

Mapping Global Value Chains: Intermediate Goods Trade and Structural Change in the World Economy



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

DEVELOPMENT POLICY AND STRATEGIC RESEARCH BRANCH
WORKING PAPER 05/2010

Mapping Global Value Chains: Intermediate Goods Trade and Structural Change in the World Economy

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 2011

Acknowledgements

This working paper was prepared by Olga Memedovic, Senior Industrial Development Officer, for the UNIDO Research Project: *Changing nature of manufacturing*. The main authors are Timothy Sturgeon from the Massachusetts Institute of Technology and Olga Memedovic, UNIDO staff member. Statistical assistance was provided by Oemer Aksoycan and Stefan Eichwalder, UNIDO staff members, and Andreas Alfons, UNIDO consultant. UNIDO Interns, Nargiza Abdullaeva, Andrew Bell, Johan Boström, and Shabnam Marboot, provided assistance during various stages of the preparation of this paper. Iguaraya Saavedra provided administrative support. The list of apparel intermediates was vetted by Stacey Frederick, Ph.D. in Textile Technology Management, NC State University, College of Textiles; Research Scientist at Duke University's Center on Globalization, Governance, & Competitiveness. Valuable comments were provided by Ronald Jansen, Chief, International Trade Branch, UN Statistics Division.

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Abstract

Economic globalization has proven resistant to detailed quantification and empirical characterization. In this paper, we address a small part of this data gap using novel classifications for final and intermediate goods trade, overall; for “customized” and “generic” intermediate goods; and in three industries oft-cited as being at the forefront of global economic integration: 1) electronics, 2) automobiles and motorcycles, and 3) apparel and footwear. We find evidence of deepening economic integration overall, especially since 2001, but strong differences in its extent and character across the three industries. This suggests that patterns of global economic integration are highly dependent on the characteristics of specific products and the processes and the routines and regulations that prevail in particular industries. It follows that the policy responses to the opportunities and structural changes introduced by global economic integration need to be tailored to, or at least sensitive to, such industry differences. Over-generalizations, blanket statements, and blunt policy instruments need be avoided and the factors underlying industry differences need to be better understood.

1. Introduction

There is broad agreement that the world economy is becoming more deeply integrated and interdependent along multiple dimensions: economic, cultural and political. While one might expect cultural or political integration to be difficult to measure with precision, global economic integration has also proven resistant to detailed quantification and empirical characterization. We have a strong sense of profound changes in the world economy, and see signs everywhere, but cannot fully describe the new patterns and structures that are taking shape, not least because the official statistics at our easy disposal were created for other purposes and in simpler times (see Sturgeon and Gereffi, 2010 for a fuller discussion).

In this paper, we address a small part of this data gap using novel classifications for final and intermediate goods trade, overall; and in three industries oft-cited as being at the forefront of global economic integration: 1) electronics, 2) automobiles and motorcycles, and 3) apparel and footwear. We find evidence of deepening economic integration overall, especially since 2001, but significant differences in its extent and character across the three industries. This suggests that patterns of global economic integration are highly dependent on the characteristics of specific products and processes, as well as the firm-specific routines and institutional conventions (regulations) prevailing in particular industries (Ponte and Gibbon, 2005). It follows that the policy responses to the opportunities and structural changes introduced by global economic integration need to be tailored to, or at least sensitive to, such industry differences. Over-generalizations and blanket statements need be avoided and the factors underlying industry differences are better understood.

1.1 How global value chains drive structural change

There is a rapidly growing body of research examining the processes of geographic fragmentation, dispersion, and long distance coordination in both goods and services industries (e.g.: Gereffi, 1994, 1999; Zander and Kogut, 1995; Borrus *et al*, 2000; Humphrey and Schmitz, 2002; Dossani and Kenney, 2003; Dean *et al*, 2007; Escaith *et al*, 2010, Cattaneo *et al*, 2010; Kawakami and Sturgeon, forthcoming). Clearly, the rise of what are often referred to as global value chains (GVCs) is an important driver of structural change on many levels. When production becomes increasingly fragmented, or “roundabout” (Young, 1929), the increased demand for specialized intermediate goods and services draws a broader range of establishments, firms, workers, and countries into increasingly complex and dynamic divisions of labor. For nations that are very deeply integrated and economically interdependent with others, the basic structure of industries, employment, and innovation can be affected.

In theory, each segment, activity, or node in the value chain can contribute a set of highly specialized tasks and inputs to the build up of finished products or services (Smith, 1776), with the dividing lines between tasks influenced by points of technological dissimilarity (Richardson, 1972) as well as the codification schemes and standards that ease the exchange of appropriate technical information between specialized tasks (Langlois and Robertson, 1995; Baldwin and Clark, 2000; Sturgeon, 2002; and Principe *et al*, 2003).

Such factors can influence how work is divided, not only within a factory or single firm, but also in globe-spanning business networks that link several — if not dozens — of firms, facilities, offices, carriers, and workshops as a product or service takes shape along a value adding chain of activities. Moreover, the potential for GVC formation is increasing. Advances in information technology, better codification schemes, and improvements in transport and logistics increase the potential for the geographical fragmentation of work. As it becomes more likely that value chains in large, economically important industries will be spread across multiple countries, it is more difficult to conceive of national industries as self-contained systems and national economic performance as endogenous. The measurement and policy challenges posed by these changes are non-trivial.

Despite significant data gaps, recent research strongly suggests that GVCs have become a central force driving structural change in many modern economies, and that their rise is likely to have triggered both positive and negative outcomes. On the positive side, Bernard *et al* (2006) have shown that in the United States, firms that trade tend to be larger, earn higher profits, spend more on R&D, and pay higher wages than firms that do not. Empirical research has also shown that access to a range of competitively priced foreign intermediate goods has been crucial to achieving higher productivity in both industrialized countries and recent developers such as India and China (Miroudot *et al*, 2009; Goldberg *et al*, 2008).

For developing countries, the trade, investment, and knowledge flows that underpin GVCs can provide mechanisms for rapid learning, innovation and industrial upgrading (Lall, 2000; Humphrey and Schmitz, 2002). GVCs can provide better access to information, open up new markets, and create opportunities for fast technological learning and skill acquisition. Because GVC-linked transactions and investments typically come with quality control systems and prevailing global business standards that exceed those in developing countries, suppliers and individuals in developing countries can be “pushed” to acquire new competencies and skills

though their participation in GVCs. In the most deeply linked developing countries, these business process improvements can sometimes be felt far beyond exporting firms and sectors.

At the same time, local firms in developing countries can achieve greater success in their own markets by combining domestic and foreign intermediate inputs and creating economies of specialization that leverage cross-border complementarities. For example, border-spanning GVC linkages can potentially bring local firms into closer contact with “open innovation” systems (Teece *et al*, 1997 cited in Ketels and Memedovic, 2008), where firms draw on and contribute to freely available technologies and standards. Local firms can also take advantage of specialized knowledge garnered through participation in GVCs to export or set up production abroad, either directly or through contractors and suppliers.

The impact of GVCs can be easy to see on the ground. GVC-mediated trade has clearly driven investments in new productive capacity and massive infrastructure improvements, especially in key producing countries such as China, where we see huge factory complexes, sometimes employing 100,000 workers or more, churning out products that are sent to world markets through vast new port facilities. While little if any of this business or technological competency is likely to be indigenous to the “host” developing countries, it is clear enough that GVCs have boosted employment, enabled increased specialization and larger scale production, driven more efficient geographical allocation of industrial activities, and increased the availability of a variety of intermediate goods in the developing world. As a result, GVCs tend to “compress” the development experience, making non-linear catch up possible, as has been the case in China (Whittaker *et al*, 2010; Breznitz, 2011).

Still, GVCs are not necessarily a panacea for development. On the negative side, compressed development can create a host of new policy challenges in the realms of economic and social development. In regard to social development, policy-makers in compressed developers can face a series of “double burdens” from the simultaneous and often sudden appearance of developing and developed country problems, such as malnutrition and obesity, rapid industrialization and de-industrialization, requirements for basic literacy and world class tertiary education, and so on, creating “policy stretch” in states forced to cope with a wide range of issues at the same time (Whittaker *et al*, 2010).

In the realm of economic and technological development, GVCs can create barriers to learning and drive uneven development over time, even as they trigger rapid industrial development and

upgrading (Kaplinsky, 2005). There is considerable evidence that greater rents accrue to those “lead firms” in the value chain that control branding and product conception, on one hand, and to the “platform leaders” that provide core technologies and advanced components, on the other (Chesbrough, 2001; Gawer and Cusumano, 2002; Linden and Somaya, 2003). Firms that provide routine assembly tasks and other simple services within GVCs earn less, pay their workers less, and are more vulnerable to business cycles because they tend to hold large-scale employment and fixed capital (Kawakami, forthcoming). If one of these categories of firms tends to dominate a specific country or region, then consequences for economic performance and social welfare can be profound and persistent, shaping the business systems of entire economies over extended periods. Specifically, entrenchment in narrow, routine, low value added activities can lock firms and national industries into unprofitable and intellectually narrow segments of GVCs. Learning might be rapid at first, but over time limits can be acutely felt (Schmitz, 2004; Kawakami and Sturgeon, forthcoming).

In industrialized countries, it is hard to dispute that GVCs have helped to accelerate the loss of manufacturing jobs in labor intensive industries such as apparel and footwear, while allowing domestic firms to better compete at home and abroad in technology intensive industries such as electronics and information technology (Mann and Kirkegaard, 2006). Nevertheless, because GVCs can quickly spread work across multiple countries, there is worry that such innovation and new industry creation no longer comes with any guarantee of large-scale domestic employment (Davis, 2010).

In sum, the impacts of GVCs can be mixed. At the most general level, GVCs can be a positive force because they embed countries, firms, and workers in common projects and activities. As the work of nations becomes economically entwined at the fine-grained level of GVCs, the optimistic view is that stark international conflict could become less likely, at least among countries with extensive GVC linkages. This hopeful view highlights the importance of finding ways to encourage GVC development in countries that remain isolated from them (for example, see the USAID’s Value Chain Development website).

With stakes this high, there is broad interest in finding mechanisms to ensure that GVCs not only thrive but also work to elevate, rather than depress, the welfare of societies in which they are embedded. But with multiple externalities, high complexity, and mixed outcomes, the challenge at hand is to understand more fully the dynamic effects of rising fragmentation on economic development. There is an urgent need to develop better tools for evaluating the impact

of GVCs and the role that specific categories of firms and even entire national industries play within them. For this, better data are required. While linking trade statistics to enterprise-level statistics contained in business registers, developing international input-output and trade in value added databases, and formulating and collecting entirely new GVC-oriented economic statistics are all high on the agenda (UN Statistical Division, 2011), there are also considerable benefits to be had from mining and re-working existing data sets, not least because such work can be accomplished over a relatively short time horizon. The research presented in this paper takes the latter approach.

1.2 The structure of the paper

In this paper we draw on the United Nations (UN) COMTRADE database to examine patterns of final and intermediate goods trade.¹ Trends in intermediate goods trade are indicative of GVC formation because fragmented production processes require that parts, components, and partially manufactured subassemblies cross borders—sometimes more than once—before final goods are produced and shipped to final markets (Feenstra, 1998; Arndt and Kierzkowski, 2001). We focus on trade in goods because goods-producing industries have been at the forefront of GVC development and, simply put, rich international trade statistics are only available for goods (Sturgeon *et al*, 2006; Sturgeon and Gereffi, 2010).

The product information in the UN COMTRADE database is organized according to several distinct classification systems.² One of these, the Broad Economic Categories classification scheme (BEC, revision 3), collects UN COMTRADE data into three end-use categories: 1) capital, 2) intermediate, and 3) consumption goods. While the BEC classification is mainly intended for internal use by the United Nations Statistic Division (UNSD) to calculate national accounts³, it has become popular for other purposes as well, such as setting tariff rates,

¹ Intermediate goods can be parts and components or any other item used as an input in the production of manufactured goods for final consumers.

² These include the Standard International Trade Classification (SITC) revisions 1-4, the Harmonized Tariff System (HTS or HS) revisions 1992, 1996, 2002, 2007, and the Broad Economic Categories (BEC) described subsequently. Concordance tables are available to make conversions among these different classifications, and sometimes for other systems such as the North American Industrial Classification System. See <http://comtrade.un.org/> for more details about the UN COMTRADE database and the classification systems by which it is organized.

³ The BEC classification scheme allows the UNSD to reclassify merchandise imports (reported in terms of standard international trade classification — SITC) into end-use product categories relevant for the System of National Account framework: capital, intermediate and consumption goods. The UNSD has created correspondence tables between BEC and each new revision of SITC and the Harmonized System (HS) product classification schemes. Since the Central Product Classification (CPC) is based on HS, it also can be correlated to BEC. But the BEC structure remained unchanged over the years. Since the rules for assigning particular SITC or HS headings to BEC need to be updated if BEC is to serve as a useful

conducting research on trade specialization, and comparing external trade statistics with country-level industrial statistics and national accounts. Most relevant to our goals, researchers have used the pre-determined category of intermediate goods to examine issues related to GVCs, or even as a proxy for their growth, which, as we will explore below, is a powerful but problematic approach. Some recent research using the BEC classification scheme is collected in Appendix 1.⁴

Section Two of the paper presents a simple modification to the UN BEC scheme of traded goods that better reveals the extent and character of GVCs, and examines the overall growth of intermediate goods trade relative to trade in final goods. This analysis suggests a cyclical pattern of post-recession GVC expansion, and a possible GVC “take off” period after 2002. Section Three examines trends in intermediates goods trade at the country level, revealing the growing involvement of developing countries in GVCs. Section Four prepares the ground for our analysis of intermediate goods trade at the industry level. We examine flows of the top 50 traded intermediate goods that we identify as “customized” and “generic,” and check our assumptions about the industries that dominate GVCs. By "customized" intermediates we mean items made specifically for one or a few final products. "Generic" intermediate products are used in a wide variety of end products. In the period 1988-2006, we find that that “customized” intermediates in general did indeed become more important in the 50 traded intermediate goods, and that customized intermediate goods in the electronics and automotive industries dominate world manufactured intermediate goods trade.

Section Five presents our industry analysis. We trace GVC development in the three industries mentioned above: 1) electronics, 2) automobiles and motorcycles, and 3) apparel and footwear, using a customized classification of final and “true” (customized) intermediate goods. We find that the share of electronics intermediates in international trade grew rapidly, that the share of automobile and motorcycle intermediates was stable, and that the share of apparel and footwear

tool, the UN has proposed that the BEC should be reviewed to ensure that their relationship to transportable goods is still appropriate, that the draft correlation table between the BEC categories and subheadings of *Harmonized Commodity Description and Coding System*, 2007 edition is accurate, and that a possible extension of the BEC to services products should be considered, along with the development of a link between the BEC and the Central Product Classification (CPC).

⁴ The three broad classes of goods in the BEC scheme allows for external trade statistics to be considered together with other sets of general economic statistics, such as national accounts and industrial statistics, for the purpose of national, regional or world level economic analysis. Currently, it has been proposed to United Nations Department of Economic and Social Affairs Statistics Division, 2007, “Future Revision of the Classification by Broad Economic Categories (BEC),” Meeting of the Expert Group on International Economic and Social Classifications New York, 16-18 April 2007 Future, ESA/STAT/AC.124/8; UNSD; <http://unstats.un.org/unsd/class/intercop/expertgroup/2007/AC124-8.PDF>

intermediates fell. Significantly, the data show that the “classic” GVC pattern — where intermediate goods trade is larger and rising faster than final goods — is present only in the electronics industry. GVC are certainly important in the other two industries, in terms of coordination, control and ownership, but our findings suggest that strong backward linkages in auto parts and textiles in large producing (and exporting) countries have attenuated growth in intermediate goods trade in these industries relative to electronics. From this we can conclude that trade flows alone cannot tell the whole story of GVCs.

In our conclusion, we summarize our findings and look forward to additional research possibilities using the classification frameworks developed in the paper. Finally, the paper includes two appendices. Appendix 1 lists recent publications using the UN BEC classification of traded good. Appendix 2 contains our customized list of “true” (customized) intermediate and final goods in each of the three industries so that others can reproduce and extend our work. Our explicit goal is to use our findings to stimulate further research, to justify programs for vetting industry-specific GVC classifications, and to encourage the regular publication of “true” intermediate and final goods trade statistics, especially in industries where customized inputs dominate trade in intermediates, such as aircraft, machinery, and commercial vehicles.

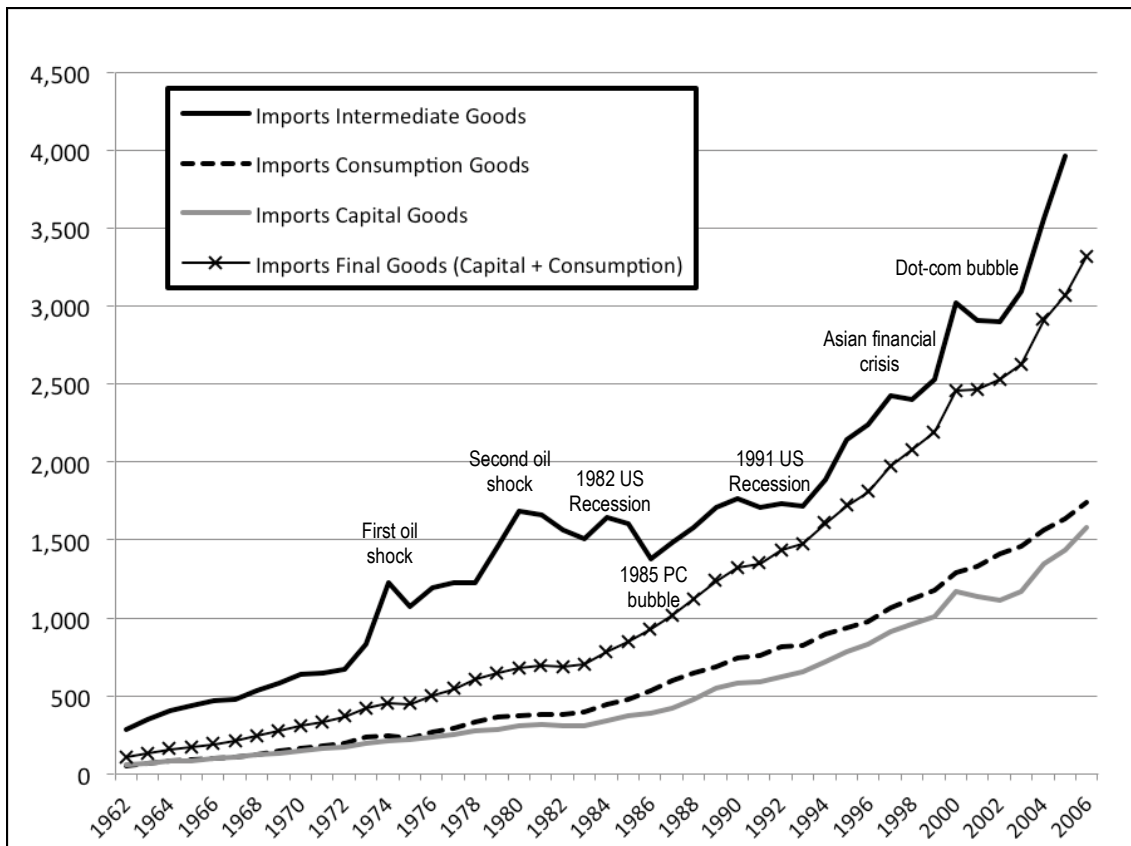
2. Global analysis of intermediate and final goods trade

In this section we propose a first, very simple modification to the BEC classification scheme. To better analyze GVC development in the aggregate, we combine capital and consumption goods into a single “final goods” category. (In later sections we use our own, customized classifications for final and “true” (customized) intermediate goods in three industries). Figure 1 shows total world import growth of intermediate, capital, and consumption manufactured goods, as well as a “final goods” category, which combines capital and consumption goods taken together, for the period 1962 to 2006 (slow reporting, exacerbated by the recent economic crisis, renders more recent data highly anomalous or even unreliable).

There are several points to emphasize in regard to Figure 1. First, trade in intermediate goods appears to be much more volatile than trade in either capital or consumption goods. This supports the notion of “bullwhip” effects of recessions and business cycles, where slowdowns and downturns impact material, parts and component shipments more than final goods because final goods producers tend to draw down parts inventories and delay re-ordering during and directly after periods of uncertainty (Escaith *et al*, 2010). In addition, the growth of intermediate goods trade has been notable after recessions, especially US recessions (outsourcing by US

companies has been one of the most important drivers of GVC expansion), but also following bubbles in industries driving GVC development (for instance, the 1985 personal computer bubble and the 2001 “dot.com” or “technology” bubble), crises in regions deeply engaged in GVCs (the 1997 East Asian financial crisis), and worldwide slowdowns (the oil shocks of 1972 and 1979). We can hypothesize that a similar up tick will follow in the wake of the “great recession” or “financial crisis” of 2008-2009.

Figure 1 World imports of intermediate, capital and consumption goods 1962-2006, in Billions of Constant (2000) US Dollars



Source: SITC Rev 1 and 3 data; WITS; BEC.

Note: To identify commodities as Consumption, Capital and Intermediate goods, two conversion tables have been used: BEC to SITC Rev 3 from UNSD, and BEC to SITC Rev 1 from WITS. To calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator to the year 2000 has been applied.

It is well documented that companies tend to be reluctant to hire new workers after recessions, slowdowns, and crises until demand improvements are sustained, making employment a lagging indicator of recovery (Langdon *et al*, 2004). Related to this, however, and less well documented, is the more aggressive implementation of outsourcing and offshoring strategies, when expansion resumes, based in a similar reluctance to invest in new internal production capacity and lingering caution from recession episodes of cost cutting and downsizing. This pattern is in line with the findings from qualitative research on the electronics industry, where

companies increased outsourcing and offshoring following recessions and technology bubbles in 1985, 1991 and 2001, because demand uncertainty rendered investments in internal capacity more risky. Then, as the cycles continued toward new peaks, firms reported building on successful outsourcing experiences given insufficient time to install new internal capacity to meet rapidly growing demand (Sturgeon, 2003). So, in good times and in bad, outsourcing and offshoring tended to become more common.

A second important point to make about Figure 1 is that, from a GVC “governance perspective” (Gereffi *et al*, 2005), the categories of capital and consumption goods can both be considered final goods. Capital goods include not only machinery and other production equipment, but computers, passenger vehicles, and other items purchased by both business and consumers. As such, they are by and large designed and marketed, if not produced, by “lead firms” in GVCs: branded companies that understand final markets, control central aspects product architecture, select suppliers of intermediate inputs, decide on the location of final assembly, and underwrite financial aspects of the supply chain. Intermediate goods, by contrast, are more likely to be produced by supplier firms. Lead firms tend to have power in GVCs, in part, because they select and place orders from suppliers (Sturgeon, 2009). Because suppliers tend to produce to the specifications of lead firms, they have fewer unique competencies, tend to exert less power in the chain, and earn lower profits.⁵ Because different classes of GVC actors tend to produce final and intermediate goods, it is best to combine the BEC categories in a way that captures this dichotomy. Therefore, we combine consumption and capital goods into a single “final goods” category that is significantly associated with the activities of lead firms, and compare them to the BEC’s standard intermediate goods category, consisting of products produced largely by suppliers.

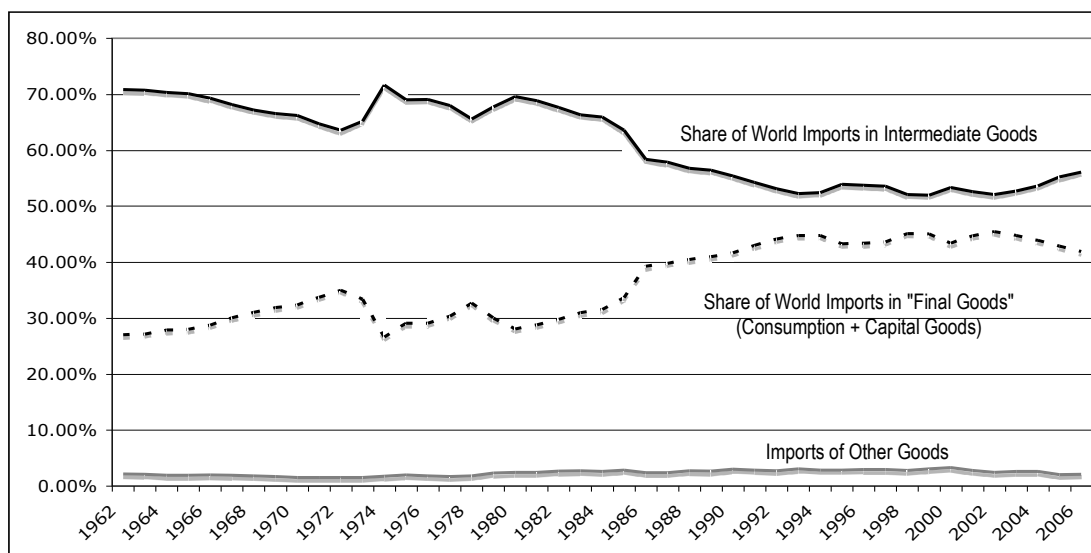
When the data are analyzed in this way the value and growth rate of intermediate goods trade is quite similar to trade in final goods, especially after the mid-1980s, as presented in the top two lines in Figure 1. When consumption and capital goods are considered separately, as in the

⁵ Exceptions fall on each end of the spectrum of technological complexity. On the low end are suppliers of very simple, standardized, generic intermediate inputs, such as fasteners, bulk materials, and metal stock. These companies sell their commodities based on prevailing market prices. On the high end of the technological scale are the aforementioned “platform leaders,” producers of highly complex intermediate goods based on proprietary technologies, such as Intel microprocessors for personal computers and Shimano’s bicycle component systems (Gawer and Cusumano, 2002; Fixon and Park, 2008). These firms can sell their products for high prices because there are few, if any substitutes available. In such cases, the tail can truly wag the dog as lead firms are forced to adapt their products and services to the specifications of suppliers. While such cases garner much attention in the press and in academic literature, they are actually quite rare (see Sturgeon, 2009, for an extended discussion).

bottom two lines, then trade in intermediate goods is growing much faster than trade in either consumption or capital goods, considered separately. This simple adjustment in categorization of goods reveals that, aside from the greater volatility in intermediate goods trade, aggregate trends in final and intermediate goods imports have become similar over time, especially since the mid-1980s.

These results are even clearer when imports data are calculated as a share of total world imports, as shown in Figure 2. Here we see the share of intermediate goods in total world imports falling from 70.8 per cent in 1962 to 52.2 per cent in 1993. After 1993, the share of intermediate goods leveled off at about 52 per cent until 2002, when it began to rise year upon year to 56.1 per cent in 2006, its highest level since 1989.

Figure 2 Share of total world imports in intermediate and “final” goods (capital plus consumption), 1962-2006



Source: Based on UN COMTRADE SITC Rev.1 data. To identify commodities as Consumption, Capital, and Intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used. In order to calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator has been applied.

This contradicts the widely held notion that GVCs, as proxied by intermediate goods, have been growing steadily over time. In fact, our results suggest the opposite of what might be expected, at least until 2002, when total world imports on intermediate goods increased sharply. One interpretation is that trade in final and intermediate goods have been boosted more or less equally by the internationalization of production (Miroudot, 2009: 18). Our interpretation is that it uncovers a second misleading aspect of the BEC classification system when it comes to GVC analysis: *the BEC categories are too highly aggregated to provide clear evidence of trends in GVCs*. Indeed, a closer look at the products that make up the intermediate goods lists

within “intermediate” goods category in the BEC classification scheme reveals a large number of unprocessed commodities with little or no need for the “explicit coordination” required to specify customized intermediates, a characteristic that should largely define economic integration through GVCs (Humphrey and Schmitz, 2003; Gereffi *et al*, 2005).

For example, the two-digit BEC intermediate goods category “industrial supplies n.e.c., unprocessed” (#21) contains items more usefully thought of as generic primary commodities, such as raw cotton bales. This might be expected, but even the BEC category “industrial supplies n.e.c., *processed*” (#22) contains generic products such as crude linseed oil and potato starch. These are not the type of products we have in mind when we think of highly differentiated intermediate goods traded in manufacturing GVCs. These generic products may be overwhelming the share of trade in differentiated intermediate goods (for instance, auto parts, semiconductors, etc.) in Figure 2, and may well be responsible for inflating the apparent share of “true” intermediate goods in world trade.

In later sections, we address this problem selectively by developing several industry-specific classifications intended to isolate “true” (differentiated, customized, product-specific) intermediates from generic intermediates, so they can be contrasted with final consumption goods trade in the same industry. Unfortunately, because of classification changes, the disaggregated data is not available prior to 1988, so a long time series investigation of this hypothesis is not possible. In subsequent research, we would like to test our assumptions by identifying all “customized” goods in world trade.

We have been provided with many clues about GVCs from prior research on specific industries where company managers were interviewed in depth about their outsourcing and offshoring practices (Borras *et al*, 2000; Humphrey and Memedovic, 2003; Berger *et al*, 2005, and Kawakami and Sturgeon, forthcoming). Qualitative, case study research of this kind allows us to conceptualize GVCs and develop a series of hypotheses. First, we can surmise that outsourcing and offshoring strategies of lead firms and retailers (especially those based in the United States of America) have driven dramatic GVC growth in developing countries in general, East Asia in particular, and in China especially. We have learned that countries with relatively low labor costs adjacent to large market areas, such as Mexico and several transition economies in Eastern Europe have also been popular locations for GVC expansion.

Second, the rise of GVCs, and the increasing competence of local suppliers and transnational corporation (TNCs) affiliates in developing countries suggests that trade in “customized” intermediates should be increasing in relation to “generic” products and commodities. Third, we can identify four main industries that are likely to have been important in driving the growth of global production sharing: electronics (broadly defined to include communications and information and communication technology (ICT) equipment and electronics-based consumer products), passenger vehicles (including motorbikes), apparel (including footwear), and back office and ICT services (including call centers and software coding). We test these hypotheses in the remaining sections of the paper, with two caveats. First, since COMTRADE database only includes goods, we exclude services from the analysis. Second, since a pre-determined category of manufactured intermediate goods (MIG), which excludes petroleum products, became available in the BEC classification after 1988, we use it in this subsequent analysis and discussion. In fact, when we mention intermediate goods in the remainder of the paper, we are referring to this set of manufactured intermediate goods, which together represented 77% of world trade in 2006.

3. Country analysis of intermediate and final goods trade: the growing involvement of developing countries

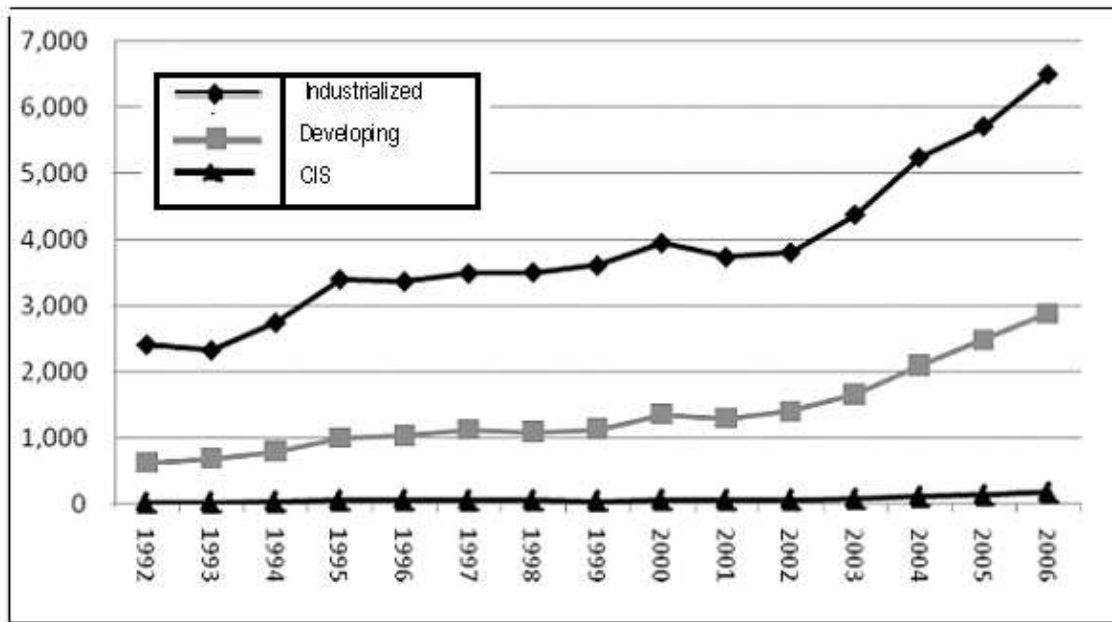
In this section we document the rising involvement of developing countries in total MIG trade and rank the top 50 trading countries in 2006. Because of classification changes after 1988, and unsettled country boundaries in the years following 1989⁶, we begin this analysis of developing countries’ involvement in intermediate goods trade in 1992. We end our time series in 2006 because of the reporting delays in 2007 and 2008 and inconsistencies exacerbated by the recent economic crisis, as mentioned earlier.

Despite these limitations, Figure 3 clearly shows the increase of developing countries’ participation in MIG trade. Developing countries’ share of worldwide MIG trade increased from 25.5 per cent in 1992 to 35.2 per cent in 2006. During this period total MIG trade grew 2.2 times in developed industrialized countries and 3.4 times in developing countries. Table 1 shows these same data, along with growth rates for selected time periods, in tabular form. For developing countries, growth in MIG trade has accelerated steadily from 6.5 per cent annually in the period 1992-1999 to 10.6 per cent for the post-2001 “technology” bubble period of 2000-

⁶ For example, in the 1988-1991 period, the UNIDO designation of “industrialized” and “developing” only included countries accounting for 81.9 per cent of world total intermediate goods trade,⁶ while in 1992 and 2006 the two categories accounted for 98.5 and 99.96 per cent of total world trade respectively.

2006, a period that may signal a moment of “take off” for the formation of GVCs. In keeping with the above discussion of post-crisis acceleration of outsourcing and offshoring in GVCs, the fastest average annual growth rate was in the period immediately following the bursting of the technology bubble in 2001: 14.5 per year in the period 2001-2005.

Figure 3 Developing countries participation in manufactured intermediate goods total trade, 1992-2006, in Billions of Constant (2000) US Dollars



Source: UNIDO calculation based on UN COMTRADE SITC Rev.1 data. To identify commodities as Consumption-, Capital- and Intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used. In order to calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator has been applied; Country groups based on UNIDO Statistical Yearbook, 2010.

As with any highly aggregated classification, the United Nations’ distinction between industrialized and developing countries is quite coarse, even with the high-, medium-, and low-income sub-categories provided. Also, the classification of specific countries has understandably changed over time. For example, many newly industrialized economies in East Asia, such as Republic of Korea, Taiwan province of China, Singapore, and Hong Kong SAR have achieved a high enough level of development to be classified as “industrialized”.

Table 1. Developing countries rising share of total trade (imports plus exports) in manufactured intermediate goods, 1992-2006 (constant US dollars, with growth rates for selected time periods)

Value	1992	1995	2001	2006
Industrialized	1,380,375,536,200	1,720,847,708,465	2,252,420,329,204	3,019,403,093,017
Developing	487,357,283,929	650,955,440,950	878,758,841,260	1,679,393,556,417
CIS	15,453,053,620	27,031,446,884	54,101,654,480	76,567,695,453
Unclassified	28,961,902,524	7,010,728,883	7,603,279,947	1,738,133,518
Total MIG trade	1,912,147,776,273	2,405,845,325,183	3,192,884,104,891	4,777,102,478,405
Shares	1992	1995	2001	2006
Industrialized	72.2%	71.5%	70.5%	63.2%
Developing	25.5%	27.1%	27.5%	35.2%
CIS	0.8%	1.1%	1.7%	1.6%
Unclassified	1.5%	0.3%	0.2%	0.0%
Growth rates	CAGR 1992-2006	CAGR 1992-1999	CAGR 2000-2006	CAGR 2001-2005
Industrialized	5.7%	5.5%	4.3%	4.7%
Developing	9.2%	6.5%	10.6%	14.5%
CIS	12.1%	19.1%	4.7%	7.7%
Not-classified	-18.2%	-18.0%	-24.5%	-1.1%

Source: Based on UN COMTRADE SITC Rev.1 data. To identify commodities as Consumption-, Capital- and Intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used. In order to calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator has been applied.

In Table 2, we present a list of the top 50 countries according to total trade in manufactured intermediate goods, according to selected country groupings: 1) Developed industrialized; 2) Developing; 3) East Asian Newly Industrialized; 4) CIS and former Eastern Europe, 5) Western Europe and Scandinavia, and 6) Other.

As Table 2 shows, Japan and the developed countries of North America, especially the United States of America, dominate trade in MIG, but the growth rate of this group is low in comparison with other country groupings (6.9 per cent per year from 1988-2006). China and Mexico led the way for developing countries during this period, both in the absolute value of intermediate goods trade and the rate of growth, at 24.0 and 23.3 per year, though growth rate for this set of countries as a whole is relatively high (17.1 per cent per year).

Not surprisingly, the growth and absolute value of total MIG trade is remarkably high for China. In 2006, China ranked number three among all countries, behind the United States of America and Germany, and value of its total MIG trade was roughly equal to the rest of the other 13 countries in the developing country group combined, less Mexico. If we measure MIG trade in greater China to include Mainland, Hong Kong SAR, and Taiwan Province together, the region would be ahead of all others by a comfortable margin.

Within the developing country group, total MIG trade is generally larger and growing faster among countries in East Asia than in Latin America. Growth has also been rapid across the East Asian Newly Developed group as well (14.9 per cent per year). This set of countries (and provinces) in East Asia are important hubs for the transshipment of intermediate goods, though Republic of Korea, perhaps because it had an earlier start and has more vertically integrated industrial structure than other countries in East Asia (except for Japan), shows a lower rate of growth in MIG trade than the others in this group of countries.

Growth in the transition countries of Eastern Europe is also relatively high, but the absolute value of total MIG trade is quite low, at least in comparison with other countries in the top 50, because these countries have grown quickly from a relatively small base. Furthermore, the average rate of growth for the group is skewed upward by Kazakhstan, which has grown very quickly from an extremely small base. There are a few examples of isolated countries ranking among the top 50, including Australia, South Africa, and Israel, which are significant exporters and tend to produce for their surrounding regions.

Saudi Arabia's presence in the top 50 is somewhat puzzling because little manufacturing takes place there. A closer look at the MIG trade data available for this country reveals that the country participates in MIG trade as a net importer (imports comprise 55 per cent of total MIG trade), and its main MIG exports are generic products (e.g. chemicals and chemical products, and coke and refined petroleum products). In fact, generic products account for over 90 per cent of the country's MIG trade, meaning that it produces very little for use in specific GVCs. While Saudi Arabia is among the top-50 performers in apparel, electronics, and automotive total MIG trade, the country is a net MIG importer in each of these industries.

The countries of Western Europe included on the list are certainly important actors in GVCs, but the data from this group of countries is not comparable since intra-regional trade tends to drive the value of MIG trade to very high levels. The same conclusion might be drawn from Canada's relatively high rank in Table 2.

Table 2. Ranking of top 50 countries according to total trade in manufactured intermediate goods, according to selected country groupings, 2006

Country	Countries by Income level	Rank 2006	Total Trade 2006	Share of Total MIG Trade 2006	CAGR 1988-2006
Developed (Industrialized) Countries		Total : 1,928,354,152,976		Average: 6.9%	
United States	High Income	1	1,128,381,557,065	11.8%	9.0%
Japan	High Income	4	504,531,180,564	5.3%	6.0%
Canada	High Income	9	295,441,415,347	3.1%	5.8%
Developing Countries		Total: 1,875,959,062,950		Average: 17.1%	
China	Lower Middle-Income	3	807,940,330,825	8.5%	24.0%
Mexico	Upper Middle-Income	15	228,844,092,019	2.4%	23.3%
Malaysia	Upper Middle-Income	17	162,343,513,366	1.7%	12.5%
Thailand	Lower Middle-Income	18	121,123,525,333	1.3%	13.2%
India	Lower Middle-Income	21	114,145,697,698	1.2%	11.7%
Brazil	Upper Middle-Income	26	95,876,008,402	1.0%	13.5%
Turkey	Upper Middle-Income	27	86,274,932,382	0.9%	16.2%
Philippines	Lower Middle-Income	31	66,420,290,143	0.7%	16.3%
Indonesia	Lower Middle-Income	33	60,841,276,407	0.6%	12.0%
Chile	Upper Middle-Income	40	39,160,609,422	0.4%	15.2%
Argentina	Upper Middle-Income	44	30,631,889,458	0.3%	15.5%
Vietnam	Lower Middle-Income	45	29,654,332,994	0.3%	33.5%
Colombia	Upper Middle-Income	49	16,421,443,345	0.2%	15.3%
Peru	Upper Middle-Income	50	16,281,121,156	0.2%	16.4%
Newly Industrialized Economies		Total: 1,194,660,476,215		Average: 14.9%	
China, Hong Kong SAR	High-Income	6	372,341,117,313	3.9%	17.7%
Singapore	High-Income	11	289,644,226,213	3.0%	17.2%
Repub. of Korea	High-Income	12	286,438,518,319	3.0%	10.6%
China (Taiwan)	High-Income	14	246,236,614,370	2.6%	14.3%
CIS and East Europe		Total: 522,478,689,265		Average: 17.9%	
Poland	High-Income	23	110,986,564,639	1.2%	19.3%
Russian Fed.	Upper Middle-Income	24	98,833,263,031	1.0%	11.9%*
Czech Republic	High-Income	25	95,991,760,403	1.0%	17.6%*
Hungary	High-Income	29	71,622,896,000	0.8%	16.9%
Romania	Upper Middle-Income	41	36,936,025,235	0.4%	17.6%
Slovakia	High-Income	42	35,699,720,503	0.4%	16.3%
Ukraine	Lower Middle-Income	43	34,264,797,931	0.4%	19.9%
Slovenia	High-Income	47	21,322,552,443	0.2%	9.6%**
Kazakhstan	Upper Middle-Income	48	16,821,109,080	0.2%	32.1%**
Other		Total: 212,438,170,577		Average: 8.1%	
Australia	High-Income developed	30	69,423,314,907	0.7%	6.0%
Saudi Arabia	High-Income developing	35	52,729,335,746	0.6%	10.3%
South Africa	Upper Middle-Income	37	47,369,976,924	0.5%	7.7%
Israel	High-Income	38	42,915,543,000	0.4%	8.4%
Western Europe and Scandinavia***		Total: 3,377,085,363,247		Average: 6.7%	
Top 50		9,110,975,915,230		Average Top 50: 12.4%	

Source: UN COMTRADE SITC Rev.1 data. To identify commodities as Consumption-, Capital- and Intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used. In order to calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator has been applied.

Notes: *CAGR 1992-2006; **CAGR 1993-2006. ***Germany (ranked #2), France (#5), Italy (ranked #7), United Kingdom (ranked #8), Belgium (ranked #10) and other countries of Western Europe and Scandinavia are included into Western Europe and Scandinavia total figure.

Country groups by World Bank: Low-income economies: US \$995 or less; lower-middle-income economies: \$996 to \$3,945; Upper-middle-income economies: US \$3,946 to \$12,195; High-income economies: \$12,196 or more; <http://data.worldbank.org/about/country-classifications/country-and-lending-groups>.

4. Industry analysis of intermediate and final goods trade

So far we have learned that total MIG trade has grown at about the same rate as final goods trade since 1993 and that MIG began to account for a greater share of total world trade after 2001. We have also learned that developing countries involvement in MIG trade has increased substantially during the same period, with a similar acceleration after 2001. These points, when compared to qualitative industry and case study research, support the use of MIG trade as a rough proxy for GVCs. Apart from the late start for GVC growth in relative terms, as proxied by total MIG trade; our findings so far are unsurprising. While the number and heterogeneity of products aggregated within the BEC classification for MIG makes it difficult to glean very much information from these statistics, there is more we can learn through the development of customized aggregations. In this section we test our central hypotheses that trade in “customized” intermediates should be increasing relative to “generic” intermediates and that three goods producing industries are important in driving the growth of GVCs: electronics (broadly defined), passenger vehicles (including motorbikes), and apparel (including footwear).

4.1 Increasing trade in differentiated intermediate products

As a simple beginning to this exercise, we sort products in the top 50 MIG, as defined by the BEC, into customized and generic categories, as presented in the middle section of in Table 3, column 2. This rough categorization is based on our own impressions of the products involved and would need to be vetted by industry experts before our results can be considered definitive. Customized intermediate products were those we deemed likely to be used in specific final products, or at least, relatively narrow classes of products, such as most auto and aircraft parts and more highly integrated electronic components. On the other hand generic intermediates were those products, such as plate and bar steel, paper, and other basic materials likely to be used in a wide range of final products, as well as products made in large, standardized batches such as pharmaceuticals and in continuous process production methods such as chemical and plastic stock. As Table 3 shows, we placed textiles in the customized MIG category, even though many generic textile products are certainly produced and traded.⁷

Table 3 provides some evidence for the increasing importance of “explicit coordination” in GVCs (Gereffi *et al*, 2005): we see that the share of customized intermediate products, increased from two-thirds of total MIG trade in the top 50 products in 1998 to more than three-

⁷ In future research using more detailed products codes (such as those contained in the harmonized tariff system (HS) codes), it may be possible to separate “true” (customized) apparel and footwear intermediates from generic fabric, fiber, and component products in this industry.

quarters in 2006. A similar increase can be found for this set of customized products in the top 50 relative to *total* MIG trade: 21.8 per cent of total MIG trade in 1998 versus 31.0 per cent in 2006. This supports the hypothesis that international trade comes with requirements for higher levels of specification and explicit coordination than in the past, creating greater cross-border interdependence and learning opportunities for suppliers in developing countries.

4.2 Which industries are important in manufactured intermediate goods trade?

Table 3 clearly shows that intermediate electronics and automotive goods dominate total trade in the top 50 MIG, followed by basic materials such as metal stock (copper, aluminum, and steel), wood and paper. The share of electronics intermediates (semiconductors, printed circuit boards, and others) increased sharply, from 24 per cent of the top 50 products (out of 1,600 in SITC Rev. 4) in 1988 to an astounding 43 per cent in 2006, while the share of automotive intermediates fell from the top spot in 1988 (25.1 per cent) to the number two spot in 2006 (21.4 per cent).⁸ Table 3 confirms our hypothesis that the electronics and automotive industries are extremely important drivers of GVC development.

However, intermediate goods inputs to the apparel and footwear industries appear to be far less important in terms of the total value MIG trade than those of other two industries. In 1988, only two products likely to be inputs to apparel and footwear products appeared in the top 50, bovine hides and skins (#46) and cotton yarn (#48), comprising 1.9 per cent of the value of the top 50 and 0.6 per cent of total trade in manufactured intermediates. By 2006 no apparel inputs ranked among the top 50.⁹ This may reflect the low unit value of textiles and other inputs to apparel and footwear relative to inputs to electronics and motor vehicles. Two other industries represented in Table 3 support the assumption that the list is skewed toward high value products. While GVCs in the aircraft industry are important drivers of global integration (see Kimura, 2007), the high unit value of aircraft parts (e.g., jet engines, wing assemblies) most likely exaggerates their importance in world trade. Similarly, the high unit value of gold and diamonds are likely to explain their high rank in Table 3.

Another observation from the upper section of Table 3 is that the top 50 products accounted for a significantly higher share of total MIG trade in 2006 (40.3 per cent) than was the case in 1988 (33.1 per cent). This certainly reflects the increasing importance of the electronics industry,

⁸ Appendix A shows the top 50 manufactured intermediate goods for 1998 and 2008.

⁹ The four highest ranked apparel inputs in 2006 were knitted and crocheted fabrics (#94 out of 1,600), non-woven fabrics (#109), impregnated (waterproof) fabrics (#129), and parts of footwear (#175).

given that the other industries on the list showed either a steady or a declining share of the top 50 and total MIG trade. Only pharmaceuticals significantly increased its share of the top 50 MIG trade, from 0 per cent in 1988 to 1.7 per cent in 2006, but the overall volume is quite small and is accounted for by one product, vaccines (ranked #12). Nevertheless, concentration in GVCs appears to be an overarching trend; it can be observed in the top lead firms and suppliers in globally engaged industries expanding their global presence (Sturgeon and Lester, 2004); in the concentration of production for global markets in specific countries in East Asia, especially China.

Turning to a comparison of *total* MIG for each of the three industries, rather than just the top 50, shown in the bottom section of Table 3, we see that inputs to apparel and footwear accounted for 5.0 per cent of MIG in 1988, and that this share fell to 3.0 per cent in 2006. This may reveal an earlier start for apparel GVCs, relative to the other two industries, and a relative slowdown since. The share of automobile and motorcycle intermediates fell from 10.6 to 10.2 per cent of total MIG trade during the same period. The stable share of automotive parts in total MIG trade, despite the establishment of dozens of final assembly plants in developing countries over the period (Sturgeon and Florida, 2004), could reflect the strong drive for local content in this industry, both for regulatory and operational reasons (see Sturgeon *et al*, 2008 for an extended discussion).

Again, the most striking finding from Table 3, for us, is the high and rapidly increasing importance of the electronics industry in the top 50 products and in overall MIG trade. In 1988, electronics intermediates, many highly specified and differentiated, accounted for about one quarter of the value of the top 50 products and 11.5 per cent of overall MIG trade. By 2006, electronics intermediates had increased to 43.3 per cent of the top 50 and 20.3 per cent of overall MIG trade. The rising share of the three industries in total MIG trade, taken together, from 27.0 per cent in 1988 to 33.4 per cent in 2006, is entirely due to the increasing importance of the electronics industry. In the following section of the paper we examine trends in total intermediate goods trade in the three industries more closely.

Table 3. Industries in manufactured intermediate goods in 1988 and 2006 according to total trade in 2006, by industry grouping and level of specification, current US dollars

Industries in top 50 MIG product list	Customized/ Generic	MIG Trade 1988 (M)	Share Top 50 MIG 1988	Share in Total MIG Trade 1988	MIG Trade 2006 (M)	Share Top 50 MIG 2006	Share in Total MIG Trade 2006
Top 50 MIG products grouped by Industry							
Electronics	C	162,980	24.4%	8.1%	1,670,940	43.3%	17.4%
Automobile and Motorcycle	C	167,506	25.1%	8.3%	824,392	21.4%	8.6%
Basic mat. (metal/wood/paper)	G	116,339	17.4%	5.8%	325,676	8.4%	3.4%
Chemicals and plastics	G	62,954	9.4%	3.1%	254,523	6.6%	2.7%
Manufactured metal parts	C	40,328	6.0%	2.0%	215,085	5.6%	2.2%
Gold and diamonds	G	47,596	7.1%	2.4%	203,064	5.3%	2.1%
Aircraft parts	G	37,131	5.6%	1.8%	184,575	4.8%	1.9%
Const equip& general industrial mach parts	G	20,166	3.0%	1.0%	78,688	2.0%	0.8%
Pharmaceuticals	G	0	0.0%	0.0%	66,503	1.7%	0.7%
Propane	G	0	0.0%	0.0%	35,946	0.9%	0.4%
Textiles (and hides)	C	12,657	1.9%	0.6%	0	0.0%	0.0%
Total top 50 MIG		667,657	100.0%	33.1%	3,859,393	100.0%	40.3%
Top 50 MIG products grouped by level of specification							
Customized	C	440,769	66.0%	21.8%	2,973,682	77.1%	31.0%
Generic	G	226,888	34.0%	11.2%	885,712	22.9%	9.2%
Total MIG for three industries	Customized/ Generic	MIG Trade 1988 (M)		Share in Total MIG Trade 1988	MIG Trade 2006 (M)		Share in Total MIG Trade 2006
Electronics	C	231,295		11.5%	1,942,283		20.3%
Automobile and Motorcycle	C	212,961		10.6%	974,278		10.2%
Apparel and Footwear	C	101,427		5.0%	286,843		3.0%
Total MIG for three industries		545,683		27.0%	3,203,403		33.4%
Total MIG Trade		2,019,872		100.0%	9,583,045		100.0%

Source: UN COMTRADE SITC Rev.1 data. To identify commodities as Consumption-, Capital- and Intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used.

5. Comparing global value chain development in three industries

As discussed earlier, heterogeneity within the BEC classification of “intermediate goods” led us to develop customized, industry-specific lists for both “true” (customized) intermediate goods — those goods that are likely to be used within specific industries and cannot be considered undifferentiated primary or processed but generic commodities — and a final goods category comprised of goods from drawn both the “consumption” and “capital” goods categories of the BEC. The BEC classification can be mapped to the ISIC and other classifications used by the UN that contain industry codes.¹⁰ However, close inspection revealed many misplaced products — in regard to industry — in both the intermediate and final goods categories, especially in the electronics sector. For example, the ISIC category of “medical and surgical equipment and orthopedic appliances” today consist largely of electronic-based products, as do most keyboard actuated musical instruments, clocks and watches, photographic equipment, and industrial process controls. The industry classifications in the ISIC for apparel and motor vehicle products are more accurate, with only a few obvious items misclassified, such as “seats used for motor vehicles,” which is listed in the furniture industry (ISIC 3610); “instrument panels and clocks...for vehicles” which is listed in the watches and clock industry, “ignition wiring sets...of a kind used in vehicles,” which is listed in “other electrical equipment,” and so on.

It is likely that the electronics industry required the most adjustment in developing our custom product lists because electronics technology is being steadily incorporated into a growing range of products. Again, the full list of “true” (customized) intermediates and final products for each of the three industries is included in Appendix 2. We selected these lists based on our field research experience.¹¹ We recognize that the development of official industry product lists of this sort would require additional vetting by expert groups, including industry experts, convened for the purpose of developing lists for each industry.

Figure 4 shows total trade in final and intermediate goods in the three industries from 1988 to 2006. It reveals, once again, the enormous growth of trade in electronics, in both absolute and relative terms.¹² Moreover, as mentioned previously, of the three industries, total trade in

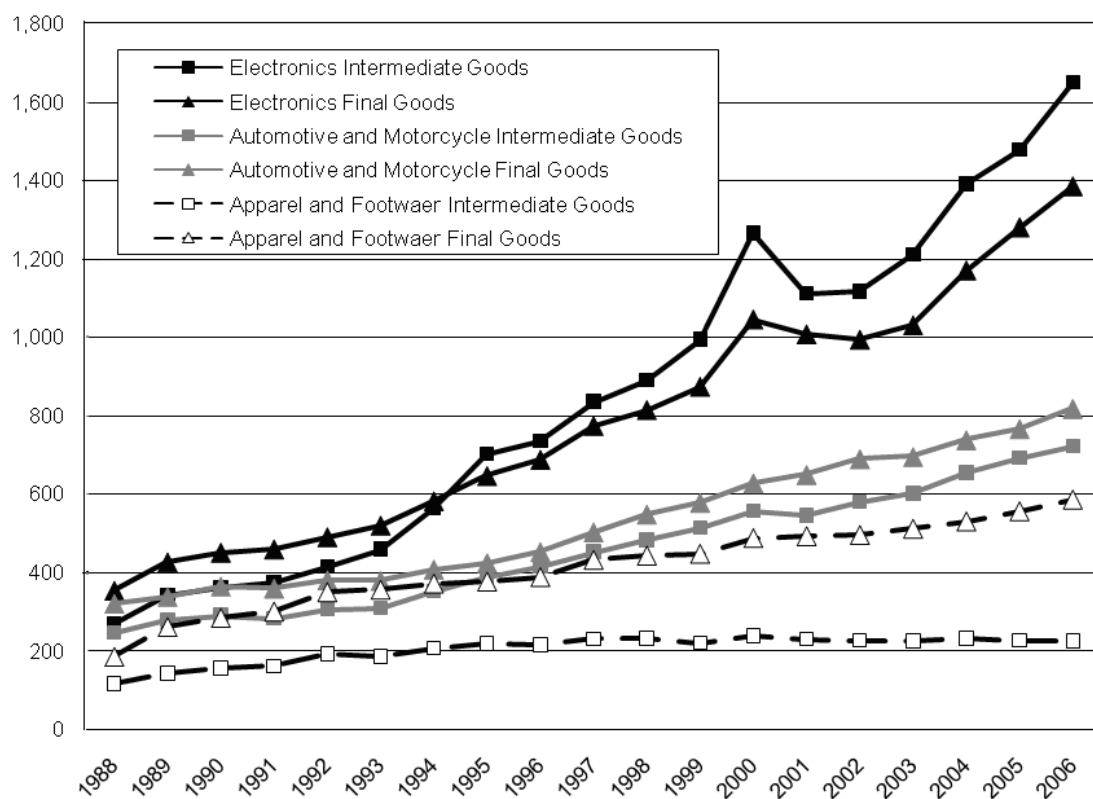
¹⁰ Mapping the BEC classification to ISIC is a two-step process, involving first the use of a SITC/ISIC concordance table (available from EUORSTAT, and also UNIDO/OECD), and then the use of a SITC/BEC concordance table (available from UNSD for SITC Rev. 3, WITS for SITC Rev. 1).

¹¹ The list of apparel intermediates was vetted by Stacey Frederick, Ph.D. in Textile Technology Management, NC State University, College of Textiles; Research Scientist at Duke University's Center on Globalization, Governance, & Competitiveness.

¹² The value of “total trade,” the sum of imports and exports, is overstated by roughly 100%. Again, total trade is used to adjust for inconsistencies in import and export data collection methods.

intermediates has outpaced that of final goods only in the electronics industry. This is the pattern we would expect in an industry where cross-border integration via GVCs is well developed and growing, and also where high value components continue to be produced in industrialized countries because they are technology intensive and include intellectual property that tends to be staunchly defended. Trade in intermediate and final goods have grown at roughly the same pace as those of the automotive and motorcycle industries, with the value of trade in final good slightly above that of intermediate goods on a consistent basis from 1988 to 2008, suggesting robust trade but along with robust increases in local production of intermediates in this industry.

Figure 4. Total Trade, Intermediate and Final Goods, Three Industries, 1988 – 2006, Billions of Constant Dollars



Source: UN COMTRADE SITC Rev.1 data. To identify commodities as consumption-, capital- and intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used. In order to calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator has been applied.

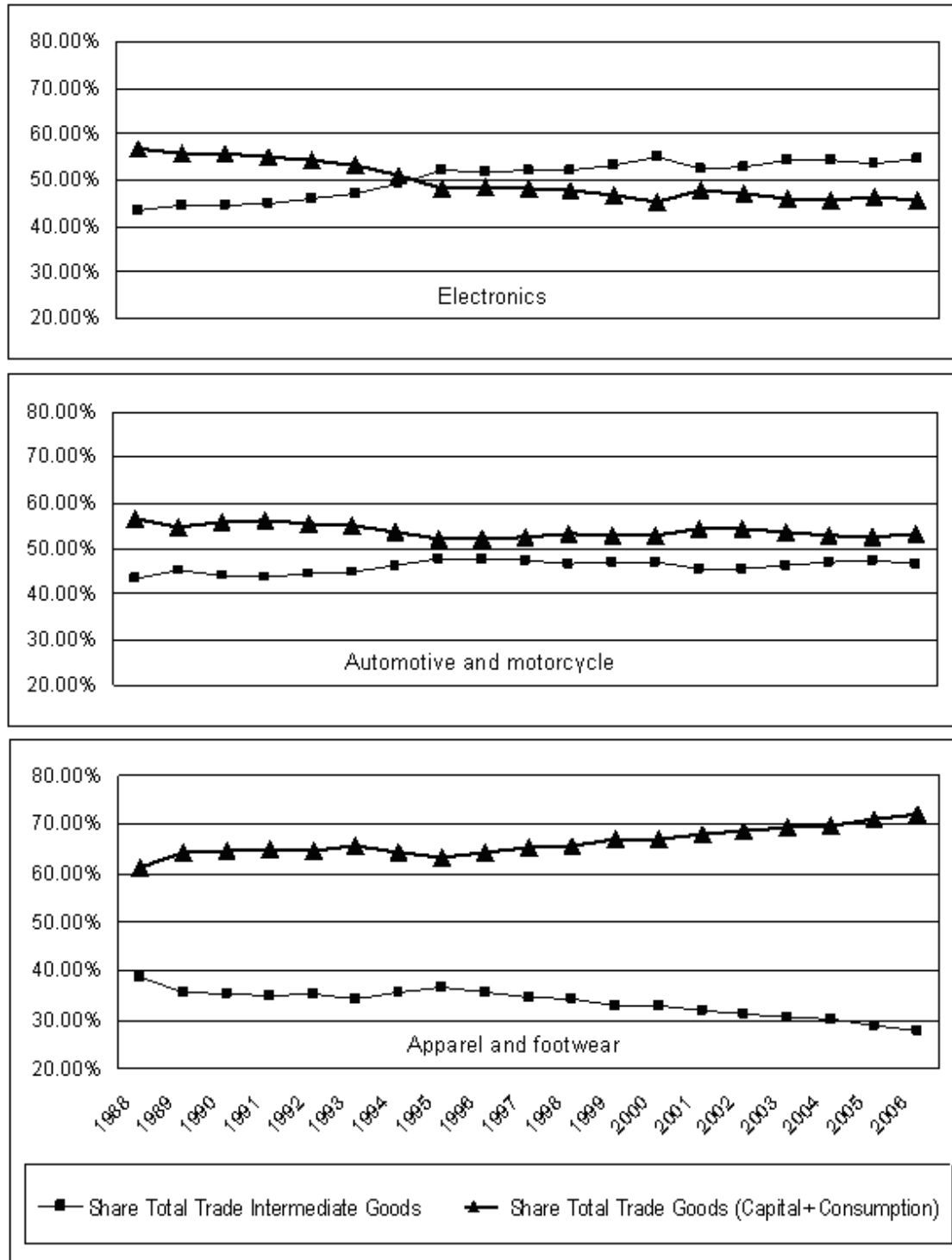
Note: the figures in Figure 4 differ from those shown in Table 3 because Table 3 represents current dollar prices.

In the apparel and footwear industries, the value of final good trade has outpaced the growth in intermediate goods trade by a wide and increasing margin. This pattern may reflect the rising importance of local production, especially in apparel and to a lesser extent for automotive parts and subsystems.

Figure 5, showing the same data as a share of total trade demonstrates these industry differences even more starkly. In electronics, the share of intermediate goods in the value of total trade has increased from 43.4 per cent in 1988 to 54.5 per cent in 2006. The growing importance of intermediate goods trade suggests increasing specialization and interdependence among countries in electronics GVCs, expressed by the flow of physical goods. In this sense the development of electronics GVCs are easy to measure. In contrast, the share of MIG increased only slightly in the automotive and motorcycle industries from 43.4 to 46.8 per cent. The stable share of intermediate goods in total trade is likely to be the result of the strong local content rules that have encouraged companies to build vehicles and source inputs within the world's largest markets and regional trade blocs. In the apparel and footwear industries, the share of intermediate goods in the value of total trade fell from 38.7 to 27.8 per cent. This suggests a third pattern of growing vertical integration with the major apparel producing countries, most notably China, but also Bangladesh, Indonesia, and Mexico.

We can speculate that these differences in MIG flows are likely to offer vastly different patterns of development and very different opportunities for technological learning and industrial upgrading in different GVCs. In the electronics industry, lightweight components and robust, standardized methods for codifying process instructions and product features make it easier to source customized, product-specific inputs from great distances. Moreover, because electronic hardware and information technology systems are rightly perceived as having a “propulsive” effect on other industries, and because deep expertise has tended to be concentrated in only a few places (for example, in Silicon Valley, California, and in large firms based in the United States of America, Western Europe, and Japan), politicians and policy makers in developing countries have been loath to place too much pressure on firms to produce locally or to otherwise put up import barriers. Intense competition, at first between American and Japanese producers, is what pushed early fragmentation and global division of labor in electronics (Borras *et al*, 2000), rather than trade barriers and local content rules, as was the case in the apparel and motor vehicle industries (Gereffi, 1999; Sturgeon *et al*, 2009).

Figure 5. Share of Total Trade (imports plus exports) in Intermediate Goods, Three Industries



Source: UN COMTRADE SITC Rev.1 data. To identify commodities as Consumption-, Capital- and Intermediate goods, the conversion table BEC to SITC Rev.1 from WITS has been used. In order to calculate constant price data, National Accounts data from UNIDO Statistics Unit and a GDP deflator has been applied.

Clearly, local sourcing of customized, product-specific intermediate goods in GVCs, either by the local affiliates of lead firm TNCs or by more distant “global buyers” located in

industrialized countries, can offer suppliers in developing countries opportunities for technological learning, process upgrading, and shifting to higher value added tasks in the international division of labor. However, because trade statistics, on their own, provide no enterprise-level information about ownership of traded goods, we cannot know if these opportunities are captured by local firms or by the affiliates of the growing cadre of TNC, or “global” suppliers (Sturgeon and Lester, 2004). Still, these data give us clues and evidence we did not have before, and can provide some direction to policymakers and pointers for future research.

6. Conclusions and future research directions

Clearly, the trade statistics can shed some partial light on the extent and character of GVCs. Our analysis has shown how the structure of production and trade in the world economy has changed dramatically since the 1980s, when relatively self-contained national economies interacted through arms-length trade in finished goods and raw materials. Our main findings are as follows:

1. Intermediate goods trade is more volatile than trade in final goods, supporting the notion that parts and materials suppliers suffer from “bullwhip” effects during recessions.
2. Intermediate goods trade tends to rebound strongly after down-cycles.
3. Developing countries have become more important in intermediate goods trade.
4. “Customized” intermediate goods have become more important in the top 50 traded MIGs, supporting the notion that international trade requires and supports greater levels of explicit coordination, as buyers and suppliers gain the ability to communicate and adhere to increasingly complex requirements for information exchange in GVCs.
5. The electronics and motor vehicle industries dominate trade in intermediate goods.
6. The electronics industry has driven intermediate goods trade the most and is the only one of the three industries examined where intermediate goods trade is rising faster than trade in final goods.
7. It is likely that the motor vehicle industry and especially the apparel and footwear industries have experienced strong production deepening in producing countries from expanded domestic production of intermediate inputs.

There are several areas for future inquiry. First, we would like to examine inter-regional and national patterns in MIG trade, including bi-lateral trading patterns in specific industries between key main producing and consuming countries.

Second, we would like to examine inter-industry trade in final and intermediate goods by geographical region and country groups and develop a “GVC-index” to rank countries according to their degree and mode of GVC engagement.

Third, for goods where unit pricing is a sensible measure, we would like to develop an analysis of unit pricing using our customized product classification for the three industries. Rising unit prices can be a signal of industrial upgrading in a specific value chain segments. However, previous attempts at using unit prices in the UN COMTRADE dataset have been stymied by reporting gaps and inconsistent units of measure. We believe the narrower categories we have developed with our customized classification of “true” (customized) intermediates and final goods in the three industries could help to circumvent these problems.

Fourth, we would like to develop empirical links between trade data and industrial output statistics to further specify country roles in GVCs.

Fifth, we would like to develop links to human development indicators to provide a view of development outcomes associated with different levels and modes of GVC engagement.

Sixth, we would like to further codify our custom classifications in industries where “true”, customized intermediate goods can be identified, such as the aircraft and machine tool industries, take steps to legitimate our product lists through vetting by expert groups, and advocate for a data publishing regime that would allow researchers and policy makers to track industry-specific trends in intermediate and final goods over time.

Finally, as a way to improve upon the current BEC classification system, we would like to develop complete lists of customized, product-specific and undifferentiated intermediates, not only for only the top 50 products as we have done in this paper, but for all intermediate goods.

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Appendix 1. Examples of recent research using the Broad Economic Categories (BEC) classification

Author(s) / Name of the Institution/Organization	Publication	Year	Use of BEC	Location of publication
1. Brulhart, M.	"An Account of Global Intra-Industry Trade, 1962–2006"	2009	Accounting for an intra-industry trade tendencies and features during 1962-2006, by capital, final and consumption goods.	http://www.hec.unil.ch/mbrulhar/papers/we93.pdf
2. Gaulier G., Lemoine F., Ünal-Kesenci D. / CEPII (France)	"China's Emergence and the Reorganization of Trade Flows in Asia"	2006, #5	Examining the effect of emergence of China as a global manufacturing base on other Asian countries.	http://web.rollins.edu/~tlairson/mba/chiasiatrader.pdf
3. Cheptea A., et.al / CEPII (France)	"Sectoral and Geographical Positioning of the EU in the International Division of Labour"	#2008-02 July	Examining the impact of the vertical division of labor and associated outsourcing practices on traditional specialization.	http://www.cepii.fr/anglaisgraph/reports/pdf/2008/re2008_02.pdf
4. Lemoine F., Ünal-Kesenci D. / CEPII (France)	"International Trade and Technology Transfer: the Cases of Turkey, India and China Compared "	2003	Examining India's, China's and Turkey's industrial specialization according to different production stages and technology levels.	www.erf.org.eg/CMS/getFile.php?id=644
5. Lemoine F., Ünal-Kesenci D. / CEPII (France)	"China in the International Segmentation of Production Processes"	2002	Examining China's involvement in the international division of production by decomposing its foreign goods trade according to production stage.	www.cepii.fr/anglaisgraph/workpap/pdf/2002/wp02-02.pdf
6. Fontagné L., Gaulier G. Zignago S. / CEPII (France)	"Specialization across Varieties within Products and North-South Competition"	No 2007 – 06, May	Analyzing export structure similarities and transformation across countries	www.cepii.org/anglaisgraph/workpap/pdf/2007/wp07-06.pdf
7. Dean J. M., K.C. Fung and Z.Wang	"Measuring the Vertical Specialization in Chinese Trade"	2007	Applying the BEC classification to specific duty free categories in Chinese trade.	Office of Economics Working Paper, No. 2007-01-A; U.S. International Trade Commission
8. Fontagné L., Freudenberg M., Gaulier G.	"A Systematic Decomposition of World Trade into Horizontal and Vertical IIT"	2006	Exploring the difference between two-way trade and the international division of production.	Review of World Economics, Volume 142, Number 3 / October, 2006, pp. 459-475
9. Miroudot S., R. Lanz and A. Ragoussis / OECD	"Trade in intermediate goods and services"	2009/3/Nov	Analyzing the importance of vertical specialization networks	OECD Trade Policy Working Paper No. 93 http://www.oecd.org/dataoecd/47/14/44437205.pdf JT03273415, Working Party of the Trade Committee; Trade and Agriculture Directorate Trade Committee; TAD/TC/WP(2009)1/FINAL
10. Nordas, H.	"Trade paradigms for developing countries: some old, some new, some borrowed, some out of the blue,"	2008	Examining the extent to which recent developments in international trade amount to a new paradigm.	Knowledge Hub, Working Papers, No. 9, December 2008

Appendix 1 (continued). Examples of recent research using the Broad Economic Categories (BEC) classification

Author(s) / Name of the Institution/Organization	Publication	Year	Use of BEC	Location of publication
11. Lemoine F., Unal-Kesenci D.	"Assembly Trade and Technology Transfer: The Case of China"	2004	Analyzing China's exports in terms of the international segmentation of production.	
12. Scolec, M.	"High-Tech Exports from Developing Countries: A Symptom of Technology Spurts or Statistical Illusion?"	2007	Discussing the relevance of the taxonomies that classify exports by technological intensity in the context of globalization of production and trade.	Kiel Institute DOI: 10.1007/s10290-007-0106-z 230 Review of World Economics 2007, Vol. 143 (2)
13. IMF	Export and Import Price Index Manual, Chapter 11 Treatment of specific products and issues	2009	Calculating export-import price index, along with using other classifications (HS, CPC and others)	http://www.imf.org/external/np/sta/tegeipi/ch11.pdf
14. World Bank (International Comparison Program)	"Treatment of Exports and Imports, and Adjustment of Household Consumption for Net Purchases Abroad"	2010, Feb.	Calculating the import share of household final consumption expenditure and gross fixed capital formation	http://siteresources.worldbank.org/ICPINT/Resources/270056-1255977007108/6483550-1257349667891/6544465-1263333205953/05.02_ICP-TAG02_Exports&Imports-NetPurchAbroad.pdf
15. World Bank (Policy Research Paper - #4304)	"China, India and the Future of the World Economy"	2007	Comparing the composition of merchandise exports and imports by stage of production in China and India.	http://siteresources.worldbank.org/INTDEBTDEPT/Resources/468980-1206974166266/4833916-1206974192224/PRWP4304.pdf

Note: Denmark Statistic Bank has different BEC (broad economic categories), which includes 53 items. One of the differences between BEC by UN and BEC by DSB is that lubricants and fuels are not included to intermediates group in BEC by DSB¹³. And the classification BEC of DBS is a as following:

- Intermediate goods (1-30)
- Fuels, lubricants and electric current (32-36)
- Machinery and other equipment (37-42)
- Transport equipment (43-46)
- Goods for household consumption (47-53)

¹³ See Data of Denmark StatistikBank at <http://www.statbank.dk/BEC42>

Appendix 2. True (customized, product-specific, differentiated) intermediate and final product lists in three industries

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
Intermediate Goods				
22	65225	Other woven fabrics of cotton, unbleached, weight < 200 g/m2	1711	Preparation and spinning of textile fibres; weaving of textiles
22	6536	Fabrics, woven, containing 85% or more by weight of artificial staple fibres	1711	"
22	65112	Yarn of carded wool, containing 85% or more by weight of wool, not put up for retail sale	1711	"
22	65113	Yarn of combed wool, containing 85% or more by weight of wool, not put up for retail sale	1711	"
22	65114	Yarn of fine animal hair (carded or combed), not put up for retail sale	1711	"
22	65115	Yarn of coarse animal hair or of horsehair (including gimped horsehair yarn), whether or not put up for retail sale	1711	"
22	65117	Yarn of carded wool containing less than 85% by weight of wool, not put up for retail sale	1711	"
22	65118	Yarn of combed wool containing less than 85% by weight of wool, not put up for retail sale	1711	"
22	65121	Cotton sewing thread, not put up for retail sale	1711	"
22	65133	Cotton yarn (other than sewing thread), containing 85% or more by weight of cotton, not put up for retail sale	1711	"
22	65134	Cotton yarn (other than sewing thread), containing less than 85% by weight of cotton, not put up for retail sale	1711	"
22	65141	Sewing thread of synthetic filaments, whether or not put up for retail sale	1711	"
22	65142	Sewing thread of artificial filaments, whether or not put up for retail sale	1711	"
22	65143	Sewing thread of synthetic staple fibres, whether or not put up for retail sale	1711	"
22	65144	Sewing thread of artificial staple fibres, whether or not put up for retail sale	1711	"
22	65151	Filament yarn (other than sewing thread), of nylon or other polyamides, not put up for retail sale	2430	Manufacture of man-made fibres
22	65152	Filament yarn (other than sewing thread) of polyesters, not put up for retail sale	2430	"
22	65159	Other synthetic filament yarn (other than sewing thread), not put up for retail sale	2430	"
22	65163	Other synthetic yarn, single, untwisted or with a twist not exceeding 50 turns per metre, not put up for retail sale	2430	"
22	65164	Other synthetic yarn, single, with a twist exceeding 50 turns per metre, not put up for retail sale	2430	"
22	65169	Other synthetic yarn, multiple (folded) or cabled, not put up for retail sale	1711	Preparation and spinning of textile fibres; weaving of textiles
22	65172	Textured artificial filament yarn, not put up for retail sale	2430	Manufacture of man-made fibres
22	65174	Other yarn, single, of viscose rayon, untwisted or with a twist not exceeding 120 turns per metre, not put up for retail sale	2430	"
22	65175	Other artificial filament yarn, single	2430	"
22	65176	Other artificial filament yarn (other than sewing thread), multiple (folded) or cabled, put up for retail sale	1711	Preparation and spinning of textile fibres; weaving of textiles

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
22	65177	Artificial monofilament of 67 decitex or more and of which no cross-sectional dimension exceeds 1 mm; strip and the like (e.g., artificial straw) of artificial textile materials of an apparent width not exceeding 5 mm	2430	Manufacture of man-made fibres
22	65182	Yarn containing > 85% synthetic fibres, not for retail sale	1711	Preparation and spinning of textile fibres; weaving of textiles
22	65184	Yarn containing < 85% synthetic fibres, not for retail sale	1711	"
22	65186	Yarn (other than sewing thread) containing 85% or more by weight of artificial staple fibres, not put up for retail sale	1711	"
22	65187	Yarn (other than sewing thread) of artificial staple fibres, containing less than 85% by weight of these fibres, not put up for retail sale	1711	"
22	65188	Synthetic monofilament of 67 decitex or more and of which no cross-sectional dimension exceeds 1 mm; strip and the like (e.g., artificial straw) of synthetic textile materials of an apparent width not exceeding 5 mm	2430	Manufacture of man-made fibres
22	65192	Silk yarn (other than yarn spun from silk waste), not put up for retail sale	1711	Preparation and spinning of textile fibres; weaving of textiles
22	65221	Woven fabrics containing > 85% cotton, unbleached, weight < 200 g/m2	1711	"
22	65222	Woven fabrics containing > 85% cotton, unbleached, weight > 200 g/m2	1711	"
22	65223	Woven cotton fabrics containing < 85% cotton unbleached, mixed mainly or solely with man-made fibres weight < 200 g/m2	1711	"
22	65224	Woven cotton fabrics containing < 85% cotton unbleached weight > 200 g/m2	1711	"
22	65225	Other woven fabrics of cotton, unbleached, weight < 200 g/m2	1711	"
22	65226	Other woven fabrics of cotton, unbleached, weight > 200 g/m2	1711	"
22	65231	Other woven fabrics,>85% cotton, weight < 200 g/m2, bleached	1711	"
22	65232	Other woven fabrics,>85% cotton, weight < 200 g/m2, dyed	1711	"
22	65233	Other woven fabrics,>85% cotton, weight < 200 g/m2, of yarns of different colours	1711	"
22	65234	Other woven fabrics,>85% cotton, weight < 200 g/m2, printed	1711	"
22	65241	Other woven fabrics,>85% cotton, weighing more than 200 g/m2, bleached	1711	"
22	65242	Other woven fabrics,>85% cotton, weighing more than 200 g/m2, dyed	1711	"
22	65243	Other woven fabrics,>85% cotton, weighing more than 200 g/m2, denim	1711	"
22	65244	Other woven fabrics,>85% cotton, weighing more than 200 g/m2, of yarns of different colours	1711	"
22	65245	Other woven fabrics,>85% cotton, weighing more than 200 g/m2, printed	1711	"
22	65251	Other woven cotton fabrics,<85% of cotton, bleached	1711	"
22	65252	Other woven cotton fabrics,<85% of cotton, dyed	1711	"
22	65253	Other woven cotton fabrics,<85% of cotton, of different colours	1711	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
22	65254	Other woven cotton fabrics, <85% of cotton, printed	1711	"
22	65261	Other woven cotton fabrics, <85% of cotton, bleached	1711	Preparation and spinning of textile fibres; weaving of textiles
22	65262	Other woven cotton fabrics, <85% of cotton, dyed	1711	"
22	65263	Other woven cotton fabrics, <85% of cotton, denim	1711	"
22	65264	Other woven cotton fabrics, <85% of cotton, of different colours	1711	"
22	65265	Other woven cotton fabrics, <85% of cotton, printed	1711	"
22	65291	Other woven fabrics of cotton, bleached, < 200 g/m2	1711	"
22	65292	Other woven fabrics of cotton, dyed, < 200 g/m2	1711	"
22	65293	Other woven fabrics of cotton, of yarns of different colours, < 200 g/m2	1711	"
22	65294	Other woven fabrics of cotton, printed, < 200 g/m2	1711	"
22	65295	Other woven fabrics of cotton, bleached, weighing more than 200 g/m2	1711	"
22	65296	Other woven fabrics of cotton, dyed, weighing more than 200 g/m2	1711	"
22	65297	Other woven fabrics of cotton, of yarns of different colours, weighing more than 200 g/m2	1711	"
22	65298	Other woven fabrics of cotton, printed, weighing more than 200 g/m2	1711	"
22	65314	Other woven fabrics, containing 85% or more by weight of filaments of nylon or other polyamides	1711	"
22	65315	Other woven fabrics, containing 85% or more by weight of polyester filaments	1711	"
22	65316	Other woven fabrics, containing 85% or more by weight of non-textured polyester filaments	1711	"
22	65317	Other woven fabrics, containing 85% or more by weight of synthetic filaments, n.e.s.	1711	"
22	65318	Other woven fabrics, <85% of synthetic filaments, mixed mainly or solely with cotton	1711	"
22	65319	Woven fabrics of synthetic filaments, n.e.s.	1711	"
22	65321	Fabrics, woven, of synthetic staple fibres, containing 85% or more by weight of such fibres (other than pile and chenille fabrics) of polyester staple fibres	1711	"
22	65325	Fabrics, woven, of synthetic staple fibres, containing 85% or more by weight of such fibres (other than pile and chenille fabrics) of acrylic or modacrylic staple fibres	1711	"
22	65329	Fabrics, woven, of other synthetic staple fibres, containing 85% or more	1711	"
22	65331	Fabrics, woven, of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with cotton (other than pile and chenille fabrics) of a weight not exceeding 170 g/m2, of polyester staple fibres	1711	"
22	65332	Fabrics, woven, of a weight not exceeding 170 g/m2, of other synthetic staple fibres	1711	"
22	65333	Fabrics, woven, of a weight exceeding 170 g/m2, of polyester staple fibres	1711	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
22	65334	Fabrics, woven, of a weight exceeding 170 g/m2, of other synthetic staple	1711	"
22	65341	Fabrics, woven, <85% of synthetic fibres, mixed with wool or animal hair	1711	"
22	65342	Fabrics, woven, <85% of synthetic fibres, mixed with man-made filaments	1711	"
22	65343	Fabrics, woven, <85% of synthetic fibres, mixed with other fibres	1711	"
22	65352	Other fabrics, woven, containing 85% or more by weight of artificial filament or strip or the like (other than pile and chenille fabrics)	1711	"
22	65359	Fabrics, woven, of artificial filament yarn, n.e.s.	1711	"
22	65381	Fabrics, woven, <85% of artificial fibres, mixed with cotton	1711	"
22	65382	Fabrics, woven, <85% of artificial fibres, mixed with wool and animal hair	1711	"
22	65383	Fabrics, woven, <85% of artificial fibres, mixed with man-made filaments	1711	"
22	65389	Fabrics, woven, <85% of artificial fibres, mixed with other materials	1711	"
22	65411	Fabrics of noil silk	1711	"
22	65413	Other silk fabrics containing 85% or more by weight of silk or of silk waste (other than noil silk)	1711	"
22	65419	Other silk fabrics	1711	"
22	65421	Fabrics, of carded wool or of carded fine animal hair, containing 85% or more by weight of wool or of fine animal hair (other than pile and chenille fabrics)	1711	"
22	65422	Fabrics, of combed wool or fine animal hair, containing 85% or more by weight of wool or of fine animal hair (other than pile and chenille fabrics)	1711	"
22	65431	Fabrics, woven, of carded wool/animal hair, < 85% wool m/w filaments or with man-made staple fibres	1711	"
22	65432	Fabrics, woven, of combed wool/animal hair, < 85% wool m/w filaments or with man-made staple fibres	1711	"
22	65433	Fabrics, woven, of carded wool/animal hair, < 85% wool m/w other materials	1711	"
22	65434	Fabrics, woven, of combed wool/animal hair, < 85% wool m/w other materials	1711	"
22	65492	Fabrics, woven, of coarse animal hair or of horsehair	1711	"
22	65493	Fabrics, woven, of vegetable textile fibres, n.e.s.; woven fabrics of paper yarn	1711	"
22	65521	Other knitted or crocheted fabrics, not impregnated, width < 30 cm	1730	Manufacture of knitted and crocheted fabrics and articles
22	65522	Other knitted or crocheted fabrics, not impregnated, width > 30 cm	1730	"
22	65523	Other fabrics, warp knit (including those made on galloon-knitting-machine)	1730	"
22	65529	Knitted or crocheted fabrics, n.e.s.	1730	"
22	65612	Other narrow woven fabrics, containing by weight 5% or more of elastomeric yarn or rubber thread	1729	Manufacture of other textiles n.e.c.
22	65613	Other narrow woven fabrics	1729	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
22	65621	Labels, badges of textile, cut to shape, woven, not embroidered	1729	"
22	65629	Labels, badges of textile, cut to shape, not woven, not embroidered	1729	"
22	65642	Lace, mechanically made	1729	"
22	65643	Lace, handmade	1729	"
22	65761	Hat forms, hat bodies and hoods of felt, neither blocked to shape nor with made brims; plateaux and manchons (including slit manchons), of felt	1810	Manufacture of wearing apparel, except fur apparel
22	65762	Hat shapes, plaited or made by assembling strips of any material, neither blocked to shape nor with made brims, nor lined nor trimmed	1810	"
22	84848	Headbands, linings, covers, hat foundations, hat frames, peaks and chin-straps, for headgear	1810	"
62	8519	Parts of footwear (including uppers, whether or not attached to soles other than outer soles); removable insoles, heel cushions and similar articles; gaiters, leggings and similar articles, and parts thereof	1920	Manufacture of footwear
Final goods				
62	85111	Waterproof footwear incorporating a protective metal toecap, with outer soles and uppers of rubber or of plastics	1920	Manufacture of footwear
62	85113	Footwear, non-waterproof, incorporating a protective metal toecap, with outer soles and uppers of rubber or plastics	1920	"
62	85115	Footwear, non-waterproof, incorporating a protective metal toecap, with outer soles of rubber, plastics, leather or composition leather and uppers of leather	1920	"
62	85121	Ski boots and cross-country ski footwear, with outer soles and uppers of rubber or plastics	1920	"
62	85122	Ski boots and cross-country ski footwear, with outer soles of rubber, plastics, leather or composition leather and uppers of leather	1920	"
62	85123	Other sports footwear, with outer soles and uppers of rubber or plastics	1920	"
62	85124	Other sports footwear, with outer soles of rubber, plastics, leather or composition leather and uppers of leather	1920	"
62	85125	Tennis shoes, basketball shoes, gym shoes, training shoes and the like and other sports footwear with outer soles of rubber or plastics and uppers of textile materials	1920	"
62	85131	Other waterproof footwear, the uppers of which are neither fixed to the sole nor assembled by stitching, riveting, nailing, screwing, plugging or similar processes	1920	"
62	85132	Other footwear, n.e.s., with outer soles and uppers of rubber or plastics	1920	"
62	85141	Footwear with outer soles of leather and uppers which consist of leather	1920	"
62	85142	Footwear made on a base or platform of wood, not having an inner sole or a protective metal toecap	1920	"
62	85148	Footwear, n.e.s., with uppers of leather or composition leather and outer soles of leather	1920	"
62	85149	Footwear with uppers of leather or composition leather, n.e.s.	1920	"
62	85151	Footwear with outer soles of rubber or plastics and uppers of textile materials	1920	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
62	85152	Footwear with outer soles of leather or composition leather and uppers of textile materials	1920	"
62	85159	Footwear with uppers of textile materials, n.e.s.	1920	"
62	8517	Footwear, n.e.s.	1920	"
62	8453	Jerseys, pullovers, cardigans, waistcoats and similar articles, knitted or crocheted	1730	Manufacture of knitted and crocheted fabrics and articles
63	8454	T-shirts, singlets and other vests, knitted or crocheted	1730	"
63	84621	Pantihose and tights, knitted or crocheted	1730	"
63	84622	Women's full-length or knee-length hosiery, measuring per single yarn less than 67 decitex	1730	"
63	84629	Other hosiery, knitted or crocheted	1730	"
62	84111	Overcoats, raincoats, car coats, capes, cloaks and similar articles, of wool or fine animal hair, men's or boys'	1810	Manufacture of wearing apparel, except fur apparel
62	84112	Overcoats, raincoats, car coats, capes, cloaks and similar articles, of textile materials other than wool or fine animal hair, men's or boys'	1810	"
62	84119	Other outer garments, n.e.s., men's or boys' (not of 841.2, heading 841.3)	1810	"
62	84121	Suits, men's or boys', of wool or fine animal hair, not knitted or crocheted	1810	"
62	84122	Suits, men's or boys', of textile materials other than wool or fine animal hair	1810	"
62	84123	Ensembles, men's or boys' (not of 845.2), of textile materials, not knitted or crocheted	1810	"
62	8413	Jackets and blazers, men's or boys', of textile materials, not knitted or crocheted	1810	"
62	8414	Trousers, bib and brace overalls, breeches and shorts, men's or boys'	1810	"
62	84151	Shirts, men's or boys', of cotton, not knitted or crocheted	1810	"
62	84159	Shirts, other textile materials	1810	"
63	84161	Underpants and briefs, men's or boys', not knitted or crocheted	1810	"
63	84162	Nightshirts and pyjamas, men's or boys', not knitted or crocheted	1810	"
63	84169	Other underwear and nightwear, men's or boys', not knitted or crocheted	1810	"
62	84211	Overcoats, raincoats, car coats, capes, cloaks and similar articles, women's or girls'	1810	"
62	84219	Other outer garments, n.e.s., women's or girls', of textile materials, not knitted or crocheted	1810	"
62	84221	Suits, women's or girls', of textile materials, not knitted or crocheted	1810	"
62	84222	Ensembles, women's or girls', of textile materials, not knitted or crocheted	1810	"
62	8423	Jackets and blazers, women's or girls', of textile materials, not knitted	1810	"
62	8424	Dresses, women's or girls', of textile materials, not knitted or crocheted	1810	"
62	8425	Skirts and divided skirts, women's or girls', of textile materials, not knitted or crocheted	1810	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
62	8426	Trousers, bib and brace overalls, breeches and shorts, women's or girls', not knitted or crocheted	1810	"
62	8427	Blouses, shirts and shirt-blouses, women's or girls', of textile material, not knitted or crocheted	1810	"
63	84281	Slips and petticoats, women's or girls', of textile materials, not knitted or crocheted	1810	"
63	84282	Nightdresses and pyjamas, women's or girls', of textile materials, not knitted or crocheted	1810	"
63	84289	Other underwear and nightwear, women's or girls', of textile materials, not knitted or crocheted	1810	"
62	8431	Overcoats, car coats, capes, cloaks, anoraks (including ski jackets), windcheaters, wind jackets and similar articles (other than those of heading 843.23)	1810	"
62	84321	Suits, men's or boys', of knitted or crocheted textile materials	1810	"
62	84322	Ensembles, men's or boys', of knitted or crocheted textile materials	1810	"
62	84323	Jackets and blazers, men's or boys', of knitted or crocheted textile fabrics	1810	"
62	84324	Trousers, bib and brace overalls, breeches and shorts, men's or boys', of knitted or crocheted textile fabrics	1810	"
62	84371	Shirts, men's or boys', knitted or crocheted of cotton	1810	"
62	84379	Shirts, men's or boys', knitted or crocheted of textile materials other than cotton	1810	"
63	84381	Underpants and briefs, men's or boys', knitted or crocheted of textile materials	1810	"
63	84382	Nightshirts and pyjamas, men's or boys', knitted or crocheted of textile materials	1810	"
63	84389	Other underwear and nightwear, men's or boys', knitted or crocheted of textile materials	1810	"
62	8441	Overcoats, car coats, capes, cloaks, anoraks (including ski jackets), windcheaters, wind jackets and similar articles	1810	"
62	84421	Suits, women's or girls', knitted or crocheted of textile materials	1810	"
62	84422	Ensembles, women's or girls', knitted or crocheted of textile materials	1810	"
62	84423	Jackets and blazers, women's or girls', knitted or crocheted of textile materials	1810	"
62	84424	Dresses, women's or girls', knitted or crocheted of textile materials	1810	"
62	84425	Skirts and divided skirts, women's or girls', knitted or crocheted of textile materials	1810	"
62	84426	Trousers, bib and brace overalls, breeches and shorts, women's or girls'	1810	"
62	8447	Blouses, shirts and shirt-blouses, women's or girls', knitted or crocheted of textile materials	1810	"
63	84481	Slips and petticoats, women's or girls', knitted or crocheted of textile materials	1810	"
63	84482	Briefs and panties, women's or girls', knitted or crocheted of textile materials	1810	"
63	84483	Nightdresses and pyjamas, women's or girls', knitted or crocheted of textile materials	1810	"
63	84489	Other underwear and nightwear, women's and girls', knitted or crocheted of textile materials	1810	"
62	84511	Babies' garments and clothing accessories, not knitted or crocheted of textile materials	1810	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
62	84512	Babies' garments and clothing accessories, knitted or crocheted of textile materials	1810	"
62	84521	Garments made up of fabrics of subgroup 657.1 (felt) or heading 657.2	1810	"
62	84522	Men's and boy's garments made up of fabrics (not knitted or crocheted) of headings 657.32, 657.33, or 657.34	1810	"
62	84523	Women's or girls' garments made up of fabrics (not knitted or crocheted)	1810	"
62	84524	Garments made up of knitted or crocheted fabrics of headings 657.32, 657.33, or 657.34	1810	"
63	84551	Brassieres	1810	"
63	84552	Girdles, corsets, braces, suspenders, garters and similar articles	1810	"
62	84561	Swimwear, men's or boys', not knitted or crocheted	1810	"
62	84562	Swimwear, men's or boys', knitted or crocheted	1810	"
62	84563	Swimwear, women's or girls', not knitted or crocheted	1810	"
62	84564	Swimwear, women's or girls', knitted or crocheted	1810	"
62	84581	Ski suits, not knitted or crocheted	1810	"
62	84587	Articles of apparel, men's or boys', n.e.s., not knitted or crocheted	1810	"
62	84589	Articles of apparel, women's or girls', n.e.s., not knitted or crocheted	1810	"
62	84591	Track suits, knitted or crocheted	1810	"
62	84592	Ski suits, knitted or crocheted	1810	"
62	84599	Garments, knitted or crocheted, n.e.s.	1810	"
63	84611	Handkerchiefs, not knitted or crocheted	1810	"
63	84612	Shawls, scarves, mufflers, mantillas, veils and the like, not knitted or crocheted	1810	"
63	84613	Ties, bow-ties and cravats, not knitted or crocheted	1810	"
63	84614	Gloves, mittens and mitts, not knitted or crocheted	1810	"
63	84619	Other made-up clothing accessories; parts of garments or of clothing other than that of subgroup 845.5	1810	"
63	84691	Gloves, knitted or crocheted of textile materials, impregnated, coated or covered with plastics or rubber	1810	"
63	84692	Other gloves, mittens and mitts, knitted or crocheted	1810	"
62	84693	Shawls, scarves, mufflers, mantillas, veils and the like, knitted or crocheted	1810	"
62	84694	Ties, bow-ties and cravats, knitted or crocheted	1810	"
63	84699	Made-up clothing accessories, n.e.s.; parts of garments or of clothing accessories	1810	"
62	84811	Articles of apparel, of leather or of composition leather (not including gloves, mittens and mitts of heading 894.77)	1810	"
62	84812	Gloves, mittens and mitts, not designed for use in sports, of leather or of composition leather	1810	"

Apparel and Footwear				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
62	84813	Belts and bandoliers, of leather or of composition leather	1810	"
62	84819	Other clothing accessories, of leather or of composition leather	1810	"
62	84841	Felt hats and other felt headgear, made from the hat bodies, hoods or plateaux of heading 657.61, whether or not lined or trimmed	1810	"
62	84842	Hats and other headgear, plaited or made by assembling strips of any material, whether or not lined or trimmed, or made up from lace, felt or other textile fabric in the piece (but not in strips), whether or not lined or trimmed; hairnets of any material, whether or not lined or trimmed	1810	"
62	84843	Hats and other headgear, knitted or crocheted, or made up from lace, felt or other textile fabric in the piece (but not in strips), whether or not lined or trimmed; hairnets of any material, whether or not lined or trimmed	1810	"
62	84849	Headgear, n.e.s., of materials other than rubber or plastics	1810	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
Intermediate Goods				
42	76493	Parts and accessories suitable for use solely or principally with the apparatus and equipment of groups 761 and 762 and subgroups 764.3 and 764.8	32	Manufacture of radio, television and communication equipment and apparatus
42	7722	Printed circuits	3210	"
42	77231	Fixed carbon resistors, composition- or film-type	3210	"
42	77232	Other fixed resistors	3210	"
42	77233	Wire-wound variable resistors (including rheostats and potentiometers)	3210	"
42	77235	Other variable resistors (including rheostats and potentiometers)	3210	"
42	77238	Parts for the electrical resistors of subgroup 772.3	3210	"
42	77611	Television picture tubes, cathode-ray (including video monitor cathode-ray tubes), colour	3210	"
42	77612	Television picture tubes, cathode-ray (including video monitor cathode-ray tubes), black and white or other monochrome	3210	"
42	77621	Television camera tubes; image converters and intensifiers; other photocathode tubes	3210	"
42	77623	Other cathode-ray tubes	3210	"
42	77625	Microwave tubes (excluding grid-controlled tubes)	3210	"
42	77627	Other valves and tubes	3210	"
42	77629	Parts of the tubes and valves of subgroups 776.1 and 776.2	3210	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
42	77631	Diodes, other than photosensitive or light-emitting diodes	3210	"
42	77632	Transistors (excluding photosensitive transistors) with a dissipation rate of less than one watt	3210	"
42	77633	Transistors (excluding photosensitive transistors) with a dissipation rate of one watt or more	3210	"
42	77635	Thyristors, diacs and triacs (excluding photosensitive devices)	3210	"
42	77637	Photosensitive semiconductor devices; light-emitting diodes	3210	"
42	77639	Other semiconductor devices	3210	"
42	77641	Digital monolithic integrated units	3210	"
42	77643	Non-digital monolithic integrated units	3210	"
42	77645	Hybrid integrated circuits	3210	"
42	77649	Other electronic integrated circuits and microassemblies	3210	"
42	77681	Piezoelectric crystals, mounted	3210	"
42	77688	Parts of the devices of subgroup 776.3 and of the mounted piezoelectric crystals of item 776.81	3210	"
42	77689	Parts of the articles of subgroup 776.4	3210	"
42	77869	Parts of electrical capacitors	3210	"
42	76491	Parts and accessories suitable for use solely or principally with the apparatus of subgroup 764.1	3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
42	76492	Parts and accessories suitable for use solely or principally with apparatus and equipment of subgroup 764.2	3230	"
42	76499	Parts and accessories suitable for use solely or principally with the apparatus falling within group 763	3230	"
42	77423	X-ray tubes	3311	Manufacture of medical and surgical equipment and orthopedic appliances
42	77429	Other apparatus based on the use of alpha, beta or gamma radiations, whether or not for medical, surgical, dental or veterinary uses	3311	"
	7599	Parts, data processors, machinery, etc.	3000	Manufacture of office, accounting and computing machinery
42	75991	Parts and accessories of the machines of subgroup 751.1 (other than covers, carrying cases and the like)	3000	"
42	75993	Parts and accessories of the machines of subgroup 751.9 (other than covers, carrying cases and the like)	3000	"
42	75997	Parts and accessories for the machines of group 752 (other than covers, carrying cases and the like)	3000	"
42	7591	Parts and accessories of the photocopying and thermocopying apparatus of subgroup 751.3	3000	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
42	76491	Parts and accessories suitable for use solely or principally with the apparatus of subgroup 764.1	3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
41	76423	Loudspeakers, not mounted in their enclosures	3230	"
42	76492	Parts and accessories suitable for use solely or principally with the apparatus and equipment of subgroup 764.2	3230	"
42	76499	Parts and accessories suitable for use solely or principally with the apparatus falling within group 763	3230	"
42	87319	Parts and accessories of gas, liquid or electricity meters	3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
42	87329	Parts and accessories of the articles of subgroup 873.2	3312	"
42	87412	Parts and accessories of navigational instruments and appliances	3312	"
42	87454	Parts and accessories for the machines and appliances of heading 874.53	3312	"
42	87479	Parts and accessories for the instruments and apparatus of subgroup 874.7	3312	"
42	8749	Parts and accessories for machines, appliances, instruments and apparatus	3312	"
42	87469	Parts and accessories for automatic regulating or controlling instruments	3313	Manufacture of industrial process control equipment
Final products				
61	89961	Hearing-aids (excluding parts and accessories)	3311	Manufacture of medical and surgical equipment and orthopedic appliances
61	89967	Pacemakers for stimulating heart muscles (excluding parts and accessories)	3311	"
61	89969	Appliances, n.e.s., which are worn or carried or implanted in the body to compensate for a defect or a disability	3311	"
61	88111	Photographic (other than cinematographic) cameras	3320	Manufacture of optical instruments and photographic equipment
61	88132	Image projectors, n.e.s.	3320	"
61	88531	Wrist-watches, battery or accumulator powered, whether or not incorporating a stopwatch facility	3330	Manufacture of watches and clocks
61	88532	Other wrist-watches, whether or not incorporating a stopwatch facility, whether or not incorporating a stopwatch facility	3330	"
61	88539	Pocket watches and other watches (not wrist-watches), with case of precious metal or of metal clad with precious metal	3330	"
61	88541	Wrist-watches, battery or accumulator powered, whether or not incorporating a stopwatch facility	3330	"
61	88542	Other wrist-watches, whether or not incorporating a stopwatch facility, not of 885.3	3330	"
61	88549	Pocket-watches and other watches (not wrist-watches), not of 885.39	3330	"
61	88572	Clocks with watch movements (excluding clocks of heading 885.71), battery or accumulator powered	3330	"
61	88573	Other clocks with watch movements (excluding clocks of heading 885.71)	3330	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
61	88574	Alarm clocks, battery, accumulator or mains powered	3330	"
61	88575	Other alarm clocks	3330	"
61	88576	Wall clocks, battery, accumulator or mains powered	3330	"
61	88577	Other wall clocks	3330	"
61	88578	Other clocks, battery, accumulator or mains powered	3330	"
61	88579	Clocks, n.e.s.	3330	"
61	89813	Pianos (including automatic pianos); harpsichords and other keyboard stringed instruments	3692	Manufacture of musical instruments
61	89821	Keyboard pipe-organs; harmoniums and similar keyboard instruments with free metal reeds	3692	"
61	89822	Accordions and similar instruments; mouth-organs	3692	"
61	89824	Percussion musical instruments (e.g., drums, xylophones, cymbals, castanets, maracas)	3692	"
61	89825	Keyboard instruments (other than accordions), the sound of which is produced or must be amplified electrically (e.g., organs)	3692	"
61	89826	Musical instruments, n.e.s., the sound of which is produced or must be amplified electrically (e.g., guitars, accordions)	3692	"
61	89829	Music boxes, fairground organs, mechanical street organs, mechanical singing birds, musical saws and other musical instruments, n.e.s.; decoy calls of all kinds; whistles, call horns and other mouth-blown sound signalling instruments	3692	"
41	72655	Sheet-fed office-type offset printing machinery (sheet size not exceeding 22 x 36 cm)	3000	Manufacture of office, accounting and computing machinery
41	75113	Automatic typewriters; word processing machines	3000	"
41	75115	Other electric typewriters, < 12 kg (excluding case)	3000	"
41	75116	Other electric typewriters	3000	"
41	75118	Non-electric typewriters, < 12 kg (excluding case)	3000	"
41	75119	Other non-electric typewriters	3000	"
62	75121	Electronic calculators capable of operation without an external source of power	3000	"
41	75122	Other calculating machines	3000	"
41	75123	Accounting machines (including bookkeeping machines)	3000	"
41	75124	Cash registers	3000	"
41	75128	Postage-franking, ticket-issuing and similar machines, incorporating a calculating device	3000	"
41	75131	Electrostatic photocopying apparatus operating by reproducing the original image directly onto the copy (direct process)	3000	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
41	75132	Electrostatic photocopying apparatus operating by reproducing the original	3000	"
41	75133	Non-electrostatic photocopying apparatus incorporating an optical system	3000	"
41	75134	Non-electrostatic photocopying apparatus of the contact type	3000	"
41	75135	Thermocopying apparatus	3000	"
41	75191	Duplicating machines	3000	"
41	75192	Addressing machines and address-plate embossing machines	3000	"
41	75193	Machines for sorting or folding mail or for inserting mail in envelopes or bands, machines for opening, closing or sealing mail and machines for affixing or cancelling postage stamps	3000	"
41	75199	Office machines, n.e.s.	3000	"
41	7521	Analogue or hybrid (analogue-digital) data processing machines	3000	"
41	7522	Digital automatic data processing machines, containing in the same housing	3000	"
41	7523	Digital processing units, whether or not presented with the rest of a system	3000	"
41	7526	Input or output units for automatic data processing machines, whether or not presented with the rest of a system and whether or not containing storage units in the same housing	3000	"
41	7527	Storage units, whether or not presented with the rest of a system	3000	"
41	7529	Data processing equipment, n.e.s.	3000	"
41	76381	Video-recording or reproducing apparatus, whether or not incorporating a video tuner	3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
41	7641	Electrical apparatus for line telephony or line telegraphy (including such apparatus for carrier-current line systems)	3220	"
41	76411	Telephone sets	3220	"
41	76413	Teleprinters	3220	"
41	76415	Telephonic or telegraphic switching apparatus	3220	"
41	76417	Other apparatus, for carrier-current line systems	3220	"
41	76419	Other telephonic or telegraphic apparatus	3220	"
41	76431	Transmission apparatus	3220	"
41	76432	Transmission apparatus incorporating reception apparatus	3220	"
41	76482	Television cameras	3220	"
61	7611	Television receivers, colour (including video monitors and video projectors), whether or not incorporating radio-broadcast receivers or sound- or video-recording or reproducing apparatus	3230	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
41	7612	Television receivers, black and white or other monochrome (including video monitors and video projectors), whether or not incorporating radio-broadcast receivers or sound- or video-recording or reproducing apparatus	3230	"
53	76211	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles (including apparatus capable of receiving radio-telephony or radio-telegraphy) incorporating sound-recording or reproducing apparatus	3230	"
53	76212	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles (including apparatus capable of receiving radio-telephony or radio-telegraphy) not incorporating sound-recording or reproducing apparatus	3230	"
61	76221	Radio-broadcast receivers capable of operating without an external source of power (including apparatus capable of receiving radio-telephony or radio-telegraphy) incorporating sound-recording or reproducing apparatus	3230	"
61	76222	Radio-broadcast receivers capable of operating without an external source of power (including apparatus capable of receiving radio-telephony or radio-telegraphy) not incorporating sound-recording or reproducing apparatus	3230	"
41	76281	Other radio-broadcast receivers (including apparatus capable of receiving radio-telephony or radio-telegraphy) incorporating sound-recording or reproducing apparatus	3230	"
41	76282	Other radio-broadcast receivers (including apparatus capable of receiving radio-telephony or radio-telegraphy) not incorporating sound-recording or reproducing apparatus but combined with a clock	3230	"
41	76289	Other radio-broadcast receivers (including apparatus capable of receiving radio-telephony or radio-telegraphy) not incorporating sound-recording or reproducing apparatus nor with a clock	3230	"
41	76331	Record-players, coin- or disc-operated	3230	"
61	76333	Other record-players	3230	"
61	76335	Turntables (record-decks)	3230	"
41	76381	Video-recording or reproducing apparatus, whether or not incorporating a video tuner	3230	"
41	76382	Transcribing machines	3230	"
61	76383	Other sound-reproducing apparatus	3230	"
41	76384	Sound-recording apparatus, whether or not incorporating a sound-reproduction	3230	"
41	76421	Microphones and stands therefor	3230	"
41	76422	Loudspeakers, mounted in their enclosures	3230	"
41	76424	Headphones, earphones and combined microphone/speaker sets	3230	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
41	76425	Audio-frequency electric amplifiers	3230	"
41	76426	Electric sound amplifier sets	3230	"
41	76481	Reception apparatus for radio-telephony or radio-telegraphy, n.e.s.	3230	"
41	77411	Electrocardiographs	3311	Manufacture of medical and surgical equipment and orthopedic appliances
41	77412	Other electrodiagnostic apparatus (including apparatus for functional exploratory examination or for checking physiological parameters)	3311	"
41	77413	Ultraviolet or infrared ray apparatus	3311	"
41	77421	Apparatus based on the use of X-rays, whether or not for medical, surgical, dental or veterinary uses (including radiography or radiotherapy apparatus)	3311	"
41	77422	Apparatus based on the use of alpha, beta or gamma radiations, whether or not for medical, surgical, dental or veterinary uses (including radiography or radiotherapy apparatus)	3311	"
42	77423	X-ray tubes	3311	"
42	77429	Other apparatus based on the use of alpha, beta or gamma radiations, whether or not for medical, surgical, dental or veterinary uses	3311	"
61	89961	Hearing-aids (excluding parts and accessories)	3311	"
61	89963	Orthopedic or fracture appliances	3311	"
61	89965	Artificial teeth and dental fittings	3311	"
61	89966	Other artificial parts of the body	3311	"
61	89967	Pacemakers for stimulating heart muscles (excluding parts and accessories)	3311	"
61	89969	Appliances, n.e.s., which are worn or carried or implanted in the body to compensate for a defect or a disability	3311	"
41	76483	Radar apparatus, radio navigational aid apparatus and radio remote control	3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control
41	87131	Microscopes (other than optical microscopes) and diffraction apparatus	3312	"
42	87139	Parts and accessories of microscopes (excl. optical microscopes) and diffraction apparatus	3312	"
41	87311	Gas meters	3312	"
41	87313	Liquid meters	3312	"
41	87315	Electricity meters	3312	"
41	87321	Revolution counters, production counters, taximeters, mileometers, pedometers and the like	3312	"
41	87325	Speed indicators and tachometers; stroboscopes	3312	"
41	87411	Direction-finding compasses; other navigational instruments and appliance	3312	"

Electronics				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
41	87441	Gas or smoke analysis apparatus	3312	"
41	87442	Chromatographs and electrophoresis instruments	3312	"
41	87443	Spectrometers, spectrophotometers and spectrographs using optical radiations (UV, visible, IR)	3312	"
41	87444	Exposure meters	3312	"
41	87445	Other instruments and apparatus using optical radiations (UV, visible, IR)	3312	"
41	87446	Instruments and apparatus for physical or chemical analysis, n.e.s.	3312	"
41	87449	Microtomes; parts and accessories of the articles of subgroup 874.4	3312	"
41	87451	Balances of a sensitivity of 5 cg or better, with or without weights	3312	"
41	87453	Machines and appliances for testing the hardness, strength, compressibility, elasticity or other mechanical properties of materials (e.g., metals, wood, textiles, paper, plastics)	3312	"
41	87461	Thermostats	3312	"
41	87463	Pressure regulators and controllers (manostats)	3312	"
41	87465	Other regulating or controlling instruments and apparatus	3312	"
41	87471	Instruments and apparatus for measuring or detecting ionizing radiations	3312	"
41	87473	Cathode-ray oscilloscopes and cathode-ray oscillographs	3312	"
41	87475	Other instruments and apparatus, for measuring or checking voltage, current, resistance or power, without a recording device	3312	"
41	87477	Other instruments and apparatus, specially designed for telecommunication (e.g., crosstalk meters, gain-measuring instruments, distortion factor meters, psophometers)	3312	"
41	87478	Other instruments and apparatus for measuring or checking electrical quantities	3312	"

Automobiles and motorcycles				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
Intermediate Goods				
53	69915	Other mountings, fittings and similar articles suitable for motor vehicles	2899	Manufacture of other fabricated metal products n.e.c.
53	77812	Electric accumulators (storage batteries)	3140	Manufacture of accumulators, primary cells and primary batteries
53	77823	Sealed-beam lamp units	3150	Manufacture of electric lamps and lighting equipment
53	77313	Ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships	3190	Manufacture of other electrical equipment n.e.c.

Automobiles and motorcycles				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
53	77812	Electric accumulators (storage batteries)	3190	"
53	77831	Electrical ignition or starting equipment of a kind used for spark-ignition or compression-ignition internal combustion engines	3190	Manufacture of other electrical equipment n.e.c.
53	77833	Parts of the equipment of heading 778.31	3190	"
53	77834	Electrical lighting or signalling equipment (excluding articles of subgroup 778.2), windscreen wipers, defrosters and demisters, of a kind used for cycles or motor vehicles	3190	"
53	76211	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles (including apparatus capable of receiving radio-telephony or radio-teleggraphy) incorporating sound-recording or reproducing apparatus	3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods
53	76212	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles (including apparatus capable of receiving radio-telephony or radio-teleggraphy) not incorporating sound-recording or reproducing apparatus	3230	"
53	88571	Instrument panel clocks and clocks of a similar type, for vehicles, aircraft or ships	3330	Manufacture of watches and clocks
53	71321	Reciprocating internal combustion piston engines for propelling vehicles of a cylinder capacity not exceeding 1,000 cc	3410	Manufacture of motor vehicles
53	71322	Reciprocating internal combustion piston engines for propelling vehicles exceeding 1,000 cc	3410	"
53	71323	Compression-ignition internal combustion piston engines (diesel or semi-diesel)	3410	"
53	7841	Chassis fitted with engines, for the motor vehicles of groups 722 and 781	3410	"
53	78421	Bodies (including cabs), for the motor vehicles of group 781	3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
53	78425	Bodies (including cabs), for the motor vehicles of groups 722 and 782	3420	"
53	78689	Parts of the trailers and semi-trailers of heading 786.1, subgroup 786.2	3420	"
53	71391	Parts, n.e.s., for the engines of subgroups 713.2, 713.3 and 713.8, suitable for use solely or principally with spark-ignition internal combustion piston engines	3430	Manufacture of parts and accessories for motor vehicles and their engines
53	71392	Parts, n.e.s., for the engines of subgroups 713.2, 713.3 and 713.8, suitable for use solely or principally with compression-ignition internal combustion piston engines	3430	"
53	78431	Bumpers and parts thereof, of the motor vehicles of groups 722, 781, 782 and 783	3430	"
53	78432	Other parts and accessories of bodies (including cabs), of the motor vehicles of groups 722, 781, 782 and 783	3430	"
53	78433	Brakes and servo-brakes and parts thereof, of the motor vehicles of groups 722, 781, 782 and 783	3430	"

Automobiles and motorcycles				
BEC	SITC	SITC DESCRIPTION	ISIC	ISIC DESCRIPTION
53	78434	Gearboxes of the motor vehicles of groups 722, 781, 782 and 783	3430	"
53	78435	Drive-axles with differential, whether or not provided with other transmission components	3430	"
53	78436	Non-driving axles and parts thereof, of the motor vehicles of groups 722, 781, 782 and 783	3430	"
53	78439	Other parts and accessories of the motor vehicles of groups 722, 781, 782	3430	"
53	71311	Spark-ignition reciprocating or rotary internal combustion piston engines	3530	Manufacture of aircraft and spacecraft
53	78535	Parts and accessories of motor cycles (including mopeds)	3591	Manufacture of motorcycles
53	82112	Seats of a kind used for motor vehicles	3610	Manufacture of furniture
Final products				
51	7812	Motor vehicles for the transport of persons, n.e.s.	3410	Manufacture of motor vehicles
522	78511	Motor cycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; with reciprocating internal combustion piston engine of a cylinder capacity not exceeding 50 cc	3591	Manufacture of motorcycles
522	78513	Motor cycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; with reciprocating internal combustion piston engine of a cylinder capacity exceeding 50 cc but not exceeding 250 cc	3591	"
522	78515	Motor cycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; with reciprocating internal combustion piston engine of a cylinder capacity exceeding 250 cc but not exceeding 500 cc	3591	"
522	78516	Motor cycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; with reciprocating internal combustion piston engine of a cylinder capacity exceeding 500 cc but not exceeding 800 cc	3591	"
522	78517	Motor cycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; with reciprocating internal combustion piston engine of a cylinder capacity exceeding 800 cc	3591	"
522	78519	Motor cycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; other; side-cars	3591	"



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