.1697	0.1393	0.1320	0.0807
Financial Services	0.0094	0.0132	0.0138	0.0030	0.0028	0.0051	0.0070	0.0025	0.0220	0.0389
Real estate	0.0023	0.0015	0.0001	0.0021	0.0003	0.0008	0.0009	0.0010	0.0007	0.0023
Private business services	0.0023	0.0144	0.0040	0.0057	0.0024	0.0008	0.0036	0.0028	0.0036	0.0076

2006

IO Description	Food Manufactures	Beverage Manufactures	Tobacco Manufactures	Textile Manufactures	Footwear, wearing apparel	Wood & wood products	Furniture & fixtures	Paper & paper products	Publishing & printing	Leather & leather products
Transportation and Storage	0.0107	0.0168	0.0066	0.0053	0.0148	0.0124	0.0058	0.0084	0.0067	0.0000
Communication	0.0050	0.0143	0.0079	0.0066	0.0064	0.0116	0.0023	0.0135	0.0049	0.0000
Trade	0.0771	0.0800	0.1491	0.0779	0.1179	0.3286	0.0181	0.3512	0.1079	0.0000
Financial Services	0.0054	0.0056	0.0054	0.0047	0.0075	0.0061	0.0060	0.0030	0.0036	0.0000
Real estate	0.0005	0.0115	0.0030	0.0030	0.0079	0.0010	0.0491	0.0181	0.0013	0.0000
Private business services	0.0012	0.0258	0.0044	0.0063	0.0045	0.0056	0.0022	0.0071	0.0228	0.0000

2006 continued

IO Description	Rubber products	Chemical & chemical products	Products of petroleum & coal	Non-metallic mineral products	Basic metal industries	Metal fabrication	machinery except electrical	Electrical machinery	Transport equipment	Miscellaneous manufactures
Transportation and Storage	0.0083	0.0137	0.0099	0.0458	0.0066	0.0082	0.0079	0.0190	0.0065	0.0063
Communication	0.0025	0.0036	0.0014	0.0082	0.0021	0.0100	0.0040	0.0181	0.0144	0.0114
Trade	0.1114	0.0816	0.0266	0.0825	0.1202	0.1287	0.1649	0.0774	0.2321	0.1765
Financial Services	0.0044	0.0051	0.0035	0.0069	0.0039	0.0041	0.0023	0.0024	0.0049	0.0061
Real estate	0.0019	0.0010	0.0000	0.0018	0.0001	0.0078	0.0080	0.0011	0.0003	0.0100
Private business services	0.0105	0.0068	0.0027	0.0023	0.0093	0.0109	0.0032	0.0012	0.0166	0.0042