

# Bachelorthesis

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Titel:

**“Global Value Chain Participation: An Analysis of Key Performance Indicators and Sector Composition of an Emerging Nation (China) and a Developed Nation (Germany)”**

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– Abstract –

This thesis aims at investigating to what extent, and in which sectors, China's emerging economy links into Global Value Chains, or GVCs, compared to the patterns of participation of a developed nation such as Germany. International production and trade are increasingly organized within global networks comprising lead firms, affiliated suppliers and services providers engaged in a wide range of business activities. By juxtaposing the patterns of GVC participation of an emerging nation (China) and a developed country (Germany), this thesis attempts to clarify what effects the unbundling of production has had on two countries that are at different stages of their economic development. The comparison between China and Germany is intended to provide insight into how the gains of globalized trade and production are distributed among participators of GVCs at the country level. One of the main concerns of the analysis presented here is to identify the specific avenues through which a developed nation such as Germany integrates into global production networks, as opposed to the modalities of accessing GVCs exhibited by China's emerging economy. Key performance indicators based upon the novel statistical Trade in Value Added (TiVA) method are consulted in order to assess GVC participation and sector composition in both China and Germany. It was found that Germany benefits from carrying out high-value activities within GVCs, while China is still mainly engaged in low-value final assembly of commodities. However, global GVC activity is dynamic, with recent trends pointing towards a shift of economic power from developed nations to emerging economies such as China.

**Keywords: Global Value Chain, Emerging Nation, Developed Nation, China, Germany**

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## **List of Abbreviations**

ASEAN	Association of Southeast Asian Nations
BRICS	Brazil, Russia, India, China and South Africa
EPZ	Export Processing Zone
FDI	Foreign Direct Investment
FOE	Foreign-Owned Enterprise
I-O	Input-Output
ICT	Information and Communications Technology
MNE	Multinational Enterprise
NAFTA	North American Free Trade Agreement
NIC	Newly Industrialized Country
OBM	Original Brand Name Manufacturing
ODM	Original Design Manufacturing
OECD	Organization for Economic Co-operation and Development
OEM	Original Equipment Manufacturing
R&D	Research and Development
SME	Small and Medium Enterprise
SOE	State-Owned Enterprise
TiVA	Trade in Value Added
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organization

## **1. Introduction**

### **1.1. Research Problem**

This thesis aims at investigating to what extent, and in which sectors, China's emerging economy links into Global Value Chains, or GVCs, compared to the patterns of participation of a developed nation such as Germany. Amidst the ongoing globalization of production, GVCs have emerged as one of the most prevalent features of world trade and investment, universally affecting the economies of developing, emerging, and developed nations. Put simply, a Global Value Chain can be defined as the "full range of activities that firms and workers do to bring a product from its conception to its end use and beyond".<sup>1</sup> Typically, GVCs encompass activities such as design, production, marketing, distribution and customer support. Coordination of these geographically dispersed tasks usually resides with multinational enterprises (MNEs) positioned at the top of large networks of affiliates. According to a joint Organization for Economic Co-operation and Development (OECD)/World Trade Organization (WTO)/United Nations Conference on Trade and Development (UNCTAD) report prepared for the 2013 G-20 Leaders Summit in Saint Petersburg, MNE-coordinated GVCs account for 80 % of global trade.<sup>2</sup>

Over the last decades, GVCs have become the dominant organizing principle of an internationally fragmented mode of global production, pointing towards the ever-increasing interconnectedness of the world economy. Developing, emerging, and developed economies alike are interlocked in globalized production networks which are characteristically trafficking in intermediate goods rather than in final goods. According to another OECD report, as of 2012 "more than half of world manufactured imports are intermediate goods (primary goods, parts and components, and semi-finished products), and more than 70 % of world services imports are intermediate services".<sup>3</sup> Conventional international trade theory makes the assumption that countries produce goods and services domestically and compete with "foreign" producers, however, as Koen De Backer, Senior Economist at the OECD, states, "the reality is that most goods and an increasing number of services are "made in the world" and that countries compete on economic roles within the value chain".<sup>4</sup>

Understanding how today's national economies are structured and what development paths policymakers should choose to achieve growth, thus requires an analysis of how, and to what

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<sup>1</sup> Gereffi & Fernandez-Stark, 2011, p. 5.

<sup>2</sup> OECD/WTO/UNCTAD, 2013, p. 5.

<sup>3</sup> OECD, 2012, p. 4.

<sup>4</sup> Ibid, p. 2.

extent, countries are participating in GVCs. Recognizing that world trade and production are increasingly organized around GVCs raises the question whether international economic competition can still be said to be taking place among countries, or whether MNEs have ascended to become the main competitors and shapers of global trade due to their role as the primary coordinators of GVCs.<sup>5</sup>

By making use of a diverse array of state-of-the-art econometric performance indicators that shed light on the structure and scale of GVC participation, the following chapters present an assessment of how the economic particularities of both Germany and China predetermine the nature and intensity of their linkages into GVCs. Furthermore, it will be investigated if there is a power asymmetry to be found in the trade relations of the two countries or if both of them benefit from GVCs in equal measure. Sector composition of GVC participation in China and Germany will be analyzed in order to evaluate if GVC activity favors certain industries in a developed nation and others in an emerging economy. These questions, among others, will be answered.

This thesis relies on a solution-driven approach that centers around the coherent interpretation of statistical data of global trade volumes provided by international bodies such as the WTO or OECD. Drawing upon recent publications by these very institutions, as well as some academic literature, the following chapters present a theoretical analysis of GVC activity in China and Germany.

## **1.2. Course of Investigation**

The second chapter provides an introduction to the GVC framework. First, a commonly accepted definition is presented in order to familiarize the reader with the basic concept of GVCs. Second, different types of GVCs are described, so as to give an overview of some of the macroeconomic network structures that may be charted using the GVC approach. Third, dimensions of GVC analysis are discussed, shifting the focus to corporate governance of GVCs and their institutional context. Fourth, principal driving forces are listed that led to the emergence of GVCs as the predominant mode of production in today's interconnected world economy. Last, the chapter is concluded by a survey of traditional theories of international trade and their relevance to the GVC framework.

The third chapter is concerned with key performance indicators for measuring the degree of GVC participation in both China and Germany. The two economies are compared by making

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<sup>5</sup> OECD/WTO/UNCTAD, 2013, pp. 23-24.



use of some of these indicators. Due regard will be given to the research problem, that is, the question of how the patterns of GVC participation in an emerging country (China) differ from those in a developed nation (Germany). First, a preliminary section will introduce the reader to some basic facts regarding the Chinese and German economies. Second, a novel statistical approach called Trade in Value Added, or TiVA, will be introduced, so as to lay the groundwork for the later discussion of selected performance indicators that all derive from this method. Third, the performances of both China and Germany in terms of their GVC participation are examined and compared by making use of three different TiVA-based indicators; this section focuses on establishing the levels of domestic value added content of exports for both countries, on understanding the regional embeddedness of GVCs and on recognizing the econometric readjustments that have to be made to the bilateral trade balances of the two countries once these are being scrutinized in value added terms. Additionally, statistical data is discussed that helps quantifying the past and future development of China's economy in value added terms. These indicators include the expansion of Chinese processing trade, as well as increasing Foreign Direct Investment (FDI) flows to China.

To conclude the investigation, the fourth chapter examines the sectoral make-up of Chinese and German GVC linkages, also making use of TiVA-based indicators. First, China's exports are broken down by sector, allowing for the identification of those industries that are particularly well-integrated into global production networks. Sector analysis for Germany focuses on the technology level of its exports. In the next section, the automotive industry is put under special scrutiny in order to illustrate the globalization of manufacturing taking place in this particular sector. Finally, the section on the automotive industry is concluded by a brief case study of a recent corporate take-over of a German automobile supplier by a Chinese conglomerate, exemplifying how emerging economies are beginning to shape and dominate the power structure of GVCs through strategic investment decisions.

At last, the fifth chapter briefly summarizes the results of the thesis, followed by the critical acclaim that points out omissions and difficulties of the course of investigation that was chosen. The outlook at the very end wraps up the thesis by providing some thoughts on what future developments may be expected in the context of the on-going globalization of production.

## **2. Introduction to the Global Value Chain Framework**

### **2.1 Definition**

In most general terms, a GVC incorporates all those activities that a firm, or network of producers, engages in, domestically or in foreign countries, to ensure the introduction of a given product to the global market, from conception to final use.<sup>6</sup> These activities entail, for example, design, production and assembly, marketing, logistics and distribution and support of the final customers and it is generally hypothesized that the most value within GVCs is captured at the beginning and at the end of a chain.<sup>7</sup> Production and assembly are typically considered to generate less value added although this depends on the type of industry. All of the mentioned activities may be performed within a firm-internal chain or, as has been increasingly observed in the era of globalization, distributed along a cascade of other firms, affiliates or contractors, which are often spread out over the entire planet.<sup>8</sup>

However, GVCs are not necessarily centered on individual products, but instead, world trade and production themselves seem to be structured around GVCs. This is evidenced by the observation that countries are specializing in particular business functions (Research and Development (R&D), procurement, operations, marketing, customer services etc.) rather than specific industries which are accompanied by specific tasks.<sup>9</sup> One of the key policy messages pertaining to competitiveness in GVCs formulated in a recent OECD report is pointing in the same direction by stating that “Today what you do (the activities a firm or country is involved in) matters more for growth and employment than ‘what you sell’ (the products that make up final sales or exports)”.<sup>10</sup> Further, GVCs are not only involving manufacturing goods but traded services present a rising share of the derived value added (including emerging pure services chains).<sup>11</sup>

### **2.2 Different Types of GVCs**

In today’s interconnected global economy the concept of GVCs offers a valuable methodology for academics, institutions, governments and stakeholders alike for addressing the continuing phenomenon of international fragmentation of production and the ensuing ripple effects of this process on countries and firms. Broadly speaking, when analyzing

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<sup>6</sup> OECD, 2013a, p. 8.

<sup>7</sup> Ibid, p. 13.

<sup>8</sup> OECD, 2012, p. 7.

<sup>9</sup> Ibid.

<sup>10</sup> OECD, 2013b, p. 9

<sup>11</sup> World Economic Forum, 2012, pp. 18-23.

GVCs, researchers are both interested in a “bottom-up” approach, investigating how business decisions of GVC players are determining an overall trajectory leading towards economic and social “up-“ or “downgrading” in certain countries and regions, and also a “top down” perspective, which focuses on an in-depth look at major GVC players, mostly MNEs or state-owned enterprises (SOEs), thereby analyzing how these firms organize and structure (“govern”) their global production network of suppliers and affiliates.<sup>12</sup>

One important distinction in GVC-type is between “producer-driven” or “buyer-driven” chains.<sup>13</sup> The former are primarily found in high-tech sectors such as the semiconductor or pharmaceutical industry. Leading firms in this sector are mostly involved with the first production steps or activities in a GVC (“upstream”), for example R&D and design, as well as the assembly of final products. Buyer-driven chains, on the other side, are characterized by retailers and branded marketers who control the production, which might be outsourced completely, and who are in charge of end (or “downstream”) activities in the chain such as marketing and sales. A well-researched example for this kind of GVC is the apparel commodity chain.<sup>14</sup>

The concept of GVCs emerged in the late 1970s with work carried out on the meaning of “commodity chains” which presented a new way to look at the transformative processes which turned the sum of a set of specific inputs into an “ultimate consumable”. Recognizing the ever increasing globalization of commodity chains, the term “global commodity chain” was coined in the mid-1990s. At the onset of the 21st century these ideas morphed into the concept of GVCs which put a new emphasis on the value added resulting from the organization of global industries in such expansive international production networks.<sup>15</sup>

It has been argued that the term “global production network” is a more adequate representation of the international fragmentation in production than the metaphor of a vertical and sequential chain: “... economic processes must be conceptualized in terms of a complex circuitry with a multiplicity of linkages and feedback loops rather than just “simple” circuits or, even worse, linear flows”.<sup>16</sup> However, all of the mentioned terms (“global value chain”, “global commodity chain” and “global production network”) are mostly used interchangeably in the literature. Anyone of them is referring to the business reality of a globally fragmented

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<sup>12</sup> Gereffi & Fernandez-Stark, 2011, p. 4.

<sup>13</sup> Gereffi & Korzeniewicz, 1994, pp. 95-122.

<sup>14</sup> OECD, 2013a, p. 13.

<sup>15</sup> OECD, 2012, p. 8.

<sup>16</sup> Hudson, 2004, p. 18.

productive landscape in which competitiveness of countries and firms alike across international markets seems to be determined by the capability to insert themselves successfully into the new paradigm via a combination of trade, investment, innovation and structural policies. It is also shaped by the local institutional framework that includes economic and social conditions such as financial resources, taxes, labor costs and infrastructure as well as skill level, labor regulation and education.<sup>17</sup> In conclusion, the concept of GVCs

“... is a useful tool to trace the shifting patterns of global production, link geographically dispersed activities and actors of a single industry, and determine the roles they play in developed and developing countries alike... It examines the job descriptions, technologies, standards, regulations, products, processes, and markets in specific industries and places, thus providing a holistic view of global industries both from the top down and the bottom up“.<sup>18</sup>

### **2.3 Dimensions of GVC Analysis**

In the methodology section it was already laid out that the present analysis will focus on the TiVA model developed by a joint OECD-WTO effort in order to compare GVC participation of Germany's and China's economies. To broaden the view on GVCs, however, here some more general considerations are undertaken as how to analyze and lay out general modes of describing them. By doing so it is attempted to show key features that are common and relevant to different kinds of GVCs. Four basic dimensions of GVC analysis have been suggested, namely 1) an input-output structure illustrating transformative steps in a process leading from raw materials to final products, 2) a geographical perspective, 3) the control of GVCs by varying modes of “governance” and 4) defining the institutional context of respective GVCs and involved industries. In addition to these four essential aspects of every GVC analysis a fifth component was introduced with the idea of “upgrading” or “moving up the value chain” which describes the dynamic positioning of actors along the GVC.<sup>19</sup>

1) Input-Output structure: Aside from quantitative analysis via TiVA models, for example, a more descriptive approach can be taken by identifying the main segments (input goods and services) of a respective chain (through secondary data and interviews) and mapping them as a set of boxes connected by arrows that point in the direction of the output considered. The final diagram should clearly show critical steps along the chain in terms of value added and how differing returns are netted according

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<sup>17</sup> Gereffi & Fernandez-Stark, 2011, p. 11.

<sup>18</sup> Ibid, p. 2.

<sup>19</sup> Ibid, 2011, pp. 5-15.

to the position of individual chain participants. By linking the profile of a given firm (global/domestic, state-owned/private, small, medium or large etc.) responsible for providing the input of a certain segment, it becomes possible to deduce the governance type of a particular chain

2) Geography: This dimension of analysis is concerned with identifying lead firms (using firm data, industry publications or interviews with industry experts) in each of the previously specified segments of a chain. The proportion of lead firms within a respective country is therefore indicating the position of a certain country in a given chain. Compiling the geographical distribution of such GVC actors can thus map the shifting patterns of GVC participation in globally dispersed industries.

3) Governance: Power imbalances occur naturally in GVC organization and control. Based on this assumption governance in global commodity chains was initially defined as: “authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain”.<sup>20</sup> The simplest distinction in GVC governance was already mentioned: a given chain can either be producer- or buyer-driven. This broad classification has since been refined into a typology encompassing five different governance structures which are determined by three main variables: the degree of complexity of information exchanged between actors in the chain; the capability of this information to be codified (for transmission and learning between GVC actors) or stipulated in contractual terms and, lastly, the level of supplier competence.<sup>21</sup>

- Market governance involves relatively simple transactions with easy transmission of product specification from buyers to suppliers who are able to produce independently with minimal input from the former. Switching to new suppliers is easy and formal cooperation among chain actors is very limited. The main mechanism for controlling this governance type is price and not the influence of a lead firm.
- Modular governance involves more complex transactions which are easily codified. Suppliers in chains governed by this type are in charge of producing customer specified products by employing generic high-throughput machinery

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<sup>20</sup> Gereffi & Korzeniewicz, 1994, p. 97.

<sup>21</sup> Gereffi, 2005, pp. 160-182.

able to cater to a large customer base. Hence switching costs are kept low and transaction-specific investments are limited. Nevertheless, the volume of exchanged information between buyers and suppliers is relatively high and thus creates stronger ties than in purely market governed chains. An excellent information technology infrastructure as well as standards for communicating relevant instructions are necessary to make modular governance work.

- Relational governance involves the exchange of quite complex information between buyers and suppliers that is not easily codified. The result are frequent interactions and sharing of knowledge. Therefore, the created relationships between GVC participants in this governance mode are far more intimate than in the market and modular types. Although this leads to mutual dependence between buyers and suppliers, lead firms are enacting some degree of control over the entire chain by guiding the specification of products and processes. Changing from one supplier to the other is far more difficult for buyers in GVCs characterized by relational governance.
- Captive governance involves the dominant influence of a small number of buyers over suppliers. Lead firms are able to exert considerable control over smaller suppliers who have to adapt to the specific needs of the buyers. They also mainly formulate the conditions under which the linkage within a given GVC occurs. Their core competencies are mostly outside of production. It is important in such a governance type that lead firms engage in responsible and ethical business conduct to guarantee equal shares of the market price for all participants.
- Hierarchical governance involves vertical integration and managerial control over the development and manufacturing of products in-house (when product specifications are cannot be codified, complex products are manufactured or buyers are not able to find adequate suppliers). Although GVCs are usually spread over multiple firms, value chains can still be global, albeit being operated by only one firm, in terms of off-shored production facilities etc.

The prevalent type of governance within an industry can change over time and patterns combining different modes arise across varying stages of the chain.

4) Institutional context: The local, national and international institutional and policy framework is affecting the emergence of GVCs and the insertion of firms and

countries. As already mentioned, this framework is underlying economic (labor costs, infrastructure and financial resources) and social (labor and skill level, workforce composition and education) conditions that either hinder or benefit GVC participation.

5) Upgrading: in contrast to the “top down” perspective employed when looking at governance modes in GVCs, the interest into upgrading is an “bottom up” approach which focuses on the strategies employed by economic stakeholders to stabilize or improve their positioning within a given GVC. During this process GVC actors are likely to change their economic roles and capabilities related to production or export activities. A generic model for an upgrading trajectory leading from lower- to higher value added activities starts with the assembly of imported inputs, continues with original equipment manufacturing (OEM) or full-package production, then includes original brand name manufacturing (OBM), and ends with original design manufacturing (ODM). Successful upgrading (that does not necessarily need to trace this trajectory) requires a combination of government policies, institutions, corporate strategies, technologies and worker skills. Four major types of upgrading are proposed in the literature<sup>22</sup>:

- Process upgrading: improved and more efficient production due to restructuring of organization or introducing new advanced technologies
- Product upgrading: focusing on more complex product lines
- Functional upgrading: increase skill content of the performed activities within a GVC by acquiring new business functions
- Chain or inter-sectoral upgrading: entering new but related industries

Upgrading strategies differ greatly across countries and industries and there is no clear-cut method of achieving economic development by means of this process. It is of interest how social and economic upgrading can be linked to better understand how workers, firms and countries can benefit from participating in GVCs. In a later section it will be discussed how China is attempting to move up the automotive GVC by assimilating foreign high-technology suppliers into the ownership structure of State-Owned Enterprises (SOEs).

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<sup>22</sup> Humphrey & Schmitz, 2002, p. 1020.

## 2.4 Driving Factors

Three distinct forces appear to have shaped the appearance of GVCs within the last three decades: Declining costs in trade and transport, rapid advances in information and communication technologies (ICTs) and trade policy reforms promoting international trade and investment<sup>23</sup>.

Regarding the declining costs of trade (land and sea transport, freight and insurance costs, tariffs and duties) much interest has been put on investigating the role of containerized shipping in facilitating the onset and spread of GVCs which seems to have coincided with the increasing use of this type of transport. From 1990 to 2008, for example, the total volume of goods shipped via container rose from approximately 200 billion to 1300 billion tons which equals roughly to a six-fold increase<sup>24</sup>. The volume share of total goods transported in this way increased from 5% to 16% in the same period of time.<sup>25</sup>

Interestingly, detailed analysis has shown that containerized shipping has led to only a small decline in sea freight transport costs after the mid-1980s which by itself is unlikely to have caused the rise of GVCs. The decisive contribution of containerized shipping might have been presented not in the form of reduced costs but rather in a reduction in international shipping times due to standardization, automation and greater interchangeability of freight (which in the end lowers net transportation costs).<sup>26</sup> Next to containerized shipping, declining costs in air transport of goods and services (by movement of people) have been an important development in the transportation sector. Prices for transport by plane, both of passengers and cargo, have fallen by about one third since 1960s.<sup>27</sup> Of course transportation times shrink considerably as well if goods get shipped by air. Rapid shipping by air seems to be particularly favored in sectors that show a fast growth in trade in intermediate goods. One estimation suggests that faster transportation through air shipping and containerization is comparable to reducing tariffs on manufactured goods from 32% to 9% between 1950 and 1998.<sup>28</sup>

One of the most widely-cited causes that is being argued to have been responsible for the emergence of GVCs was the advent of modern ICTs, especially the internet. They have

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<sup>23</sup> OECD, 2013a, p. 9.

<sup>24</sup> Foreign Affairs - Trade and Development Canada, 2011, p. 90.

<sup>25</sup> Ibid.

<sup>26</sup> Hummels, 2007, pp. 140-141.

<sup>27</sup> Sydor, 2007, n. pag.

<sup>28</sup> Ibid.



increased the tradability of many goods and services and enhanced the information-driven management and coordination of complex networks of activities within and across firms and countries<sup>29</sup>. However, empirical evidence on the exact role of ICTs in boosting the rise of GVCs remains limited and one study, for example, concluded that there is no compelling data yet linking ICTs and the continuing fragmentation of production.<sup>30</sup>

The third proposed main driving force behind the global spread of fragmented production networks has been an ongoing liberalization of trade and investment. This development is evidenced, for instance, in the transformation of the General Agreement on Tariffs and Trade (GATT) into the WTO with the number of member states increasing from 23 in 1948 to 128 in 1995<sup>31</sup> and rising up to 159 until today.<sup>32</sup> As a result of this process trade barriers began to fall, especially tariffs (average tariff rates in OECD countries dropped from around 40% after World War II to about 4% in 1993; China lowered them from 43% to 18% in 1992).<sup>33</sup> Particularly due to dropping tariffs on manufactured goods cost-reduced multiple-border flows of inputs were increasingly traded within GVCs (e.g. in the electronics industries). Decreasing non-tariff barriers to international trade further facilitated the exchange of goods and services.<sup>34</sup>

All of the mentioned main factors seem to be involved in the global fragmentation of production networks and can lead to greater efficiency and lower costs. Sourcing cheaper or higher-quality inputs, either domestically or internationally, within or outside the ownership structure of the firm, can decrease production costs. If a firm transfers production stages to external contractors in foreign countries, “outsourcing” occurs. “Offshoring”, on the other hand, takes places when corporations keep production in-house but move it abroad<sup>35</sup>. Coordination of globally spread economic activities is simplified and cheapened by advancing ICTs. However, the growth of GVCs is not an open-ended process. Eventually a trade-off is reached when production costs are lowered by offshoring or outsourcing (decreasing the marginal cost of production) but higher fixed and variable costs are incurred that incorporate all the services links required for geographically dispersed productive activities.<sup>36</sup>

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<sup>29</sup> OECD, 2013b, pp. 19-20.

<sup>30</sup> Hillberry, 2011, p. 99.

<sup>31</sup> Sydor, 2007, n. pag.

<sup>32</sup> WTO, [http://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/org6\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm), retrieved March 2014.

<sup>33</sup> Sydor, 2007, n. pag.

<sup>34</sup> OECD, 2013b, p. 19.

<sup>35</sup> Feenstra, 2010, pp. 5-7.

<sup>36</sup> OECD, 2013a, p. 11.

Finally, access to foreign markets and knowledge are additional motivations for firms to participate in GVCs. Demographic shifts in large emerging economies, for example China and India, provide a rapidly growing customer base for a vast array of high-value products. Proximity of distribution and production facilities (also in the form of affiliates) allows firms to explore the dynamics of these emerging markets. In addition, investments are increasingly made by firms in the area of strategic knowledge assets such as foreign skilled workers, universities or research centers to foster learning and collaboration in the context of GVCs.<sup>37</sup>

## **2.5 The Economics of GVCs vs. Traditional Theories of International Trade**

GVCs have fundamentally altered the structure of production and international trade, with the on-going fragmentation of manufacturing and services across locations and borders outpacing academic efforts to situate these developments within the framework of traditional theories of international trade.

Ever since the publication of David Ricardo's *Principles of Political Economy and Taxation* in 1817, the notion of "comparative advantage" has been widely drawn upon by the economic profession, when trying to explain the underlying mechanism and direction of international trade. Put simply, comparative advantage predicts that each actor engaged in trade will specialize in producing the good in which he has a comparative advantage over other actors. The comparative advantage that is being capitalized on, is defined as a cost advantage, arising, in Ricardo's own account, from a source that remains unspecified, but which is generally interpreted to derive from a difference in technology or geography.<sup>38</sup>

Ricardo famously illustrated this view by using an example involving Portugal and England, the former being in a hypothetical position to produce two goods, wine and cloth, more efficiently, which is to say using less resources (labor), compared to the latter. However, internally, in Portugal the production of wine is even cheaper than the production of cloth, so that exporting excess amounts of wine to England, while importing cloth from there, turns out to be the cheapest, i.e. most efficient, solution for both trading partners in attaining the two goods. The comparative advantage for Portugal is greatest in the production of wine, as the profits yielded from exporting this good to England – where wine production is comparatively more expensive than cloth production – will allow Portugal to import cloth from England. Producing cloth at home, although cheaper than in England, would have prevented Portugal

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<sup>37</sup> Ibid, p. 10.

<sup>38</sup> Foreign Affairs - Trade and Development Canada, 2011, p. 86.

from exporting the surplus quantities of wine, thereby thwarting the trade between the two countries, which, as it turns out, is the most profitable option for all parties involved.<sup>39</sup>

However, in a much-noticed paper Grossman and Rossi-Hansberg make the assertion that the new reality of globalized production renders obsolete the classical Ricardian concept of “comparative advantage”, as, according to them, “it’s not wine for cloth” anymore.<sup>40</sup> The two authors emphasize the importance of what they refer to as “trade in tasks”, i.e. trade in intermediate goods and services, which they say is of a different nature than the conventional exchange of final goods.<sup>41</sup> In principle, though, Grossman and Rossi-Hansberg remain committed to comparative advantage as the overarching explanatory model for describing the direction and welfare effects of international trade flows. They still view specialization based upon comparative advantage as the main determinant for the organization of today’s global supply chains, essentially saying that rather than specializing in final goods countries now specialize in specific tasks that they perform more efficiently compared to others based upon comparative advantage.<sup>42</sup>

In their book “*Outsourcing Economics: Global Value Chains in Capitalist Development*” – as of yet one of the few monographs on the topic of GVCs – co-authors Milberg and Winkler propose a radically different theoretical approach to the international fragmentation of production, claiming that the notion of comparative advantage is in large part refuted by empirical observations of the current economic landscape. They write:

“The principle of comparative advantage is relevant in a world with no capital mobility, no unemployment, little trade in intermediate goods and in which the international payments system brings an automatic reversal of trade imbalances. It is of much less relevance in the world we find ourselves in today, characterized by rapid international capital mobility, footloose input production, intense technological competition, persistent trade imbalances, and stagnant wages in many countries”.<sup>43</sup>

Following Ricardo, economists Heckscher and Ohlin had argued that the differences in relative costs can be ascribed to what they referred to as “factor endowments”.<sup>44</sup> Their theory, called Heckscher-Ohlin (H-O) model, attributed the patterns of specialization in international trade mainly to the differences among countries in their endowments of either capital or labor, predicting that capital-intensive countries will specialize in capital-intensive products and

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<sup>39</sup> Mankiw, 2001, pp. 47-55.

<sup>40</sup> Grossman & Rossi-Hansberg, 2006, p.1.

<sup>41</sup> Ibid, pp. 7-8.

<sup>42</sup> Foreign Affairs - Trade and Development Canada, 2011, pp. 87-88.

<sup>43</sup> Milberg & Winkler, 2013, p. 80.

<sup>44</sup> Jones, 2006, pp. 91-105.

labor-intensive countries will specialize in labor-intensive products.<sup>45</sup> Feenstra and Hanson adopted the H-O model and, in a manner very similar to Grossman and Rossi-Hansberg's approach, divided up production into specific "activities", which are geographically distributed corresponding to where they are most efficiently executed. For the purpose of this brief survey of some of the theories on the internationalization of production, distinguishing precisely between "tasks" (Grossman and Rossi-Hansberg) and "activities" (Feenstra and Hanson) is negligible.<sup>46</sup> It is, however, important to note that both of these models adopt some variety of the H-O model, and thus propose that the concept of comparative advantage still applies in an age of globally disintegrated production. Winkler and Milberg, on the other hand, have found the exact opposite to be true. To them, the notion of comparative advantage is no longer relevant due to three major limitations, which are identified as conceptual, historical, and ethical.<sup>47</sup> Conceptually, comparative advantage, they say, cannot account for the persistence of trade imbalances among countries. Ricardo proposed that free trade will eventually result in universally even trade balances because of price and exchange rate adjustments – an outcome, which Milberg and Winkler statistically prove not to have come to pass by any means. Comparative advantage is further challenged by the fact that capital, taken as a production factor, has become increasingly mobile. This recognition renders comparative advantage virtually meaningless, as it implies that:

“in a two-country, two-good, two-factor model [the basic assumption of H-O models, M. L.], if the home country has an absolute advantage in both goods, that is, if unit costs are lower in the production of both goods, the home country will attract foreign capital, reducing foreign production and employment – potentially to zero in equilibrium”.<sup>48</sup>

International capital mobility, according to this view, discourages trade patterned around comparative advantage, as production as such will inevitably shift to those locations where labor is abundant, taking with it the footloose capital and thereby excluding other deserted sites from producing at all. Among other conceptual flaws of comparative advantage, Milberg and Winkler point specifically to the technology gap among countries, unaccounted for in conventional H-O models.<sup>49</sup> Factor endowment theories generally assume innovations in technology to evenly disseminate across the globe, addressing as determinants for trade patterns only factors such as labor or capital. But, running counter to the trend of increased

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<sup>45</sup> Foreign Affairs - Trade and Development Canada, 2011, p. 86.

<sup>46</sup> Ibid, 2011, pp. 87-88.

<sup>47</sup> Milberg & Winkler, 2013, pp. 79-98.

<sup>48</sup> Ibid, pp. 82-83.

<sup>49</sup> Ibid, pp. 88-89.

capital mobility, it seems that there are lasting differences in technology across countries. This persistent discrepancy in innovational strength between national economies establishes uneven conditions of productivity among trading partners, which are irreconcilable through cost adjustments. According to Dosi et al.:

“Our hypothesis is thus that absolute advantages dominate over comparative advantages as determinants of trade flows. Their dominance means that they account for most of the composition of trade flows by country and by commodity at each point in time and explain the evolution of such trade flows over time. This dominance takes two forms. First, absolute advantages/disadvantages are the fundamental factors, which explain sectoral and average competitiveness, and, thus, market shares. Second, they also define the boundaries of the universe within which cost-related adjustments take place”.<sup>50</sup>

In order to outline the historical limits of comparative advantage, Milberg and Winkler refer to recent events in economic history, which serve to demonstrate that the conceptual inadequacies that they discuss are reflected in real developments. For example, the rapid growth of China, according to them, was characterized by institutionalized, i.e. state-sanctioned or corporate-coordinated, “defiance” of the patterns of specialization dictated by comparative advantage: “Chang .. and Lin and Chang .. show how “defiance” of comparative advantage pursued by developing country firms and governments have historically been a necessity for economic development”.<sup>51</sup> Lastly, what Milberg and Winkler call the ethical limits of comparative advantage, is a general critique of the supposed welfare improvement achieved through free trade.

The approach chosen by Milberg and Winkler in their own attempt to account for the specialization patterns of international trade, as manifested in the rise of Global Value Chains, bears some resemblance to Krugman’s New Trade Theory, which stresses the importance of economies of scale and network effects in informing firm decisions regarding the structuring of their production processes.<sup>52</sup> Milberg and Winkler assert, “... that it is the strategic behavior of lead firms that has structured and driven the dynamics of GVCs”.<sup>53</sup> Disregarding the supposed self-regulation of markets through price adjustments based on comparative advantage, the two authors of “*Outsourcing Economics*” emphasize the embeddedness of international trade within a worldwide institutional setting, where strategic decisions by

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<sup>50</sup> Dosi et al., 1990, p. 151.

<sup>51</sup> Milberg & Winkler, 2013, p. 61.

<sup>52</sup> Ibid, p. 63.

<sup>53</sup> Ibid, p. 97.

powerful MNEs and active policy-making at the state level interlock to shape an increasingly interconnected global economy.<sup>54</sup>

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<sup>54</sup> Ibid, p. 98.

### **3. GVC Participation: Key Performance Indicators for Germany and China**

#### **3.1 Germany and China: Two Distinctive Export Economies**

To better understand both similarities and difference among the export-oriented economies of Germany and China in the 21<sup>st</sup> century, a short overview of the respective economic histories and recent trade figures of the two countries is sketched out here. This helps in explaining the later discussed results from the comparison of key performance indicators.

In 1820, before the completion of the industrial revolution in Western Europe later in the century, China's estimated share of world GDP amounted to 33% followed by India with 20% and another combined 20% of North America and Europe. More than a 100 years later, in 1950, China's and India's shares were 4% and 3% respectively, while the Western world with only 20% of the total population produced 55% of world output. Germany and, to the east, Japan reached the peak of their first industrialization wave later than other European countries like Great Britain around the turn of the 20th century. Now, after another hundred years have passed, Germany stands out among the major European countries as the last surviving industrial power. Some of the reasons for this include: Close ties between industry and finance, a well-coordinated interaction between labor and management, a unique predominance of medium-sized firms in the economy (Mittelstand), a tradition in engineering and an education system that can specifically cater to industry needs.<sup>55</sup>

The United States became the world's leading manufacturing power in the early 20th century, mainly owing to the introduction of scientific management methods (statistics in particular) to the business world, when Germany was still gaining traction in regard to its productive capacities. Only until a couple of years ago, in 2010, the US lost this status to China.<sup>56</sup>

China opened up to the dynamics of the global economy beginning in the late 1970s with a resulting imbalance in regional development – export growth rates were more pronounced in coastal areas than in inland China.<sup>57</sup> Initially, this process was characterized by allowing increasingly more FDI inward flows into the manufacturing sector. In contrast to other major Asian economies, for instance Japan or South Korea, China relied on foreign knowledge, technology and eventually access to global markets from the beginning by pursuing such a strategy instead of focusing on the formation of own global industry actors. This has been

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<sup>55</sup> World Economic Forum, 2012, p. 10.

<sup>56</sup> Ibid.

<sup>57</sup> WTO/IDE-JETRO, 2011, p. 106-113.

called “compressed development” in contrast to the “late development” of South Korea and Japan. China's rise to become a main player in the global economy was characterized by skipping a slow but solid phase of industrial growth focused on incorporating high-value activities and instead creating an explosive expansion of the manufacturing sector via the improvement of assembling capabilities. A similar approach to economic growth had previously been undertaken by Taiwan. Three factors were decisive in the globalization of China's economy and the subsequently resulting high growth rates. First, a large reservoir of cheap labor from rural areas was channeled to the many emerging export processing zones that offered job opportunities to millions. Second, the pre-recession period of global economic growth before 2008 and especially the strengthening of a new middle-class in Brazil, Russian Federation, India, China and South Africa (BRICS) led to great demand for Chinese goods. Third, China invested heavily in infrastructure.<sup>58</sup>

As has already been briefly pointed out earlier, China is embedded within an Asia-wide production network in which the production of intermediates is rather occurring outside in other countries while the final assembly of goods appears to be the main activity of the Chinese economy. Before China became the main attractor for global FDI, large Western and Eastern economies invested in members of the Association of Southeast Asian Nations (ASEAN) such as Malaysia and Thailand whose successful development became a prerequisite for China's own integration into regional and world markets.<sup>59</sup>

Germany's rank as the last remaining industrial power in Europe can be illustrated using the 2012 foreign trade statistics. Exports amounted to € 1095.8 billion and were higher than in any other European country and in fact only topped by China and the US. Imports were calculated to be € 905.9 billion. Trade in exports and imports rose by 3.3% and 0.4% respectively. This closed the foreign trade balance with a surplus of € 189.8 billion compared to € 158.7 billion in 2011. The share of exports destined for European countries was at 69%, with 57% going to member states of the EU. Although the whole of Asia received 16% of German exports (more than America's 12%), China was not among the top three importers by country. These were, first, France receiving 9.4% of total exports (€ 102.9 billion), second, the US with 7.9% (€ 87 billion) and, third, the United Kingdom with 6.7% (€ 73.3 billion). On the other hand, German import shares were as follows: 9.5% (€ 85.7 billion) from the Netherlands, followed by China with 8.7% (€ 78.5 billion) and France with 7.1% (€ 64

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<sup>58</sup> Ibid, p. 13.

<sup>59</sup> Ibid.



billion). As in previous years, Germany's major export good in 2012 were motor vehicles with 17.3% of total exports (€ 190 billion). Machinery ranked second with 14.9% (€ 163.6 billion), followed by chemical products with 9.5% (€ 104.5 billion).<sup>60</sup>

### 3.2 Measuring Trade in Value Added

In a globalized economy where the production of a single commodity may be fragmented across various countries, involving inputs from all around the world, the very notion of “country of origin” seems outdated. Traditional trade statistics measure trade flows gross and thus the value of intermediate products that repeatedly cross borders is counted multiple times. This statistical misrecognition of the actual value of traded goods may result in false perceptions of the true dimensions of global trade and of the consequences it has for economic growth and national income. As Maurer and Degain note, “what you see is not what you get”.<sup>61</sup> The predicament of adequately measuring the real value added across the different stages of global manufacturing processes is well illustrated in this passage from a joint OECD-WTO paper:

“For example, an exported good may require significant intermediate inputs from domestic manufacturers, who, in turn, require significant intermediate imports, and, so, much of the revenue, or value added, from selling the exported good may accrue abroad to reflect purchases of the intermediate imports used in production, leaving marginal benefits in the exporting economy”.<sup>62</sup>

A real-world example of such value drain occurring as a result from the dependency on foreign inputs, is discussed in an often-cited case study on the production of the Apple iPod.<sup>63</sup> The study demonstrated that from the \$144 Chinese factory price of an iPod, less than 10 % were attributable to Chinese value added, as components worth about \$100 had been imported from Japan, with the remaining parts originating largely from the US and Korea. Grasping the production of the iPod as an instance of a manufacturing process being structured along a GVC, it becomes apparent that China is not especially profiting from participating in this particular value chain. When tracing the input share of exports not just in the context of a single GVC, but at the sector or industry level, it is revealed that distinguishing domestic from foreign value added significantly alters the bilateral trade

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<sup>60</sup> Statistisches Bundesamt, <https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/Aussenhandel/Gesamtentwicklung/Aktuell.html;jsessionid=16536A06C188121D7573DBA85F0220E3.cae1>, retrieved March 2014.

<sup>61</sup> Maurer & Degain, 2010, p. 1.

<sup>62</sup> OECD/WTO, n.d., p. 1.

<sup>63</sup> Dedrick et al., 2008, p. 3.

balances between nations. This will be discussed in-depth in the chapter on key performance indicators of GVC participation.

Since today products are “Made in the World”<sup>64</sup>, exportation has become a somewhat ambiguous issue for nations involved in commerce. Examining the gross trade flows of a given country does not necessarily indicate how much of revenue generated by exports is retained domestically in the national economy. As noted by OECD/WTO: “There is a need for better metrics to the contribution of trade to nations’ value added, income and employment”.<sup>65</sup>

The same authors argue that there are three main problems with current trade statistics: first, the fact that the same labor, capital or intermediate input embodied in one and the same product, is counted multiple times when analyzing world trade at the aggregate level, i.e. as the total sum of bilateral trade flows in gross terms; second, the inability of conventional metrics to reveal the exact level of domestic value added, resulting in the obfuscation of the real effects of GVCs on national employment and income; third, the need to even go “beyond value added”, as phrased by the authors, because of the nominal capture of value added in the National Accounts which is then, due to the corporate governance structure of GVCs, nevertheless repatriated to the home country of the lead firm.<sup>66</sup>

In order to tackle these issues, OECD-WTO in May 2013 published its dataset on Trade in value added (TiVA) for 58 countries (including all OECD countries; BRICS countries; NICs (Newly Industrialized Countries), Cambodia, Brunei Darussalam and ‘Rest of the world’) for the years 1995, 2000, 2005, 2008 and 2009, employing “harmonized” input-output (I-O) tables of these countries to achieve a refined understanding of the “net value added” effects of GVC participation on national economies. These statistics were supplemented by UNCTAD to include data on developing and developed countries.<sup>67</sup>

As Banga notes: “An important advantage of I-O tables is that they classify goods according to their use (as input into another sector’s production or as final demand); and include information on inputs of/in services sectors, allowing for the analysis to include services trade”.<sup>68</sup> The I-O model, developed by Russian economist Leontief, provides an assorted matrix representation of the yields of different sectors or industries in a given national or

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<sup>64</sup> OECD/WTO, n.d., p. 1.

<sup>65</sup> Ibid, p. 3.

<sup>66</sup> Ibid, pp. 3-4.

<sup>67</sup> Banga, 2013, p. 5.

<sup>68</sup> Ibid.

regional economy, showing how the output in one sector relates to that of another. Such charts thus give an insight on how sectoral interdependencies in an economy affect its overall productivity. “Harmonized”<sup>69</sup> I-O tables, as arrived at by the TiVA framework, involve the collation of data from country-level. I-O tables with available statistics pertaining to bilateral trade flows, so as to be able to calculate the ratio of domestic value added in exported and imported goods and services, as opposed to the foreign value added contained therein. Capturing the exact share of domestic value added, however, poses some difficulties, as it is not enough to simply subtract from the “Gross Exports” trade volume the foreign value added, i.e. the value created abroad that is imported through shipped-in intermediate goods and therefore passively inheres in the exports of the country. Domestic value added may also be found in the imports of a country, since imported goods are often found to have components attached to them which were originally exported as intermediates from one country to another, and which are now being re-imported, further processed, by their initial producer.<sup>70</sup>

Therefore, national economies can be said to engage with GVCs in a twofold manner; first, as consumers of inputs coming from abroad and, second, as providers of intermediate goods and services that are utilized by other economies for producing their own exports. Furthermore, participation in GVCs is generally observed to relate to some fundamental characteristics of the involved economies. Small open economies such as Belgium, Luxembourg or the Slovak Republic procure a relatively higher share of foreign inputs and are relatively more specialized in supplying intermediate goods for application in GVCs than large economies, e.g. Japan, the United States, or the European Union. These latter economies, due to their bigger size, are capable of producing the required inputs domestically, rather than having to source them from a foreign country.<sup>71</sup>

Figure 1 gives a first impression of how to measure the degree of engagement with GVCs in individual countries. The indicator on display is the so-called participation index, made up of two basic elements: backward participation and forward participation. The former denotes foreign content of exports, while the latter signifies to what extent a country’s exports are utilized in foreign countries as intermediate goods. The figure indicates how the aforementioned small open economies rely heavily on backward participation, as is to be

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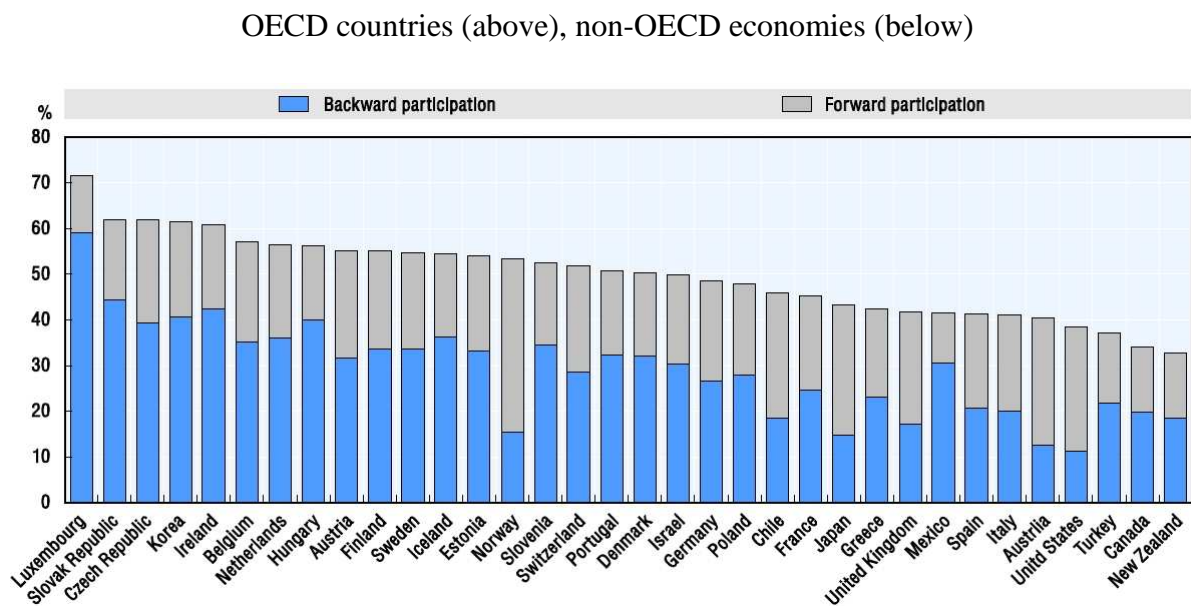
<sup>69</sup> Ibid.

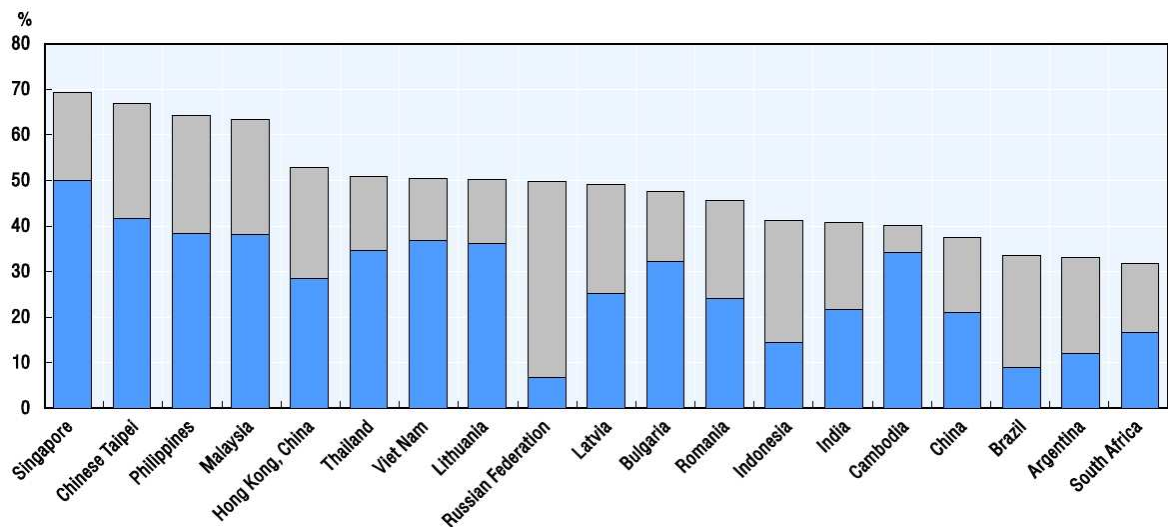
<sup>70</sup> OECD/WTO, n.d., p. 11.

<sup>71</sup> OECD, 2013a, p. 17.

expected from the fact that only a small range of inputs is available in their respective economies. The degree of forward participation, on the other hand, is very limited, as these countries are not associated with large-scale exportation of any specific intermediate goods. New Zealand being the country with the lowest participation index of all OECD countries suggests that distance to other markets also influences participation in GVCs. Looking at the participation index of Japan and the USA, which is just over 40 % in both cases, largely due to heavy forward participation, it is clearly noticeable that in some countries the pattern of participation in GVC emphasizes the export rather than the import sector, as was the case with small open economies. In the two countries that this thesis focuses on, Germany and China, both backward and forward participation are fairly balanced, amounting to a participation index of roughly 50 % in both China, and Germany. The two countries are found to be rather active exporters and importers of intermediate goods alike, implying that despite their development gap both economies are well embedded in GVCs.

Figure 1: GVC participation 2009





Source: OECD, 2013a, p. 12.

By employing global I-O tables, participation in GVCs at the country-level becomes measurable. However, the participation index described above provides no insight on the specific linkages, whereby certain sectors of a national economy integrate into global production processes. The degree of participation in GVCs is very likely to vary from industry to industry, with some of them obtaining the needed inputs from domestic value chains, or producing mostly for the internal economy, while others are highly dependent on foreign inputs, and yet others export the lion's share of what is produced in order to satisfy demand from abroad. But TiVA also renders visible these differences among industries, making possible a detailed analysis of the precise avenues, through which any given national economy featured in the OECD-WTO dataset connects with GVCs. The indicators provided by TiVA for measuring participation in GVCs are listed by the OECD as follows:

“breakdowns of gross exports by industries into their domestic and foreign content (with the domestic content split into direct, indirect and reimported components); the services content of gross exports by exporting industry (broken down by foreign/domestic content); bilateral trade balances in value-added terms; and the percentage of intermediate imports embodied in exports, as a percentage of total intermediate imports”.<sup>72</sup>

Making use of these indicators, the next section will look at the German and Chinese economy, respectively, evaluating to what extent TiVA-based statistical data reveals these two countries to be involved in GVCs. Differences and commonalities within the patterns of participation will be pointed out, assessing for each of the indicators how the particular

<sup>72</sup> OECD, 2013a, p. 15.

performances of both Germany and China hinge upon the distinctive features of the two economies, and what role the development gap between them is likely to play in accounting for the observed differences.

### **3.3 Key Performance Indicators**

#### **3.3.1 Domestic Value Added Content of Exports**

A first measure for estimating the extent of participation in GVCs in a given country is to look at the level of domestic value added. Figure 2 shows the percentage of domestic value added content of gross exports in the 34 OECD member countries and in selected developing and emerging nations, among them China. The numbers are given for 1995 and 2009, indicating the overall increase or decrease of the level of domestic value added over a period of almost 15 years.

In 2009, China's domestic value added content of its exports was 67 %, which is 9 percentage points (pp) lower than the OECD average (76 %), and substantially below its level in 1995 (88 %). Germany's domestic value added content of its exports was 73 % in 2009, slightly below the OECD average, and 8 pp less than its 1995 share (81 %). In both China and Germany, the domestic value added has dropped to a considerable degree, signifying higher shares of foreign content in exports and, by extension, increasing participation in Global Value Chains. The global fragmentation of production has thus affected China and Germany alike, as revealed by the declining rates of domestic value added in exports in both countries. In China, though, the drop has been far more pronounced, amounting to 21 pp.

Strikingly, of all BRICS countries, China is by far the one economy with the heaviest decline of domestic value added. In Brazil, Russia, and India the levels have not much changed at all, highlighting, at least in the case of the former two countries, continuous reliance on resource-based exports. The fact that, of all BRICS countries, China has lost the greatest share of domestic value added, clearly indicates that no other emerging economy has so radically integrated into GVCs.

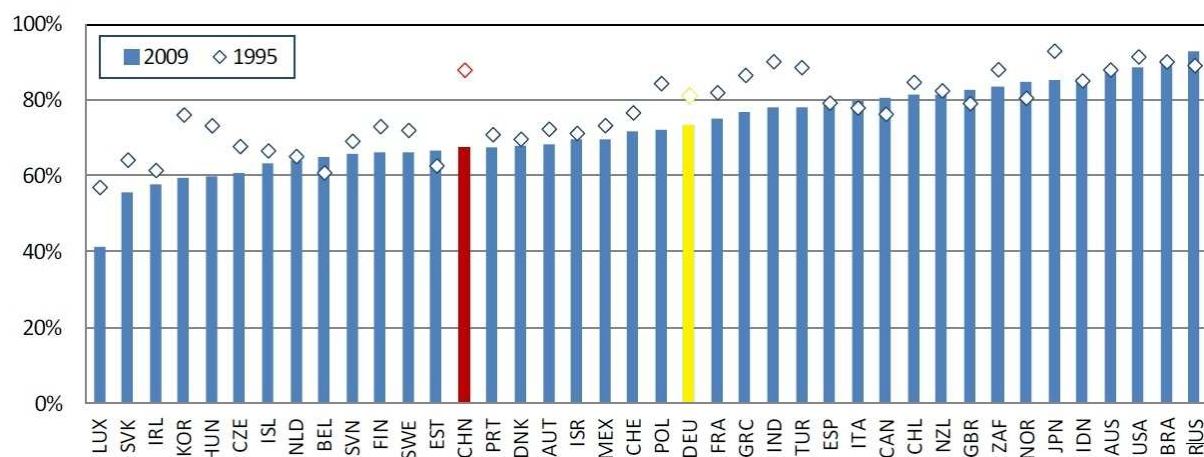
However, as noted by OECD, "China's domestic value added content of its exports rose between 2005 and 2009 suggesting that China was beginning to extract higher value from global value chains".<sup>73</sup> It is important to keep in mind that "naked" participation in GVCs, as implied by a decline in the domestic value added of exports, does not necessarily amount to

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<sup>73</sup> OECD, 2013c, p. 1.

being a successful recipient of GVC-generated profits. Retention of domestic value added is key in order to, as Banga puts it, “gainfully link into GVCs”.<sup>74</sup>

Figure 2: Domestic value added content of gross exports



Source: OECD, 2013c, p. 1.

### 3.3.2 Regional Aspects of GVCs

Although the fragmentation of manufacturing and services has spread out productive activities all across the globe, the analysis of GVCs through the TiVA framework nevertheless reveals the huge importance of regional trading partners in supplying essential intermediates to neighboring economies. Figure 3 displays the origin of foreign value added content of exports, by geographic region, as of 2009. Germany obtained more than 60 % of its required foreign inputs from other European countries, with only small fractions of its foreign-value added content being sourced from non-European regions. China, in contrast, acquired the bulk of its foreign inputs, that is, roughly 30 %, from East Asian exporters, relying in large part on geographically proximate suppliers in a manner similar to Germany. Overall, however, China’s foreign-value added content is more diversified than Germany’s in terms of its origin. Large chunks of China’s foreign value added originate from Europe or from NAFTA (North American Free Trade Agreement) countries, roughly 20 pp from Europe and roughly 15 pp from NAFTA respectively, leading to the conclusion that China, although firmly footed in regional supply chains, also sources to a considerable degree from far-away countries, being well integrated into production networks that are truly in global in scope. Germany, in comparison, primarily operates within a consolidated European production hub, as the European countries in general tend to do.

<sup>74</sup> Banga, 2013, p. 3.

To a significant extent, China's supply chains are regionally embedded as well. According to OECD, "'Made in China' is largely 'Made in Asia'".<sup>75</sup> Processing trade, in particular, accounts for much of the imported intermediates, and not surprisingly so, since it is being actively facilitated by the Chinese state through establishing Export Processing Zones (see Section 3.4.1). According to OECD, from the late 1980s onwards until the mid-1990s the share of processing trade in China's exports expanded dramatically, levelling out at about 50 %, in between 1991 and 2010 with an average annual growth rate of 17 %.<sup>76</sup> Much of the processing trade in China occurs within regional supply chains, some of which extend even beyond Asia. The report notes:

"Processing trade has given rise to a triangular pattern of trade, with parts and components produced by more developed Asian countries (e.g. Korea and Japan) and other advanced countries, and then exported to China where the different intermediates are assembled into finished products. Almost 80% of China's processing imports, including high-technology intermediates, originate from other East Asian economies . . . The assembled final products are either exported back to Asian countries or exported to developed countries/regions such as the United States and Europe where they may undergo additional processing (packaging, marketing, etc.)."<sup>77</sup>

Regional supply chains, according to these estimates, account for much of the volume of processing trade, which, in turn, accounts for half of Chinese exports. Regional suppliers deliver foreign inputs to China, where the imported parts are assembled and further processed, and then possibly re-imported by neighboring countries which contributed some of the value added in the first place. This regionally-grounded exchange of intermediates among East Asian countries is what the authors of the OECD report call the "tri-angular pattern" of Chinese processing trade.<sup>78</sup> It stands to reason, that without being embedded in this dense network of regional supply chains, China's export volume would not be quite as staggering as it is.

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<sup>75</sup> OECD, 2013b, p. 144.

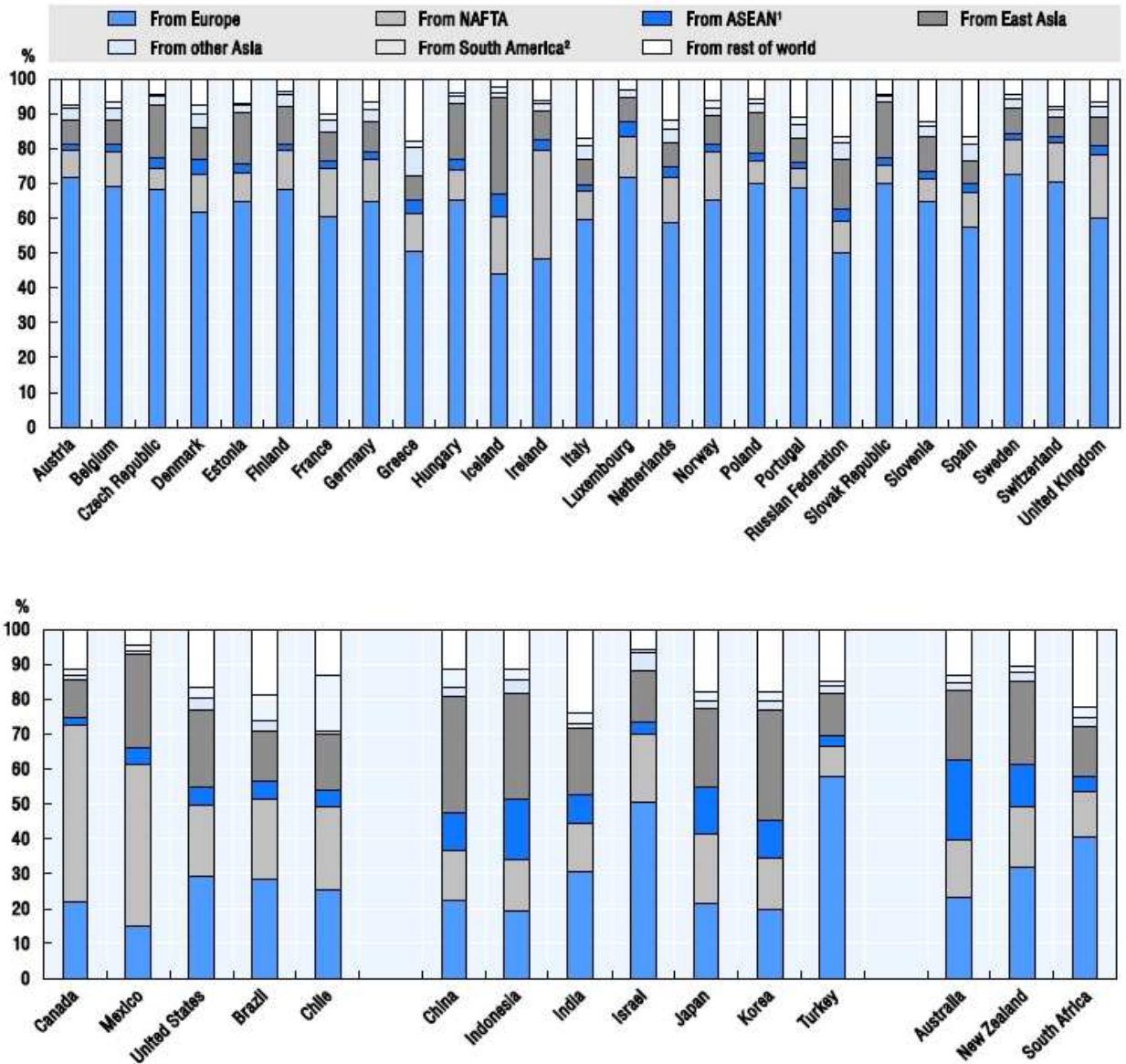
<sup>76</sup> Ibid, p. 145.

<sup>77</sup> Ibid.

<sup>78</sup> Ibid, p. 144.



Figure 3: Origin of foreign value added content of exports, by geographic region, 2009



1. Excluding Myanmar and Laos.

2. Argentina, Brazil and Chile.

Source: OECD, 2013b, pp. 28-29.

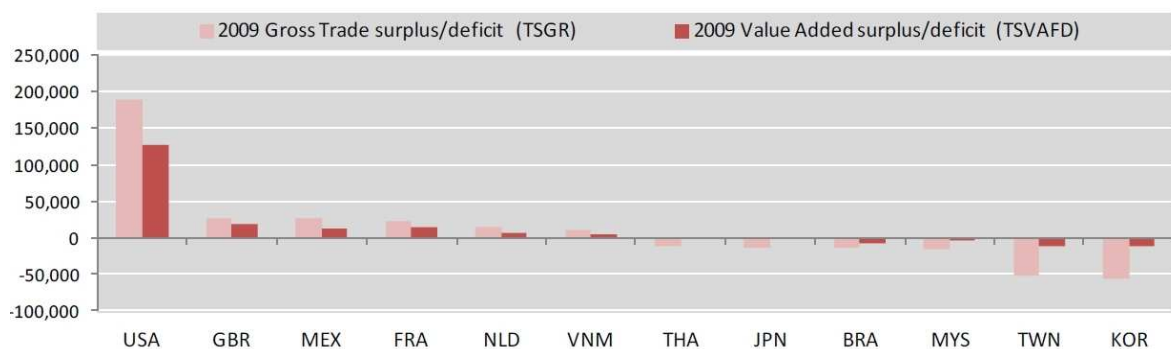
### 3.3.3 Trade Balances in Value Added Terms

In a *Financial Times* article from January 24<sup>th</sup> 2011, Pascal Lamy, then Director-General of the World Trade Organisation, notes that "the statistical bias created by attributing commercial value to the last country of origin perverts the true economic dimension of the bilateral trade imbalances. This affects the political debate and leads to misguided

perceptions”.<sup>79</sup> As pointed out in the section on measuring trade in value added, the TiVA framework allows for the meaningful reevaluation of conventional bilateral trade balances. Since measuring the volume of inter-country trade in gross terms does not adequately reflect the exchange of intermediate goods, one has to turn to the harmonized I-O tables provided by the TiVA database in order to gain a complete view of the real level of commerce taking place between two countries. Pascal Lamy's statement emphasizes the importance of the TiVA method for providing sufficiently reliable diagnostic data, needed to make proper policy decisions. The true share of domestic and foreign value added in a country's exports becomes estimable only by using TiVA, while gross statistics will inevitably overestimate the total volume of bilateral or multilateral trade patterns, because the value of border-crossing intermediates is counted multiple times.

Figure 4 and 5 illustrate how trade balances in value added terms reveal starkly different numbers compared to gross estimates. The charts show the bilateral trade balances of both China and Germany in 2009; the Chinese-US and German-US bilateral trade balances are of particular interest to this analysis owing to the fact that the TiVA-adjusted data suggests differing patterns of GVC participation in China and Germany that were previously buried in the undifferentiated mass of the gross statistics.

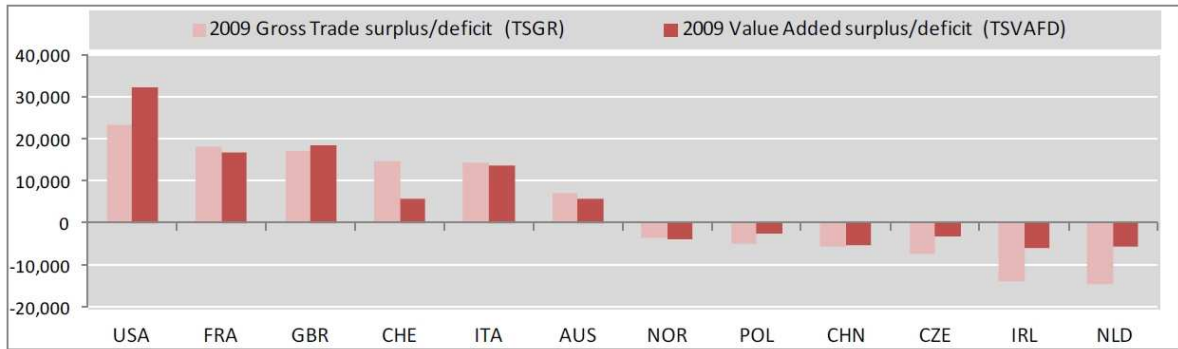
Figure 4: Bilateral Trade Balances, China, USD million



Source: OECD, 2013c p. 4.

<sup>79</sup> Financial Times Online: <http://www.ft.com/cms/s/0/4d37374c-27fd-11e0-8abc-00144feab49a.html#axzz2uyzs1k2n>, retrieved March 2014

Figure 5: Bilateral Trade Balances, Germany, USD million



Source: OECD, 2013d, p. 4.

China can be observed to have a considerable surplus in its trade balance position with the United States, amounting to almost \$20 billion. Calculated in value added terms, however, China's surplus with United States shrinks by one-third, dropping to roughly \$120 billion. The surpluses of China with its other North-American and European trading partners also decline, indicating a loss of profits for China. On the other hand, the deficits with countries from "Factory Asia" generally shrink, implying reduced financial obligations of China to its regional suppliers.

The aforementioned GVC case study on the Apple iPod came to the conclusion that of the \$144 factory price of the iPod less than 10 % contributed to Chinese domestic value added. Apple's iconic product, like many other high-tech goods, is assembled in China, and then exported to destination markets all over the world. The study singled out one particular GVC, namely Apple Inc.'s supply structure for the manufacturing process of one of their products; the findings of the study can thus not be easily extrapolated, so as to induce from the analysis of just one case the average rate at which Chinese manufacturers profit from participating in GVCs. The levels of domestic value added vary from sector to sector, as will be demonstrated in the next chapter. However, in the context of China's specialization in the assembly of high-tech products, the findings of the study can at least be interpreted as being symptomatic for a large part of the Chinese hi-tech sector.

Making such an inference would be well consistent with the considerable shrinkage of the Chinese-US trade surplus in value added terms, as the "vanished" surplus must somehow be accounted for. A very likely explanation for the reduction of US liabilities towards China, is that value drain – such as in the case of Apple's iPod – occurs across a broad range of the

GVCs that China is participating in, with the overall result that significant shares of the decomposed value added of Chinese exports actually reside in the countries which are importing the final product. The costs at which these, as it were, re-importers purchase the assembled iPod are weighed up by their respective contributions in inputs that were utilized at some stage in the manufacturing process of the product. Because the headquarters of Apple are located in the United States, the most lucrative activities involved in the production of the iPod, for example R&D or design, are delivered from precisely the country that is importing the final product. Large chunks of the decomposed value added generated by the iPod will therefore end up in the United States. Thus, a sizeable share of China's export surplus from selling the iPod will be absorbed by the expenditures for vital components and services that were indispensable in order for China to be able to produce the iPod in the first place. Thus, China's surplus with the US diminishes.

Assuming such a pattern of value reallocation to be typical of various GVCs operating in China, the observed decline in China's bilateral surpluses can be explained by the essential role of foreign suppliers in feeding the Chinese manufacturing system with intermediate goods. The enormous inflow of foreign-sourced inputs accounts for the readjustment of Chinese bilateral trade balances in value added terms, reducing Chinese surpluses with other countries. As far as China's deficits with its regional partners are concerned, the TiVA-adjusted bilateral balances – for example in China's relations with Korea – show substantial mark-ups for the Chinese domestic economy, indicating that China is now benefiting from its forward participation in Factory Asia's tight net of regional supply chains, that is, from its own exported intermediates that are returning to Chinese soil as further processed goods.

Turning to Figure 5 that displays Germany's bilateral trade balances, one quickly notices that the German surplus with the United States is actually augmented when measured in value added terms. China, in contrast, had lost some of its gains. Obviously, Germany is a "winner" of TiVA-adjusted statistics, whereas China is a "loser". Viewing their respective bilateral trade balance with the United States through the lens of TiVA, reveals that Germany's domestic value added is higher than conventional metrics suggests, while China's domestic value added turns out to be lower. According to the OECD, "Germany's trade surplus with the United States ... increases significantly as German value added is increasingly embodied in the exports of third countries to the United States".<sup>80</sup> Germany, traditionally regarded as a

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<sup>80</sup> OECD, 2013d, p. 3.

supplier of high-quality intermediates, has thus disseminated considerable portions of its domestic value added into various exports, injecting foreign products with Germany-bound value. Whenever a non-German commodity infused with German value added is imported by a third country, then Germany indirectly benefits from the transaction between the producer and the buyer, as the final product being sold is laced with German value. Germany's default position in GVCs is more "upstream" than China's, implying that German intermediates enter global supply chains at an early stage, so that eventually German domestic value cascades all the way down into final products. China, on the other hand, hooks into GVCs at a rather "downstream" position, having to pay tribute to all the antecedent producers. This is why Germany's surplus with the United States increases, while the Chinese surplus shrinks.

### **3.4 China in Focus: GVC-related Development Indicators**

#### **3.4.1 Proliferation of Export Processing Zones (EPZs)**

This section discusses how specific patterns of GVC participation relate to China's rapid development process. As noted by UNCTAD, "GVCs can be an important avenue for developing countries to build productive capacity, including through technology dissemination and skill building, opening up opportunities for industrial upgrading".<sup>81</sup> Through proactive policy decisions, China has for the past decades overseen and deliberately engineered the intergrowth of its domestic economy with global production networks, using GVCs as one of the primary agents to initiate and propel growth in its domestic economy. Interfacing China's immense labor force with GVC-embedded productive activities has largely been achieved by Chinese policymakers through state-sponsored promotion of Export Processing Zones, or EPZs.

Two development indicators that shed light on GVC-induced growth in China will be discussed here: first, the proliferation of EPZs in China's recent economic history and, second, the current massive inflow of FDI into China. While it was the establishment of EPZs that enabled China to enter Global Value Chains in the first place, by becoming a top FDI host country China has recently been elevated to the position of an increasingly "upstream" participant in GVCs.

Milberg and Winkler define EPZs as "those regulatory spaces in a country aimed at attracting export-oriented companies by offering these companies special concessions on taxes, tariffs,

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<sup>81</sup> UNCTAD, 2013, p. 135.

and regulations”.<sup>82</sup> Typically, foreign companies are attracted by special benefits such as exemption from some or all export taxes, exemption from some or all duties on imports of resources or intermediate goods, and unhindered repatriation of profits. Global presence of EPZs has been on the rise for decades, with EPZs having grown “in terms of their number, in terms of the number of countries offering them, in terms of their size and in terms of the scope of industries they comprise”.<sup>83</sup> In China, entire provinces have been declared “Special Economic Zones” (SEZs), effectively turning those regions into country-size EPZs.<sup>84</sup>

Most EPZ activity takes place in China. Milberg and Winkler note that over the last decades China has perpetually accounted for an overwhelming share of global EPZ-coordinated labor. As of 2006, it was estimated that China had 40 million people working in EPZs or EPZ-like areas, concentrating more than 60 % of total global EPZ employment on its territory.<sup>85</sup> China’s immense growth in processing trade has been driven by foreign companies outsourcing their low-skill manufacturing activities to Chinese EPZs, where policies are tailor-made as to ensure that foreign corporate interests are not interfered with by unfavorable trading conditions.

Chinese processing trade has massively grown as share of total exports since the 1980s until mid-1990s, resting at an average of 50 % ever since, with its total volume growing by an average annual rate of 17 % between 1991 and 2010. This overall expansion of Chinese processing trade was paralleled by a dramatic increase in the share of foreign-owned enterprises in processing trade, which rose from 39% in 1992 to nearly 70% at the end of 1990s and to 85% in 2008.<sup>86</sup> According to OECD, most of the top 200 exporting firms operating in Chinese EPZs are from other Asian countries, mostly Chinese Taipei, Hong Kong (China) and Korea.<sup>87</sup>

Figure 6 shows the ratio of domestic versus foreign value in Chinese processing trade and non-processing trade, as well as in overall terms. Strikingly, the share of domestic valued added in processing trade is observed to have steadily been rising from 1997 – 2011, implying that Chinese EPZs have become more involved in higher-value activities. According to the OECD:

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<sup>82</sup> Milberg & Winkler, 2013, p. 244.

<sup>83</sup> Ibid.

<sup>84</sup> Ibid, p. 243.

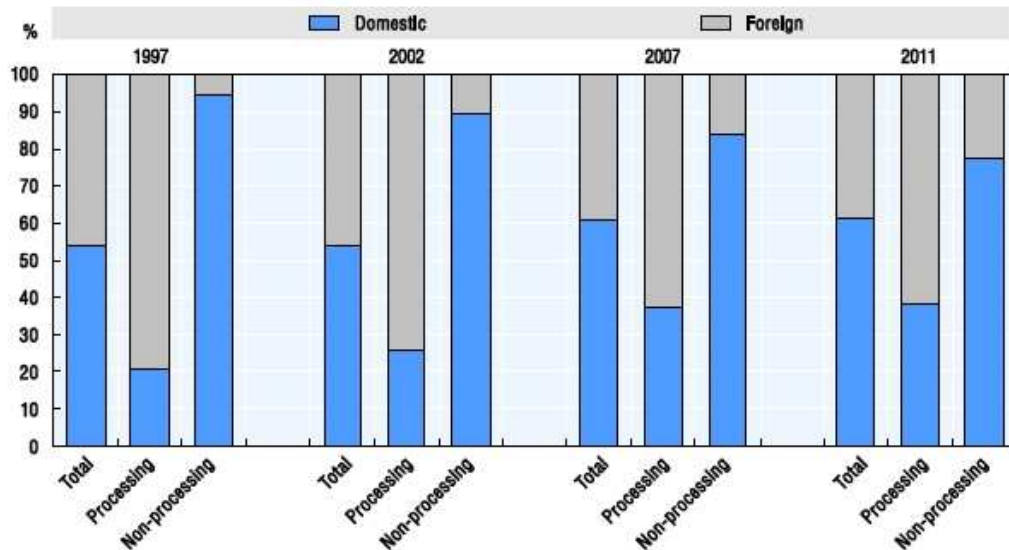
<sup>85</sup> Ibid. p. 244.

<sup>86</sup> OECD, 2013b, p. 145.

<sup>87</sup> Ibid.

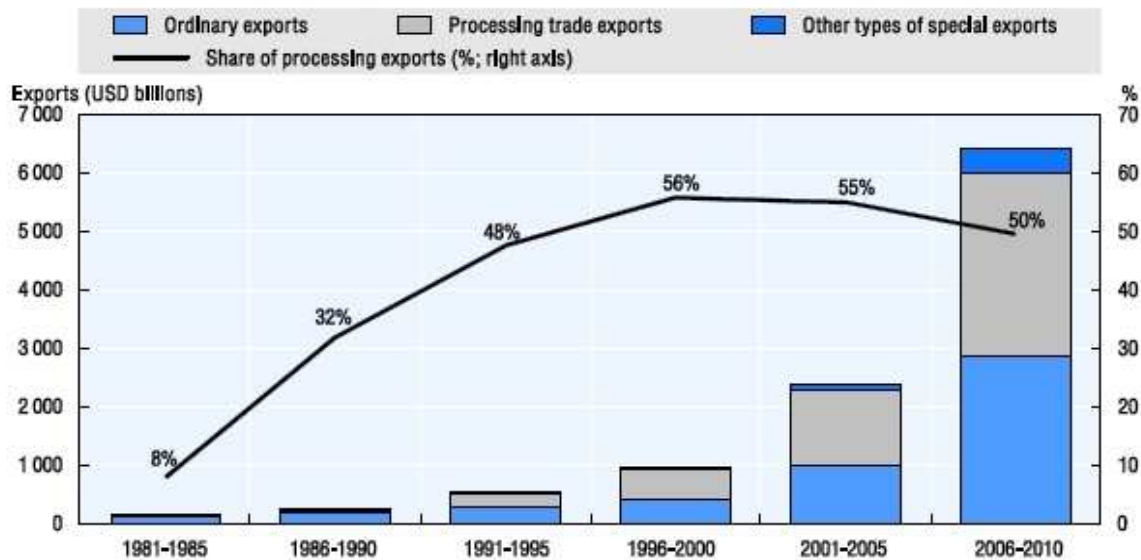
“The higher levels of domestic content in Chinese exports suggest that China is upgrading its activities and role within GVCs. Recent research shows that labour intensive activities are being shifted from the Chinese mainland to countries such as Cambodia, the Philippines and Viet Nam”.<sup>88</sup>

Figure 6: Total domestic value added, processing and non-processing exports, China



Source: OECD, 2013b, p.148.

Figure 7: China’s processing and non-processing exports, 1981-2010



Source: OECD, 2013b, p. 146.

As shown by the graph in Figure 7, the share of processing trade in total exports has steadily been rising from the early 1980s until the early 2000s when growth initially began to stagnate

<sup>88</sup> OECD, 2013b, p. 147.

and then to decline. Since processing trade comprises high volumes of foreign inputs and thus entails a high influx of foreign value added, a decline in processing trade can be plausibly correlated to the overall increase of China's domestic value added, as observed in Figure 5. However, the domestic value added in processing trade *per se* has increased over time, suggesting that China has managed to pool more and more high-value activities in their EPZs.<sup>89</sup> As noted by OECD: "Chinese firms in EPZs have increasingly moved from simple contract assembly to "full package" manufacturing, with Chinese firms controlling all stages from material procurement to product design ...".<sup>90</sup> Interestingly, foreign value added has actually been increasing in non-processing trade from 1997 to 2011 by roughly 15%, implying that a growing share of intermediates originates from abroad. This is consistent with the observation that foreign companies have steadily intensified their trade relations with Chinese firms beyond the processing regime, as illustrated by the share of foreign-owned enterprises (FOEs) in non-processing trade rising from only 5 % in 1992 to 29 % in 2008.<sup>91</sup> So, while inside of EPZs less inputs are sourced from abroad, outside of EPZs more inputs are sourced from abroad. The deregulated environment of EPZs has proven to be an irresistible pull factor for foreign companies seeking to maximize profits by taking advantage of China's low-cost labor force. Over the course of two decades, however, Chinese firms operating within EPZs have succeeded in upgrading to activities higher in value than just the final assembly of imported components, which in the beginning was the sole function of China within GVCs.<sup>92</sup> As evidenced by the growing number of foreign affiliates in non-processing trade, China now increasingly connects with GVCs in ways that promise to be more profitable to the national economy than channeling trade to EPZs where only fractions of the value added remain in domestic hands.

### **3.4.2 Top FDI Host Country**

According to a report by UNCTAD, global FDI inflows rose by 11 % in 2013, to an estimated \$1.46 trillion. FDI flows to developed countries accounted for a historically low share of global total FDI flows (39%), whereas FDI flows to developing countries peaked at an unprecedented high of \$759 billion, amounting to 52% of global FDI inflows in 2013.

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<sup>89</sup> Koopman et al., 2008, pp. 23-24.

<sup>90</sup> Ibid.

<sup>91</sup> Ibid, p. 145.

<sup>92</sup> Ibid, p. 147.



Developing Asia, having an influx of about the same level as 2012, still ranks as the top host region for FDI in the world.<sup>93</sup>

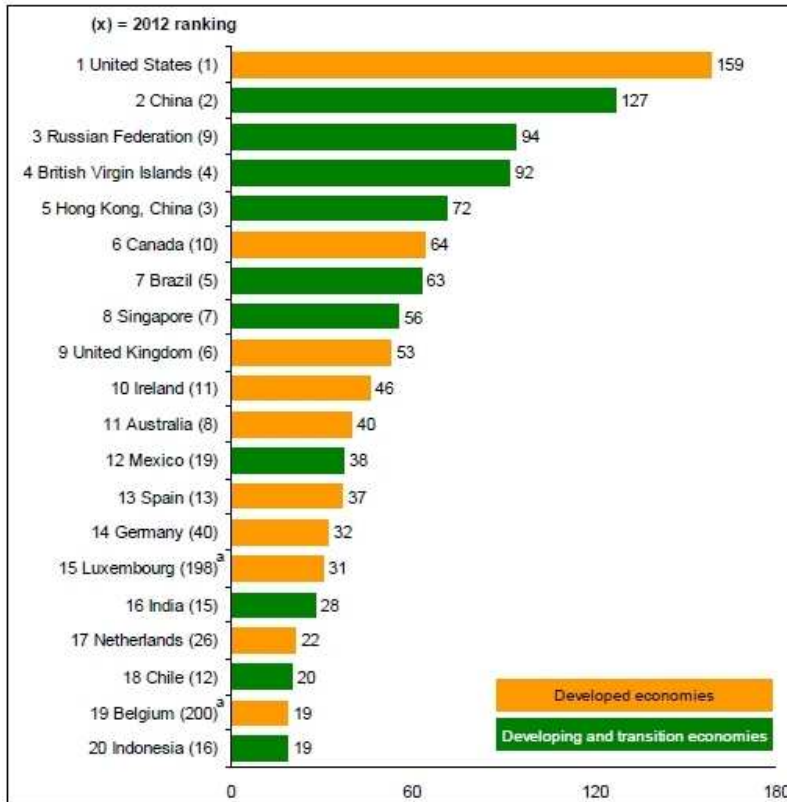
As indicated by Figure 8, China ranks as the second top FDI host country in the world with its annual FDI inflows amounting to \$127 billion, which is just \$32 billion less than the total sum of inward FDI secured by the leading host country, the US. Of all the emerging economies comprised under the umbrella of the BRICS nations, China is by far the one country to have attracted the highest level of FDI inflows. As UNCTAD reports, the BRICS “continued to be strong performers in attracting FDI. Their current share of global FDI flows at 22% is twice that of their pre-crisis level. Total inflows to the five leading emerging economies reached \$322 billion in 2013, 21% higher than in 2012”.<sup>94</sup> The substantial share of the BRICS nations in global FDI owes much to China’s exceptional performance as a host country for foreign investment. No other developing or transitioning economy, neither from BRICS nor otherwise, has a comparable influx rate of FDI. The US on the other hand are a developed country with the world’s biggest gross GDP at \$15.68 trillion, which is roughly twice as big as that of China, and yet in terms of FDI the top host country leads the statistics by a considerably smaller margin of just 21 % compared to China’s emerging economy positioned at second place.

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<sup>93</sup> UNCTAD, 2014, p. 1.

<sup>94</sup> Ibid, p. 8.

Figure 8: FDI inflows in Billions of US dollars: Top 20 Host Economies, 2013



Source: UNCTAD, 2014, p. 6.

China’s prominence as a recipient of FDI is relevant here because of the generally acknowledged relationship between FDI inflows and GVC participation. According to OECD: “Countries with a higher presence of FDI relative to size of their economies tend to have a higher level of participation in GVCs and to generate relatively more domestic value added from trade”.<sup>95</sup> By proxy, FDI statistics thus provide a measure for a given country’s engagement with GVCs. The higher the influx of FDI, the more an economy tends to interlink with international production networks. FDI inflows correlate with participation in GVCs because strategic investment decisions are one of the primary instruments of MNEs for setting up and implementing GVC infrastructures. Where FDI activity occurs, domestic and foreign economies grow together through transnational ownership of GVC-embedded firms. As noted in the section on EPZs, hosts countries may incentivize FDI by establishing deregulated institutional settings which are designed to facilitate trade within MNE-owned production networks and to allow for the unrestricted repatriation of profits.

<sup>95</sup> OECD/WTO/UNCTAD, 2013, p.13.

Figure 9 illustrates how FDI inward stock positively correlates with the overall level of GVC participation. The countries with the most FDI relative to the size of their economies exhibit three common features: first, higher foreign value added in exports; second, higher backward and forward participation in GVCs; third, a higher relative share in global value added trade compared to their contributions to global gross exports.<sup>96</sup>

As of 2013, about 80 % of global trade is estimated to be taking place within MNE-managed GVCs.<sup>97</sup> FDI provides MNEs with the tools to engineer, maintain and expand GVCs. By building up highly branched webs of supplier relationships and employing different governance modes, MNEs oversee their GVC operations and channel the profits back to the home country of the lead firm. Methods for coordinating GVCs include FDI-based direct ownership of foreign affiliates, non-equity modes of international production such as exporting or contractual agreements, as well as arm's-length dealings between partner companies. Rising levels of FDI inward stock go hand in hand with heightened GVC participation, allowing for the conclusion that investment strategies of MNEs exert decisive influence over the distribution pattern of value added in global production. So, while at the macro-level the connection between FDI-related MNE activities on the one hand and the degree of a country's GVC participation on the other hand can be firmly established, tracing back the profits of MNE-coordinated GVC activity to their final destination remains a difficult task due to the lack of available information on the convoluted ownership structures of MNEs.

Case studies focusing on a single GVC – such as the one on Apple's iPod – shed some light on how the value added inherent in an exported product is distributed among the international parties involved in the manufacturing process, but those findings cannot be taken as being representative of each and every GVC in any given sector. However, the iPod study provides an interesting inside look into the mechanisms of value retention and transfer within a single GVC, revealing how, in this case, the economic gains from participating in GVCs are directed towards the balance sheet of a powerful MNE rather than China's domestic economy. The extent and centers of gravity of China's value capture remain an opaque matter because of the non-transparency of MNE ownership structures.<sup>98</sup> But as a consequence of the firmly established correlation of FDI inward stock and GVC participation, the fact that China is the

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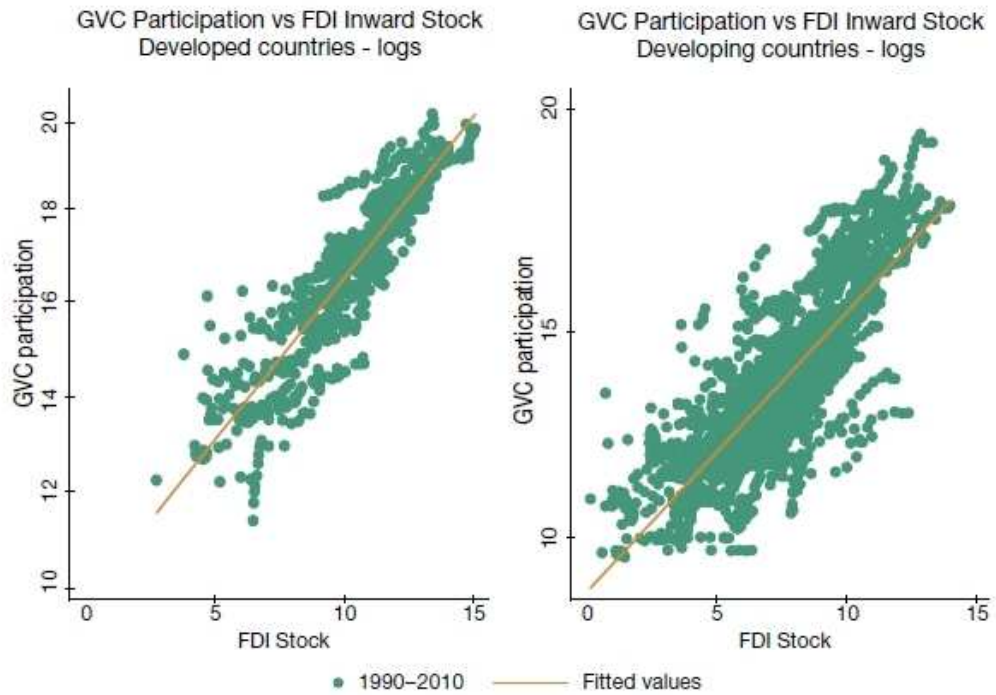
<sup>96</sup> UNCTAD, 2013, pp. 136-137.

<sup>97</sup> OECD/WTO/UNCTAD, 2013, p. 5.

<sup>98</sup> UNCTAD, 2013, p. 137.

top FDI host country among emerging economies may still be plausibly interpreted as another strong indicator for the pervasiveness of China's linkages into GVCs.

Figure 9: Correlation between levels of inward FDI stock and GVC participation



Source: UNCTAD, 2013, p. 138.

## 4. Sector Composition in China and Germany

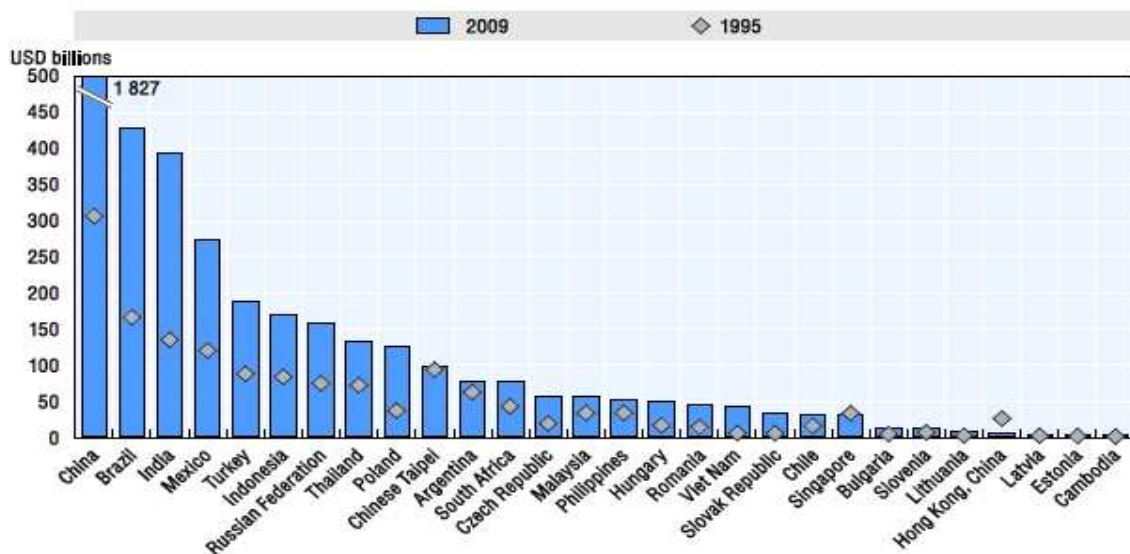
### 4.1 Country Analysis: GVC participation by Sectors

#### 4.1.1 China

In this section China's and Germany's patterns of GVC participation will be examined in terms of their sector composition. To gain a full picture of a country's engagement with GVCs, its gross exports have to be broken down by industries into their domestic and foreign content, so as to allow for the differentiation of those sectors that are well embedded within GVCs from those that are more oriented towards the domestic market. TiVA-based inter-country I-O tables provide the necessary data for estimating the specific levels of domestic and foreign value added, sector by sector.

Figure 10 gives a first overview of the value added created and captured in manufacturing GVCs in selected emerging and developing economies for the years 1995 and 2009. China is the single most successful emerging economy with a total value added in exports of \$1.827 trillion, leading the list by a margin of almost 400 % compared to the second biggest exporter Brazil. Within a period of 14 years, China has increased the value added of its exports sixfold, radically outpacing the growth of all its peers among emerging and developing countries.

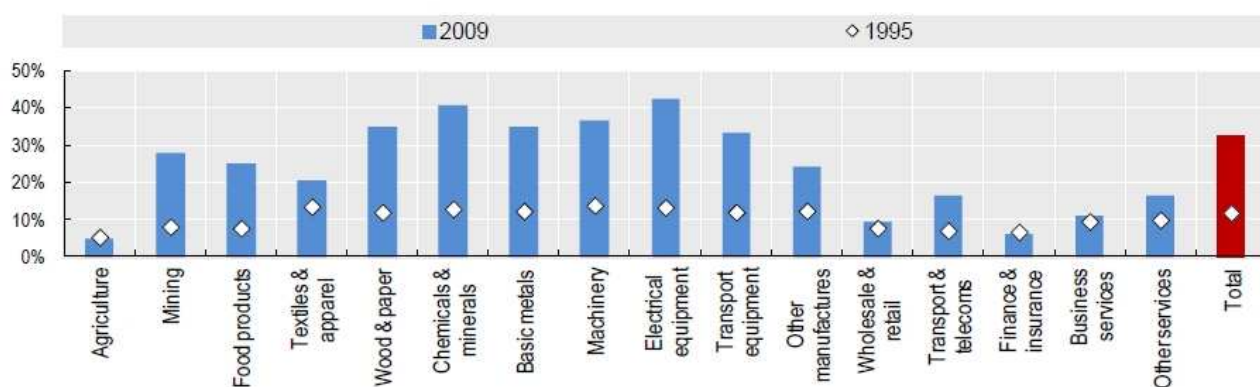
Figure 10: Value added created/captured in manufacturing GVCs, selected emerging and developing economies, 1995 and 2009



Source: OECD, 2013b, p. 157.

By looking at Figure 11, those industries become discernible that have contributed most substantially to the immense growth of the Chinese export volume. Concomitant with the dramatic increase of value added in China's manufacturing GVCs there has been an intensified import of foreign inputs in precisely those sectors that tend to contribute the greatest share to Chinese export growth. Along with China's rise as a major exporter of electrical equipment from 1995 to 2009, for example, there has also been a significant increase in foreign value added content of gross exports in the very same sector. At 43 % the electrical equipment industry had the highest percentage of all sectors in 2009, three times the percentage of 1995. Chemicals and minerals, Machinery, and Basic metals industries had similarly high shares of foreign input in gross exports. The parallel growth of foreign value added, domestic value added and of the overall export volume in the electrical equipment industry leads to the conclusion that those sectors with the highest GVC participation have also been the main drivers of China's emergence as the world's largest exporting economy.

Figure 11: Foreign value added content of China's gross exports, by industry, %



Source: OECD, 2013c, p. 1.

#### 4.1.2 Germany

Figure 12 shows aggregate data of the exports in OECD countries and in BRIICS countries (BRICS plus Indonesia) sorted by technology and price level. The results indicate that there is a quality gap in the exports of emerging and developed economies. OECD countries consistently have a higher unit value of exports in every technology category compared to emerging economies. According to the UN glossary: "A unit value index is a 'price' index which measures the change in the average value of units that are not homogeneous and which may therefore be affected by changes in the mix of items as well as by changes in their prices".<sup>99</sup> Throughout the

<sup>99</sup> UN, <http://data.un.org/Glossary.aspx?q=Balance+of+payments+-+Unit+value+of+exports>, retrieved March 2014

various technology categories from low-end to high-end, Germany's shares of high price exports are more sizeable than those of China, implying that Germany is generally partaking in GVCs at more upstream levels than China. The OECD reports: "While China's export bundle thus overlaps those of more developed countries (China exports the same products), the unit values of Chinese exports are significantly lower (China specialises in lower price/quality products)".<sup>100</sup> The unit values of the overlapping German exports, in contrast, suggest a specialization in high price and high quality products.

Clearly, Germany engages in higher-value activities than China, reinforcing Milberg and Winkler's assertion that a technology gap among countries will result in a power asymmetry in the hierarchical structure of GVCs that favors technologically more advanced economies over lesser advanced economies. However, as the brief case study in the next section demonstrates, China is in the process of actively upgrading the degree of technological sophistication of its exports through strategically buying up foreign, particularly Germany-based, supplier firms in key industries. A 2013 news item from state-owned Chinese news agency Xinhua reads:

"Chinese Vice Premier Ma Kai on Sunday called for more proactive opening up and accelerated economic restructuring in order to help facilitate a mutually beneficial global value chain. [...] With the deepened economic globalization, global value chain has played an increasingly important role in the world economy, Ma noted, adding that China is still at the low end of international division of labor system and benefited far less than developed countries. To move up its value chain, China will accelerate the shift of economic growth mode, promote innovation-driven strategy, ensure the better use of foreign investment and foster its outbound investment cooperation, Ma added. [...]"<sup>101</sup>

Germany has been a prime target of Chinese investment owing to the fact that Chinese policymakers are attempting to actively promote GVC participation by integrating foreign suppliers into Chinese State-owned production networks.<sup>102</sup> This move, in effect, represents a reversal of the power asymmetry that has kept GVC activity of Chinese firms at a rather downstream position. Now, by means of FDI, the ownership of foreign supplier firms with high levels of upstreamness is transferred to China, leading to an overall increase of the profits yielded from Chinese GVC participation. German supplier firms have become major recipients of Chinese FDI flows because they provide the kind of high-end technology that

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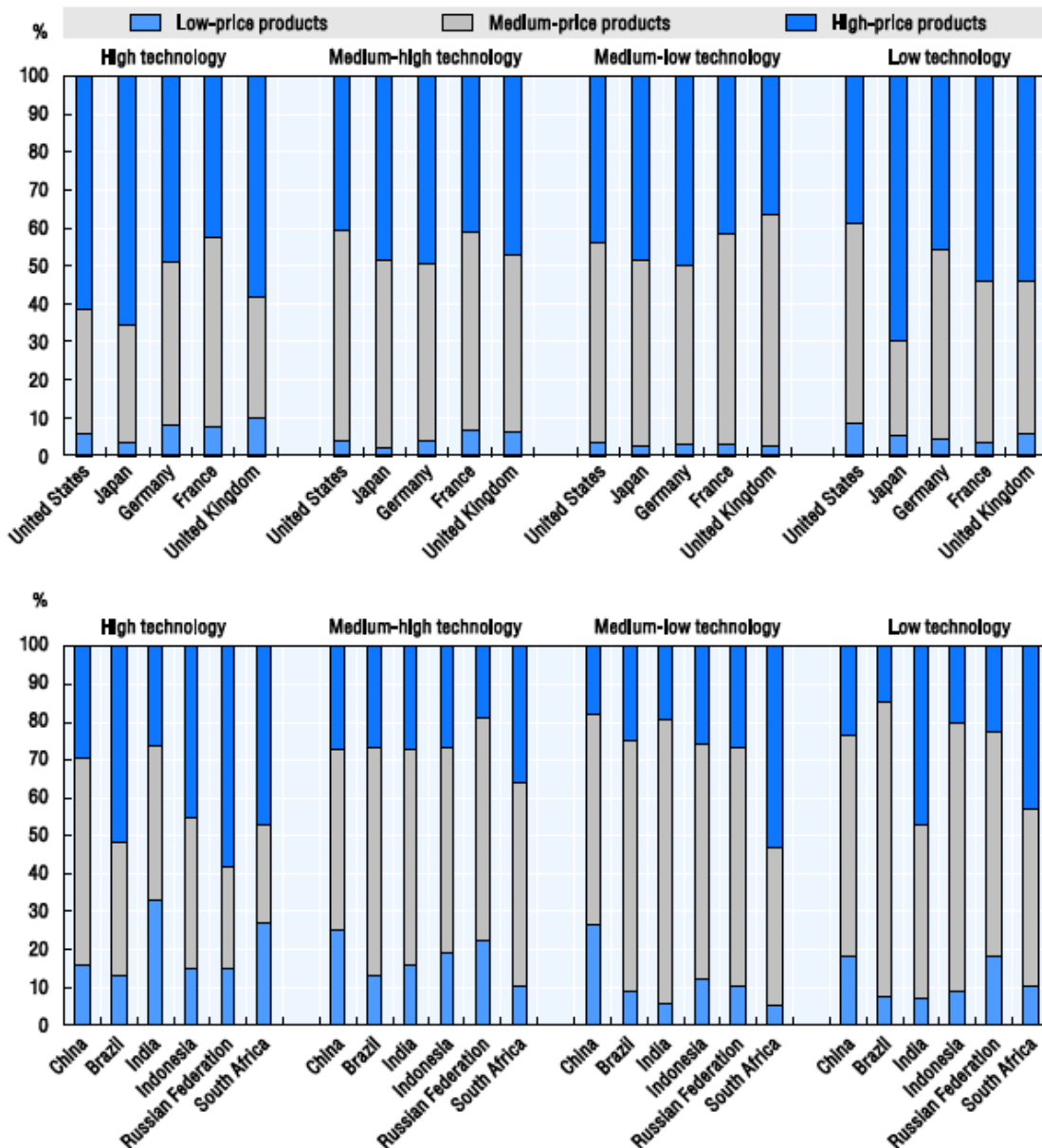
<sup>100</sup> OECD, 2013b, p. 153.

<sup>101</sup> Xinhua News Agency, [http://news.xinhuanet.com/english/china/2013-09/08/c\\_132702644.htm](http://news.xinhuanet.com/english/china/2013-09/08/c_132702644.htm), retrieved March 2014

<sup>102</sup> Ernst & Young, <http://www.ey.com/DE/de/Newsroom/News-releases/20140131-EY-News-Chinesische-Unternehmenskaeufo-in-Europa-auf-neuem-Hoechststand>, retrieved March 2014

China requires in order to hack into the upper tiers of the international system of labor division. This is why Germany has remained attractive as a FDI host country despite the historically low levels of FDI flows to developed countries.

Figure 12: Exports by technology and price level, selected OECD and BRIICS countries, 2010 OECD countries (above); BRIICS countries (below)



Source: OECD, 2013b, p. 154.

Interestingly, nearly half of Germany’s export volume in 2009 was made up of services, roughly the same as the average among OECD countries (48 %) and 10 pp more than the portion of 1995. In almost every sector, the share of services rose, particularly in the



Transport equipment industry, which saw the services content increase from 27 % in 1995 to 41 % in 2009. Percentages of around 40 % were also found in the Food, Textiles, Wood and paper, and Chemicals and minerals industries, implying that apart from its top tier position in a diverse range of manufacturing GVCs, Germany has also become an increasingly important exporter of essential services for foreign clients.

## **4.2 Sector in Focus: The Automotive Industry**

### **4.2.1 Globalized Production in Car Manufacturing**

In this section the global automotive industry will be examined from the perspective of GVC participation in Germany and China. It will especially focus on the dynamics between trends of regionalization on the one hand and fragmentation of international production in this sector on the other. The automotive industry is of importance to the German economy because of its top share in exports, as well as to the Chinese owing to an increasing flow of FDI toward lead firms in this sector located in Germany. This development will be exemplified by a short case study in the next section.

Generally, hierarchical governance is typical for producer-driven GVCs in the automotive industry. Thus a small number of lead firms, or automakers (mainly based in Japan, Germany and the United States), is controlling the production process from design, branding down to final assembly. However, these lead firms are dependent on global first-tier suppliers which are providing complete subsystems that require an extended network of often purely local lower tier suppliers.<sup>103</sup>

The close linkage between lead firms and first-tier suppliers can be described as relational or captive using the GVC governance framework. Automakers often depend on only a few or just a single first-tier supplier for a given subsystem since these tend to be highly modularized for specific car types. As a consequence regional co-location of automakers and first-tier suppliers often occurs to allow for just-in-time production, design collaboration and combined production hubs (assembly + supplied parts) world-wide that can cater to local market demands. Another driving factor for local clustering of independent but interconnected GVCs are high transportation costs related to downstream activities such as international shipping of complete cars or subsystems. Although the main design work is mostly carried out in regional clusters near the headquarters of automakers and first-tier suppliers, lead firms are becoming more reliant on globally operating suppliers to guarantee smooth production and in addition

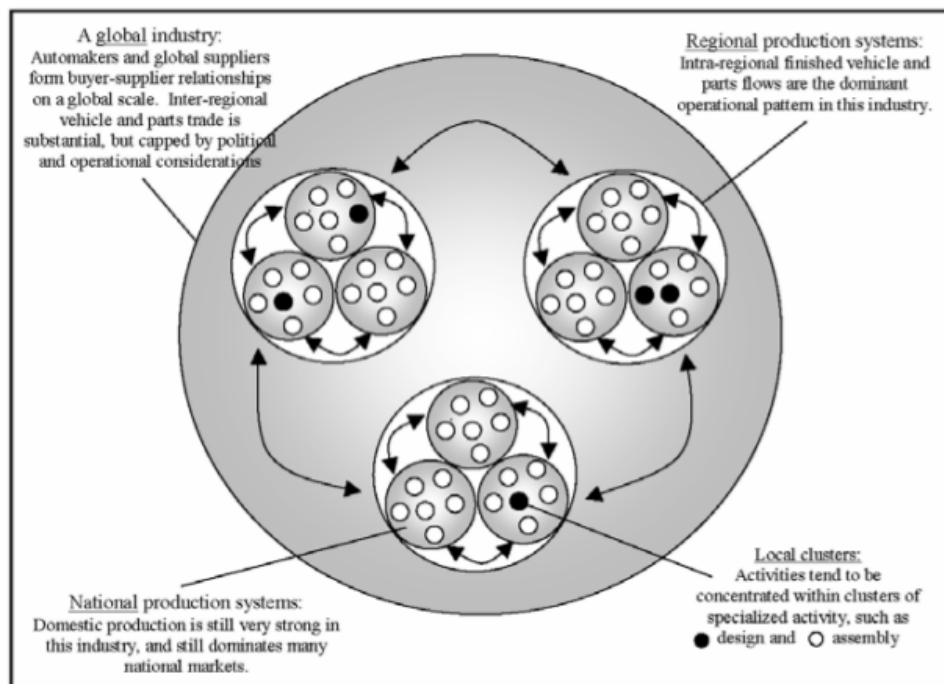
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<sup>103</sup> OECD, 2012, p. 23.

enable local design capabilities of affiliated suppliers close to the respective end markets. As a result buyer-supplier relationships across multiple production regions emerge.<sup>104</sup>

In Figure 13 this kind of organization of the global automotive industry is shown as a nested set of geographic clusters incorporating local, national, regional and global actors into distinct but intertwined GVCs.

Figure 13: The nested geographic and organizational structure of the automotive industry



Source: Sturgeon et al., 2009, p. 10.

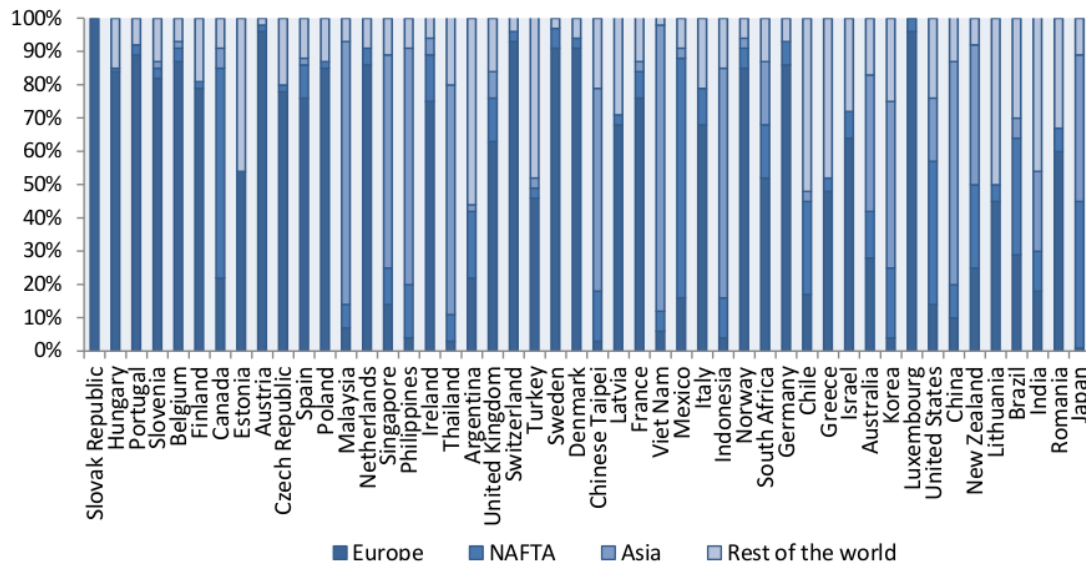
As can be seen in Figure 13 (large white circles) the global automotive industry is organized into three interacting regional production systems that are subdivided into national ones (small grey circles) and local clusters specialized into design or assembly activities (tiny white and black circles).

In order to map geographic areas onto the regional production systems depicted in Figure 13 it is useful to look at an automotive industry specific graph based on an I-O table displaying the import content of exports by country of origin (belonging to either the European Union, NAFTA, Asia, or the rest of the world).<sup>105</sup> Such a table is given in Figure 14.

<sup>104</sup> Sturgeon et al., 2009, p. 10.

<sup>105</sup> OECD, 2012, p. 23.

Figure 14: Import content of exports by origin, motor vehicles industry, 2009



Source: OECD, 2012, p. 23.

In Germany the highest share, around 85%, of import content of exports in the automotive industry is primarily coming from other European countries. Less than 10% is sourced from NAFTA countries and the rest of the world. Virtually no imports in this sector are originating in Asia. China, on the other hand, is sourcing 10% of its imports in the automotive industry from Europe and NAFTA countries respectively and more than 60% from Asia. Among the regional trading clusters, Germany is at the center of the European automotive industry, the United States is the leading country among NAFTA members, and Japan is the strongest actor on the Asian market.

#### 4.2.2 Case study: Take-Over of German Automobile Parts Supplier Kiekert

The interlocking of German and Chinese GVC participation becomes apparent when looking at recent developments in the global automotive industry. As already noted, Chinese SOEs are increasingly interested in mergers and acquisitions of German companies in the automotive and machinery sector. This section will briefly describe the acquisition of the German automobile parts supplier Kiekert by Beijing-based SOE Hebei Lingyun Industrial in 2012. The take-over of a German supplier for automobile parts can be seen as one example of a broader Chinese GVC upgrading program that is targeting Europe in general and Germany in particular for growing FDI outward flows.

According to online news articles, Kiekert, the world-leading supplier for car locks, was bought up in 2012 by Chinese SOE Heibei Lingyun Industrial.<sup>106</sup> In fact, this take-over reflects only the latest instance in a series of strategic investment decisions by Chinese corporations directed at German supplier firms in the automotive sector. Previously, Chinese investors bought up German car parts suppliers Preh (control systems), KSN Castings (light metal parts) and Sellner (decorative elements).<sup>107</sup> Obviously, Chinese corporations are intent on making targeted purchases of foreign suppliers of essential car components, so as to capitalize on the technological expertise and innovational strength of these firms. Rather than building up a domestic supply structure of car-related intermediates from scratch, Chinese SOEs are systematically absorbing foreign suppliers into production networks of their own. As noted by an OECD/WTO/UNCTAD report:

“Another important dimension for emerging and developing countries relates to their involvement not just as passive ‘recipients’ of GVCs but as active creators of GVCs. This can be seen in the rapidly growing shares of international investment originating from emerging economies. An interesting feature of international investment from emerging economies is that it has involved significant investment from state-owned enterprises (SOEs). [...] Concerns have been expressed over the effects of this investment on competition and markets, and, within GVCs, how SOE concentration in upstream markets might eventually have implications on firms further downstream”.<sup>108</sup>

The take-over of Kiekert by Chinese SOE Heibei Lingyun Industrial is a real-world example of the developments described in the report. As the ownership structure of GVCs is being reconfigured by investment flows from emerging economies, powerful SOEs ascend to the top of an increasing number of GVC hierarchies. It is difficult to estimate how Germany’s economy as a whole is affected by the growing influence of foreign investors over domestic firms. However, just as China in previous decades had to accept the repatriation of profits from foreign-owned production sites, it is likely that in the future increasing shares of German value added will actually end up on the balance sheets of Chinese corporations.

According to a press release by Kiekert, the new Chinese owner of the company is expected to almost double its revenues to an estimated \$ 1.2 billion<sup>109</sup> as a direct consequence of the take-over. According to German automobile online magazine Automobilindustrie, Kiekert’s

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<sup>106</sup> SPIEGEL Online, <http://www.spiegel.de/wirtschaft/unternehmen/chinesen-kaufen-autozulieferer-kiekert-a-821164.html>, retrieved March 2014

<sup>107</sup> Manager Magazin, <http://www.manager-magazin.de/unternehmen/autoindustrie/a-821182.html>, retrieved March 2014

<sup>108</sup> OECD/WTO/UNCTAD, 2013, p. 19.

<sup>109</sup> Impulse – Das Unternehmer Magazin, <http://www.impulse.de/management/turnaround-beim-autozulieferer-kiekert-ansprechbar-sein-das-ist-wichtig-in-der-krise>, retrieved March 2014

management has settled on the following growth paths for the company: “Kiekert will das Geschäft mit Schließsystemen im asiatischen Raum deutlich ausbauen und plant zugleich, auch LingYuns Stamm-Produkte nach Europa und in den NAFTA-Raum zu globalisieren”.<sup>110</sup> Interestingly, the take-over of Kiekert opens up markets both ways: Kiekert’s flagship product, their world-renowned locking systems, will be increasingly available on Asian markets, while the Chinese parent company uses Kiekert as a gateway to access markets and production sites in Europe and NAFTA countries. As Kiekert operates manufacturing plants in two of the three major production hubs of the global automotive industry, i.e. in Europe and in NAFTA countries, the transfer of the company’s ownership to an Asian investor will lead to the total integration of all of the three production hubs, making Kiekert a widely-connected node in a complex web of GVC activity.

The fact that SOEs from emerging economies account for much of the international investment flows underline Milberg and Winkler’s point that patterns of international trade are rather shaped by active policymaking and corporate strategy than by non-human market forces operating according to the principle of comparative advantage. The SOE is an entity that blurs the line between political and economic actor, predestining it to become the tool of choice for implementing macroeconomic government agendas.<sup>111</sup> Tracking current global FDI flows and interrelating them with GVC activity lends credibility to Milberg and Winkler who claim “that it is not some set of natural ‘market forces’ that determines the allocation of capital across the economy, but the decisions by firms and the strategic and power dynamic in their production network ..”.<sup>112</sup>

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<sup>110</sup> Automobilindustrie, <http://www.automobil-industrie.vogel.de/zulieferer/articles/378308/>, retrieved March 2014.

<sup>111</sup> Kowalski et al., 2013, p. 4.

<sup>112</sup> Milberg & Winkler, 2013, p. 29.

## **5. Conclusion**

### **5.1 Summary**

The goal of this thesis was to identify commonalities and differences in the characteristic patterns of GVC participation for an emerging economy (China) and a developed nation (Germany). The GVC framework was introduced as a highly relevant analytical tool for understanding the mechanisms of today's internationally fragmented mode of production. A number of factors were suggested to be responsible for shaping the organization of GVCs. These include corporate governance and the institutional context of a given country. GVCs can be categorized as buyer- or producer-driven and GVC analysis can be done from a bottom-up or top-down perspective. Here it was mostly carried out by employing a bottom-up approach to gain insight on GVC participation on the country level. It was argued that the emergence of GVCs was driven by decreasing transportation costs, rapid improvement in ICTs and the implementation of international trade policies. Furthermore, the GVC framework was interrogated for its compatibility with traditional theories of international trade, coming to the conclusion that the principle of comparative advantage cannot fully account for the dynamics of today's international trade.

Analysis of key performance indicators for GVC participation and sector composition was based on a statistical method called TiVA. The advantage of this novel approach to econometrics lies in the fact that gross export statistics can now be decomposed fairly accurately into shares of domestic and foreign value added, allowing for a more precise monitoring of international trade flows.

The selected indicators for assessing the intensity of GVC participation in the two countries included measuring the share of domestic value in exports, geographically mapping regional supplier networks, and re-evaluating the bilateral trade balances of the two countries in value added terms. It was found that lowered levels of domestic value added usually coincide with heightened participation in GVCs, implying that the significant drop in Chinese domestic value added over the last decades reflects a deep integration with international production networks that goes much further than what the data suggests for Germany. Both countries were found to rely on regional supply structures that form the root system of geographically more extensive GVC activity. A close look at the bilateral trade balances in value added terms of both China and Germany revealed that Chinese trade surpluses shrink because of China's

currently rather downstream default position in GVC hierarchies, while Germany's readjusted trade surpluses increase due to the general upstreamness of its exported intermediates.

China was found to have used two main strategies for entering and upgrading within GVCs. In order to make its immense working force available to foreign enterprises under favorable conditions, EPZs were established that guaranteed maximum profit repatriation for trading partners from abroad. China can also be observed to have become the single most successful FDI host country among developing and transitioning economies, indicating an ever increasing GVC participation.

Examining the sector composition of Chinese exports revealed that a high share of foreign-sourced inputs correlates with the overall export growth of a sector, making the Electrical equipment, Chemicals and minerals, Machinery, and Basic metals industries the sectors with the highest degree of GVC participation. Germany, on the other hand, was shown to engage in higher-value activities compared to China, largely due to the technology gap separating the two economies.

Three consolidated production hubs – one in Europe, one in Asia and one in the NAFTA region – were identified as the centers of a globalized mode of production in the automotive industry. The take-over of traditional German car parts supplier Kiekert by a Chinese SOE suggests that China is turning the tables in some of the GVC hierarchies, becoming an active designer – and owner – of wide-ranging production networks.

## **5.2 Critical Acclaim**

The aim of this thesis was to give a broad overview of GVC participation in the German and Chinese economy. To this end, key theoretical aspects of the GVC framework like governance and institutional context were introduced but not discussed in their entirety.

Differing views expressed in the literature on how these factors are shaping the organization of individual GVCs could not be contrasted due to the solution-driven approach chosen for the thesis. It was described how GVCs can be viewed in the light of classical trade theories but no final conclusion could be given pertaining to the question if the GVC paradigm is a continuation or supersession of these theories.

Furthermore, the limited scope of the thesis did not allow for a technical explanation of the TiVA indicators that formed the basis for the comparison of GVC participation in Germany

and China (excluding other countries from the analysis). In addition, not all of the indicators mentioned in the literature could be included in the analysis and the author's selection was based on relevance to the research problem. GVC participation in different sectors was assessed by using some of these indicators but only the automotive industry was investigated in more detail due to its shared strategic importance to both economies.

Several aspects of GVC analysis found in the literature were completely left out of this thesis in order to focus on the issue of GVC participation. These include, for example, risks and adverse effects associated with GVCs, impact on labor markets as well as the role of GVCs during the 2008 economic crisis.

### **5.3 Outlook**

The GVC paradigm is adopted by an increasing number of international organizations and governmental institutions in order to better understand the ongoing fragmentation in international production and its effect on world trade.

Shifting patterns of GVC participation will influence economies of developed and emerging countries alike. Being Europe's last industrial powerhouse, Germany's eminent role in an expanded global production network will benefit the rest of the continent as well. As of now nothing indicates that Germany could lose its involvement in primarily upstream activities along the value chain. Policy decisions that facilitate the integration of German SMEs into GVCs could potentially even further improve the national economic performance. Especially developments in the automotive and machinery sectors, the two industries with the highest export shares, will be of interest for future research.

In the last two or three decades, China's vast final assembly capabilities enabled GVCs to emerge. As many of the country's activities are moving up the value chain, the global economic power balance is slowly but steadily moving away from the historical centers of production, namely Europe and North America. China is not only a main actor in Asian value chains but will continue to shape global production. Strategic investments in European and American enterprises by state-owned companies are the best proof of China's expanding influence in regards to the creation of new GVCs. According to economist Paul Krugman, "the biggest recent change on the international scene is the emergence of China – a development that promises to redefine the international balance of economic and political



power in the coming centuries.”<sup>113</sup> In the future it will become apparent how China’s successful economic development, largely made possible due to the rise of GVCs, translates into social and political changes in the region.

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<sup>113</sup> Krugman & Obstfeld, 2009, p. 20.

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