

The Role of Bulgaria in Global Value Chains

Neli Ivanova
Evgeni Ivanov



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ABSTRACT: Considering the increasingly fragmented production across different countries, the high degree of trade openness of Bulgaria and the significant role of exports for the country's overall real GDP growth, the aim of this paper is to analyse the importance of participation in Global Value Chains (GVCs) for Bulgaria relative to a set of selected economies. The analysis is based on three main indicators, constructed from international input-output databases: participation in GVCs index, length of GVCs index and distance to final demand index. Our results suggest that Bulgaria is deeply integrated in GVCs mainly through manufacturing activities such as petrol refining, the production of basic metals and the production of machinery, electrical and transport equipment. Bulgaria participates predominantly in highly fragmented GVCs and specialises in processing and assembly functions, which is why the country's participation in GVCs is characterised by relatively low domestic value added content and an intense usage of foreign inputs. We also find that the products with which Bulgaria participates in GVCs are predominantly inputs rather than final products, which places them further away from end-users. The article also concludes that, although, services play a less significant role for Bulgaria's exports compared to regional peer countries, some fast-growing manufacturing sectors have considerably increased their usage of services inputs over time, in line with these sectors' increased participation in GVCs. Our results suggest that Bulgaria has managed to benefit from its participation in GVCs. Despite the significant share of foreign value added content of Bulgarian exports, the share of domestic value added trade to GDP is quite high due to the overall importance of exports relative to the size of the Bulgarian economy.

KEYWORDS: Global Value Chains, International Trade, Trade in Value Added, Production Fragmentation

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1. Introduction

The production of goods has become increasingly fragmented across countries. Due to falling trade costs, greater global openness, cooperation on trade policy and the information and communications technologies (ICT) revolution, production process has become increasingly unbundled across countries (OECD, 2013). Goods and services that were once produced in a single country have become part of global value chains (GVCs). A global value chain involves all the activities that firms engage in, at home or abroad, to bring a product to the market, from conception to final use (OECD, 2013). This means that GVCs encompass the entire process required to convert raw materials, labour, capital and knowledge into intermediate products and final goods. Production is divided into many small stages of specialisation along the chain that can be carried out where the necessary inputs are most efficiently sourced, thus achieving an increase in productivity and competitiveness. In this setup, countries tend to specialise in specific business functions rather than specific industries, such as the assembly operations for China or business services for India (OECD, 2013). Typically, a value chain includes activities like design, production, marketing, distribution and support to the final consumer, which can be performed within the same firm or divided among different firms (De Backer and Miroudot, 2014). In GVCs firms control and coordinate activities in networks of buyers and suppliers, and multinational enterprises (MNEs) play a central role (OECD, 2013). Not all GVCs are equally complex or widespread. The level of fragmentation of production is linked to the technical characteristics of products and the costs incurred when production is split among different locations (OECD, 2013).

Given the way GVCs are defined, every country in the world is to some extent part of GVCs, since it uses at least some imported inputs in its exports, or at least some of its exports end up as inputs in third countries' exports. In theory, however, a case of a country that does not participate in GVCs would be where the given country sources all inputs for its exports domestically and these exports are used only for final consumption by the rest of the world.

A country's high participation in GVCs does not simply mean that that the country has a large number of multinational enterprises (MNEs) operating on its market. Despite the crucial role of MNEs, GVCs can theoretically operate without them since the supply chains also include independent suppliers, such as domestic and foreign small and medium-sized enterprises. However, in practice this is rarely the case since investment and

trade are closely related – UNCTAD estimates that around 80% of global trade in terms of gross exports is linked to the international production networks of MNEs, either as intra-firm trade, or through arm's length transactions (UNCTAD, 2013). This is why usually countries with higher presence of FDI relative to the size of their economies tend to have higher levels of participation in GVCs and greater relative shares in global value added trade compared to their shares in global exports (UNCTAD, 2013).

Considering the growing importance of international production fragmentation, the high degree of trade openness of the Bulgarian economy and the significant role of exports for the overall real GDP growth in the country, the aim of this paper is to examine Bulgaria's participation in GVCs and to identify the production sectors with highest participation rates. The paper also aims at identifying the specific characteristics of the GVCs in which Bulgaria participates, such as the degree of production fragmentation, as well as the types of the products with which Bulgaria participates in these GVCs (whether Bulgaria participates in GVCs through the production of inputs or final products). The analysis tries to answer the question whether Bulgaria has managed to extract sufficient welfare gains from its participation in GVCs. In order to put our results in perspective and to be able to draw conclusions from our analysis we compare the results for Bulgaria to a pre-selected reference group which covers several types of economies, representative of the different specialisations in GVCs.

Our initial expectations for the results are that Bulgaria would be well-integrated in GVCs, given that it is a small, open economy, which is also a member of the European Union (EU). The structure of gross exports and imports of the country and the importance of primary commodities (such as petrol and metals), as well as the country's low endowment of natural resources, suggest that Bulgaria would focus more on processing and assembly functions in relatively more fragmented GVCs, and its products would likely be positioned further away from end-use consumers, compared to more developed economies.

The contribution of this paper is that it applies a structured empirical analysis that uses indicators based on international input-output tables in order to assess the importance of GVCs participation for Bulgaria, relative to a set of pre-selected economies. To our knowledge this paper is the first attempt in existing literature to apply such type of detailed analysis for the case of Bulgaria.

The rest of the paper is structured as follows: Section 2 gives a short overview of existing studies that are relevant to our topic. Section 3 then pre-

sents the data used for our analysis, as well as the methodological notes on the construction of the used indicators. Section 4 outlines some factors that can affect the interpretation of these GVCs indicators. Section 5 provides an overview of the structure of Bulgarian exports. Section 6 focuses on presenting and discussing the results from the GVCs-specific indicators for Bulgaria. Then we have another section that discusses in more details the role of services for Bulgarian exports, followed by a section that tries to give an intuition of how participation in GVCs has affected the Bulgarian economy. The paper ends with concluding remarks.

2. Literature Review

The fragmentation of production across countries is not a new phenomenon. What is new is its increasing scale and scope. The concept of GVCs can be traced back to the end of the 1970s with some work on the „commodity chain“ (De Backer and Miroudot, 2014), the focus of which was to trace all the sets of inputs and transformations that lead to an „ultimate consumable“ and to describe a linked set of processes that add up to this final product (Hopkins and Wallerstein, 1977). The concept of „global commodity chain“ was later introduced in the work of Gary Gereffi (1994), describing as an example the apparel commodity chain, from the raw materials (such as cotton, wool or synthetic fibres) to the final products (garments). In the 2000s, there was a shift in terminology from „global commodity chain“ to „global value chain“, the latter coming from the analysis of trade and industrial organisation as a value added chain in the international business literature (Porter, 1985).

Since globalisation has entered a phase of radical reductions in international communication and co-ordination costs and firms can offshore many tasks that used to be considered as non-traded, the examination of countries' position within international production networks has become even more crucial (Baldwin, 2006). Studies on GVCs trade have been done at a firm level (Alfaro et al. (2016), Dedrick et al. (2009)), industry level (De Backer et al. (2014), Sturgeon et al (2008)), country level (OECD (2013), ITC (2014)) as well as regional level (Timmer et al. (2013), IDE (2011), ILO (2016)). Work on the role of countries in GVCs provides a framework for the analysis of the competitiveness position of countries, their trade patterns, as well as opportunities for market expansion.

GVCs trade can be measured in several ways such as firm surveys, customs statistics that record trade flows under special schemes of tariff reduction or exemption and the Standard International Trade Classifica-

tion (SITC) classifying goods as being intermediate or final (Park et al., 2013). However, due to the limitations associated with these methods, analysis based on input-output tables has become the preferred option. Using input-output tables Koopman et al. (2011) estimate that accounting for the use of exports as inputs into exports by another country is crucial for understanding the functioning of GVCs. They provide a framework for decomposing a country's gross exports into value added components by source. In the study all value added in a country's exports is distributed to its original sources, and individual sources and destinations of value added are expressed at either a country-wide or industry aggregate level. Hummels et al. (2001) use input-output tables for 14 countries and show that growth in vertical specialisation accounted for about one-third of the growth in overall exports in the period 1970–1990. They provide evidence that it is developing countries that source inputs from developed countries which are then transformed into exports for developed economies. Another study by Banga (2013) applies a value added analysis using harmonised world input-output tables and estimates countries' extent of participation in GVCs in terms of their share in total value added created by GVCs. The study shows that around 61 per cent of total value added created in GVCs is due to OECD countries.

Analysis of a country's participation in GVCs by sector is key for establishing a country's place in GVCs. Daudin et al (2011) show evidence that standard trade statistics do not give an accurate representation of the relative dependence of different sectors on international demand. Their analysis of 66 regions and 55 sectors shows that some sectors have more value added trade than export trade which implies that their products have been traded as inputs in other goods. Furthermore, Koopman et al. (2010) suggest that a country's revealed comparative advantage in a certain sector may change when using value added in exports as opposed to official trade data which suggests that accounting for GVCs could modify substantially our understanding of trade patterns and revealed comparative advantage. In terms of the services sector, GVCs studies prove that the importance of services for trade has been more than undermined by standard trade statistics. Timmer et al. (2013) show that with the increasing participation in GVCs, the importance of services has also increased which is associated with the fact that the production of final goods in many sectors is largely dependent on service activities.

The analysis of GVCs trade brings up the question of potential positive effects from participation in GVCs for countries. Though the answer to that question is largely dependent on the specific role of each country

in GVCs, high participation in GVCs is generally seen as beneficial for countries, since studies find a positive correlation between participation in GVCs and GDP per capita growth rates (UNCTAD, 2013). Furthermore, studies such as Rahman and Zhao (2013) and IMF (2013) find evidence that the direction of causality runs from increased participation in GVCs to expansion of the production possibility frontier of the economy and a consequent spur of overall employment and growth. Economies with the fastest growing GVCs participation have some 2 percentage points above the average GDP per capita growth rates (UNCTAD, 2013). In addition, participation in GVCs can also be used by developing countries to build up productive capacity, improving their prospects for longer-term industrial upgrading. Participation in GVCs is considered a factor facilitating the integration and sustainability of country's exports and a main channel for technology and knowledge transfer.

Having established the importance of understating the role of countries in GVCs, we focus on providing a framework for the analysis of the case of Bulgaria.

3. Data and Methodology

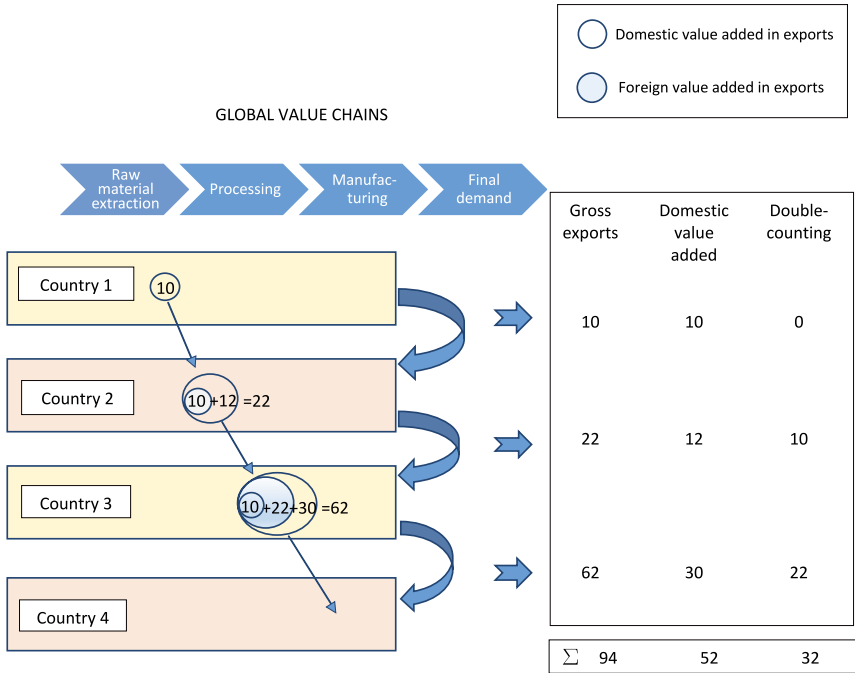
3.1. Data

With world trade and production being increasingly structured around GVCs, the sourcing and usage of inputs and components from multiple suppliers based in different countries challenges standard trade statistics (Antras et al., 2012). This is due to the fact that standard trade statistics are recorded in gross terms and as inputs cross borders multiple times, the value of intermediate inputs traded along the value chain is recorded several times (De Backer and Miroudot, 2014). In order to solve this problem, value added trade statistics can be used as it eliminates this double counting by showing where value is created along the production chain.

To illustrate the difference between standard trade statistics and value added statistics consider the following example (see Figure 1): Country 1 extracts iron ore and exports it for EUR 10 to Country 2, which processes it into steel and then exports it to Country 3. Country 2 adds value of EUR 12 to the iron ore by processing it and so exports EUR 22 to Country 3. Conventional trade statistics show gross exports of EUR 22, while only EUR 12 of value added has been generated in Country 2's production. To illustrate further, consider that Country 3 uses the imported steel for production of safe deposit boxes, adding value of EUR 30 to the steel

and exports the safe deposit boxes to Country 4 for final use. At this stage standard statistics would register gross exports of EUR 62 even though only EUR 30 of value added was created in Country 3. In other words, conventional trade statistics can overstate the importance of exports for GDP and make it difficult to visualise the production chain (De Backer and Miroudot, 2014)

Figure 1: **Difference between Gross Statistics and Value Added Statistics**



Source: based on UNCTAD (2013).

This is the reason behind the initiative of the OECD together with WTO to build a database of trade flow in value added terms that is based on a global model of international production and trade networks. This global inter-country input-output (ICIO) model is created using national and harmonised input-output tables (IOTs), national supply and use tables (SUTs), bilateral trade in goods by industry and end-use category (BTDIxE).¹ The model is used for the creation of the Trade in Value Added database

¹ http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1

(TiVA) which includes 61 economies and 34 industries in its October 2015 edition. The TiVA database can be used to extract useful information about the characteristics of GVCs, their development over time and the nature and impact of economic globalisation (OECD, 2015). Despite its usefulness, trade in value added statistics is still used as complementary to conventional trade statistics due to the significant delays in their publication and the low frequency of the data.

This analysis of the role of Bulgaria in GVCs is based on two separate OECD databases and is presented in a multi-country multi-industry framework. In particular, for most indicators related to GVCs that we have analysed we have used the October 2015 edition of the value-added database of OECD (TiVA). In the TiVA database data are available for the years 1995, 2000, 2005, 2008, 2009 and 2011. For two of the discussed indicators in the paper („length of GVCs“ and „distance to final demand“) we have used the May 2013 OECD Global Value Chains Indicators database and in order to establish possible trends we have examined the indicators for all available years (1995, 2000, 2005, 2008 and 2009).

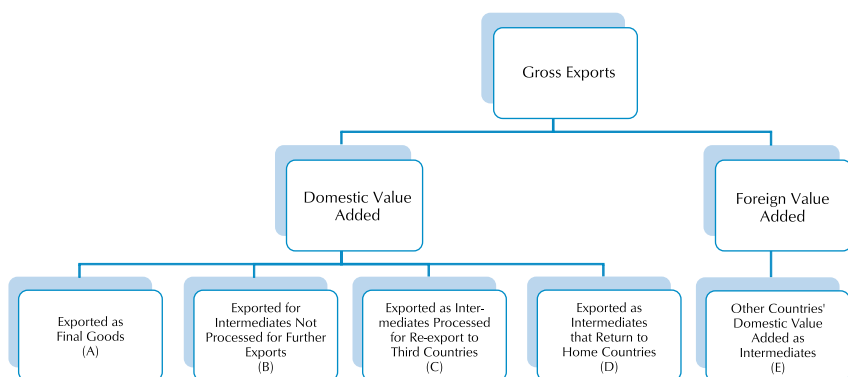
As our analysis is comparative we have chosen a reference group that covers the main types of economies in terms of different trade pattern in GVCs. The reference group includes economies with similar economic and historical development to Bulgaria (new Member States of the EU (NMS)²), main trading partners of Bulgaria and developed economies (the EU), natural resource exporters (Russia), large developed economies (the US), large developing economies (China) and technologically advanced economies with rather limited natural resources (Japan). In our analysis we emphasise on the comparison between Bulgaria, NMS and the EU as we believe this would allow us to draw the most relevant conclusions due to the economic similarities.

3.2. Methodology

In order to better understand the methodology used in this paper it is worth explaining in more details the way in which domestic and foreign value added are intertwined in gross exports. To achieve this goal we will graphically illustrate the decomposition of gross exports into its main five value added components.

² This group comprises of the Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia.

Figure 2: **Decomposition of Gross Exports into Value Added Components**



Source: IMF (2013).

The first two components (A and B) comprise the exports that are independent from the country's participation in supply chains, whereas the rest of the components represent exports that are related to the country's participation in supply chains. The participation of an economy in GVCs can be divided into two components: upstream (components (C)-(D)), which include domestic value added that is processed for further exports, and downstream (component (E)). A large share of the foreign value added in total exports can be interpreted as a sign that a country is a downstream participant in the supply chain, usually specialising in processing and assembly functions (IMF, 2013).

In order to conduct a more in-depth analysis of the role of Bulgaria in GVCs we have used several GVC-specific indicators, namely "participation index", "length of GVCs" and "distance from final demand".

Participation Index.³ The extent to which a country is engaged in global value chains is indicated by the "GVC participation index". Countries are involved in GVCs both as users of foreign inputs and as suppliers of intermediaries⁴ in other countries' exports and both of these elements are reflected in the index (OECD, 2013). Moreover, the GVCs participation index as developed by Koopman et al. (2010) is measured as a percentage of foreign inputs in gross exports (backward participation) and domesti-

³ Calculations are made based on the TiVA database updated as of October 2015. Latest available data entry in the database is for 2011.

⁴ We define intermediate products as goods and services consumed as inputs by a process of production, excluding fixed assets.

cally produced inputs used in third countries' exports (forward participation) (De Backer and Miroudot, 2014). In formal terms:

$$\text{Participation index} = \frac{IV_{ik}}{E_{ik}} + \frac{FV_{ik}}{E_{ik}}, \text{ for country } i \text{ and industry } k$$

where **IV** reflects the domestic value added embodied in third countries' gross exports (forward participation), **FV** indicates the foreign value added embodied in gross exports (backward participation) and **E** stands for the country *i*'s gross exports.

In its essence, the indicator measures both the import content (foreign value added content) of exports and the share of exports made of domestic value added used in third countries to produce other exports. The higher each one of these components is, the higher the participation of a country in GVCs. A larger value of the index shows greater integration in GVCs which, as indicated earlier, is considered beneficial for an economy.

Length of Global Value Chains.⁵ A complete understanding of how a country integrates into the production networks requires more than just looking at the participation index as a high **IV** share could correspond to the use of expensive raw materials in a simple chain, whereas a high **FV** share could be added at one go at the final stage of the production process. While the participation index underpins the importance of vertical specialisation and the degree to which a country is involved in a vertically fragmented production process, the "length of GVCs" is a complementary indicator that shows the average number of production stages required to realise a product or provide a service in a given final industry (OECD, 2015). The "length of GVCs" index allows for a more in-depth analysis of trade patterns as well as the gains from trade that a country exploits (Grossman and Rossi-Hansberg, 2008).

The average number of stages involved in the production of good *i* (N_i) depends on the number of stages required for each intermediate good (Fally, 2012). The index can be calculated at the industry level or aggregated at country level. Furthermore, it can be decomposed to reflect domestic production stages and foreign production stages by distinguishing between domestic inputs and foreign inputs.

The index of number of production stages was introduced by Fally (2012). It is calculated using input-output tables and is defined as a weighted-average number of plants involved sequentially in the production of good *i*.

⁵ Data for the index is extracted from the OECD Global Value Chains Indicators database updated as of May 2013. Latest available data is for 2009.

$$N_i = 1 + \sum_j \mu_{ij} N_j$$

where μ_{ij} is the share of inputs from industry j used to produce a good in industry i .

In our work we have used the index “length of GVC” based on the concept developed by Fally (2012) and calculated in the multi-country, multi-industry framework of the OECD Global Value Chains database. It is expressed through the following matrix:

$$N = u.(I-A)^{-1}$$

where N is a row vector with the indexes for all countries i and industries k , u is a row unit vector, and $(I-A)^{-1}$ is the well-known Leontief inverse matrix which represents the total production value that is directly and indirectly required to produce for final demand (De Backer and Miroudot, 2014).

The index takes the value of 1 if there is a single production stage in the final industry. The value of the index increases as intermediate inputs from the same industry or other industries are used in the production of the final good or service (OECD, 2015).

Distance to Final Demand.⁶ Once the depth and length of GVCs is assessed, the question of where an economy is located in the value chain remains. In order to establish the position of a country in the value chain we refer to an indicator called “distance to final demand”. The index defines whether a country is situated “upstream” or “downstream” in the GVC, depending on its specialisation. An “upstream” country is one which produces the raw materials in the beginning of the production process, whereas a “downstream” country is associated with the production of products closer to final consumers.

The “distance to final demand” is measured in terms of production stages and starting from one industry in a certain country it measures the number of production stages left before the goods or services reach final consumption. It is introduced by Fally (2012) and Antras et al. (2012). For each product Fally (2012) defines the distance to final demand (D_i) as:

$$D_i = 1 + \sum_j \varphi_{ij} D_j$$

⁶ See ref. 5

where φ_{ij} denotes the share of the production of good i that is used as an intermediate good in industry j .

Similarly, in a multi-country and multi-industry framework the OECD Global Value Chains database calculates “distance to final demand” as:

$$D = u.(I - G)^{-1}$$

where D is a row vector with the indexes for all countries i and industries k , u is a row unit vector, and $(I - G)^{-1}$ is best known as the output inverse or Gosh inverse matrix (De Backer and Miroudot, 2014).

The higher the value of the index, the more “upstream” the country or industry is – the more it is involved in the production of inputs at the beginning of the value chain. In case the entire production of a good is used for final consumption, the value of the index is one (Fally, 2012).

4. Factors to Consider When Interpreting the Results of GVCs Indicators

Economies are not all equally engaged in GVCs, just as they are not equally engaged in international trade. The role of individual countries in international production networks depends on different factors, such as the size of their economy, their level of development and the composition of their exports. As a result, countries with very different characteristics may be very similar in the ranking of GVCs participation. In this section we present some considerations, related to the interpretation of the indicators for participation in GVCs.

- **Level of fragmentation.** We should note that the level of fragmentation of production depends on the technical characteristics of products. Not all products can be produced in multiple stages. For example, vertical specialisation is less typical for services sectors, since face-to-face contact between the provider and the consumer is usually required in this area. Traditionally, a selected number of manufacturing industries has been at the forefront of value chain segmentation. The electronics and automotive industries, where products can be broken down into discrete components that can be separately produced, easily transported, and assembled in low-cost locations, have led the way in GVCs expansion and consequently rank highest by share of foreign value added in trade. A number of industries that incorporate and process outputs from extractive industries and traded

commodities (e.g. petroleum products, plastics, basic chemicals) follow closely behind (UNCTAD, 2013).

- **Share of natural resources in exports.** Countries with significant shares of natural resources in their exports, such as Russia, Brazil, Indonesia and Saudi Arabia, tend to have higher relative domestic value added trade shares, since these commodities are at the “beginning” of GVCs and require little foreign inputs (UNCTAD, 2013). Due to this outsized downstream usage of their export products in third countries’ exports, the measures for participation of natural resource exporters in GVCs appear elevated compared to other countries with similar characteristics.
- **Size of the economy.** Generally, small economies tend to score better than large economies in terms of participation in GVCs. This is because large economies like the US and Japan tend to display a greater degree of self-sufficiency in production for exports (large economies rely less on foreign inputs). Moreover, they also have lower downstream participation levels because of the focus on exporting the so-called final demand goods and services, i.e. those not used as intermediates in third countries’ exports (UNCTAD, 2013). Small economies tend to have higher import contents of exports and also export more intermediate rather than final products, which is indicative of a high degree of participation in GVCs. Such examples are the countries from East and South-East Asia, where GVCs participation is among the highest in the world, reflecting the region’s specialisation in export-oriented highly segmented manufacturing and processing activities. Due to the nature of the products they export, these countries also need to import more to generate exports, which in turn reduces the domestic value added embodied in their exports. However, despite the low domestic value added content of these countries’ exports, the overall contribution of value added trade to their GDP is usually high because of the overall importance of trade relative to the size of their economies.
- **Development stage of the economy.** According to Fally (2012), developed and developing countries tend to specialise in different stages along the value chain. In particular, richer countries like the US and Japan have a comparative advantage in goods that involve fewer production stages and which are closer to final demand.
- **Importance of Services.** Production in GVCs increases the need for the co-ordination and efficient linking of production stages across

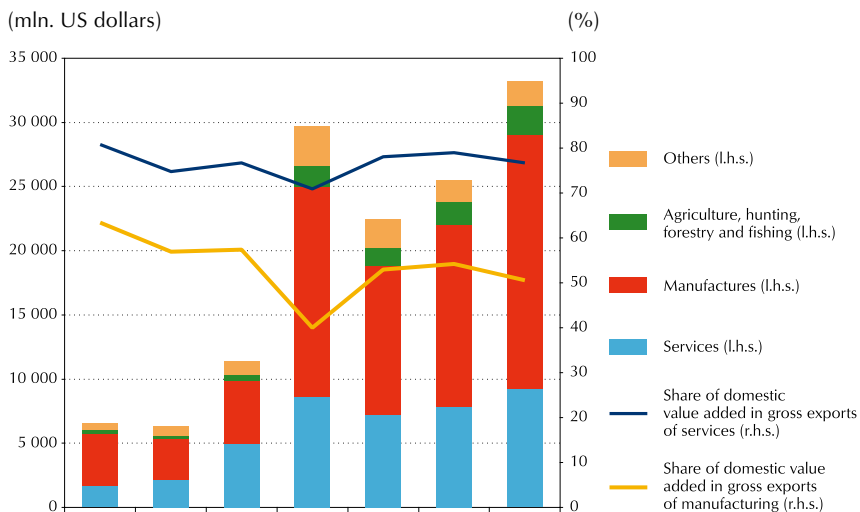
countries, with services playing a particularly prominent role. Services tend to have higher importance for overall exports in developed countries like the US, Germany and France compared to developing countries (OECD, 2013). Countries that rely more on exports of natural resources, such as Russia, Brazil and Canada, and manufacturing-intensive economies, such as China and Korea, have relatively low share of services value added in total exports. Despite this difference, the contribution of services has been increasing over time for both groups of countries. It should also be noted that services tend to have higher content of domestic value added because of the low usage of foreign inputs.

Based on these insights we could expect that as a small open economy that is part of the EU, Bulgaria would be well integrated in GVCs. Given the significance of primary commodities (such as petrol and metals) for the gross exports of Bulgaria, as well as the country's low endowment of natural resources, it follows that foreign inputs are likely to have a large contribution to the overall participation of the country in GVCs. Such participation characteristics are likely to place the products with which Bulgaria participates in GVCs relatively far away from final consumers. In the following two sections we analyse whether these expectations hold by discussing the structure of Bulgaria's exports and by examining the indicators discussed in Section 3.

5. Structure of Bulgaria's Exports

Before we focus on the indicators related to Bulgaria's participation in GVCs it is worth discussing the structure of Bulgaria's exports, which in recent years has established itself as one of the main drivers of economic growth in the country. An industrial breakdown of gross exports allows us to identify the sectors that are at the core of this export-led growth and after examining Bulgaria's participation in GVCs to be able to conclude whether these sectors are the ones in which Bulgaria participates in GVCs the most. As can be seen in Figure 3 the increase in gross exports in the period between 2000 and 2011 has been dominated mainly by the expanding exports of the manufacturing sector. Exports of services have also increased in the period under consideration but the growth was not as significant as the one in the manufacturing sector. It is interesting to note that exports of services are much less volatile than the manufacturing ones and during the financial crisis we can see that overall gross exports fell largely due to the lower manufacturing exports.

Figure 3: **Structure of Bulgarian Gross Exports**⁷



Source: OECD TiVA database, own calculations.

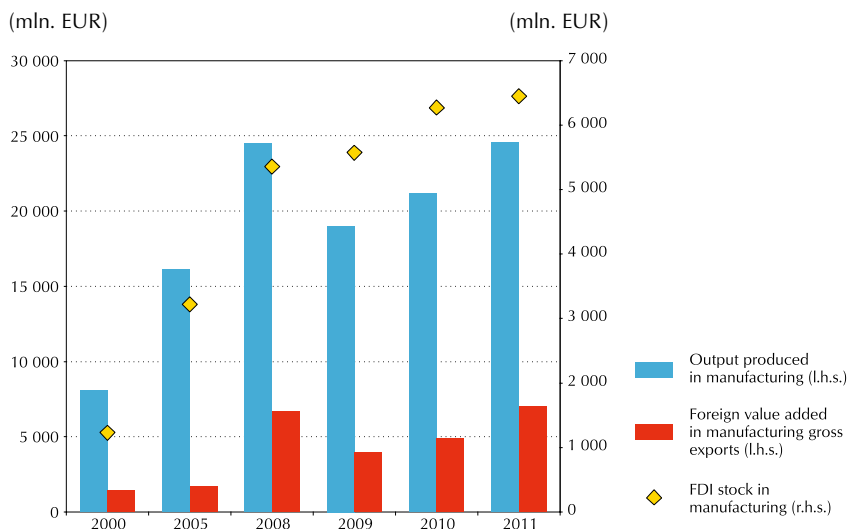
The large increase in the gross exports of the manufacturing sector between 2000 and 2008 can be partly explained with production expansion, following significant FDI inflows in this period (between 2000 and 2008 the stock of FDI in the manufacturing sector increased more than four times). These investments were mainly aimed at upgrading and expanding existing production units and as a result by 2008 total production in the manufacturing sector had increased more than three times compared to its 2000 level.

It should be noted, however, that the foreign value added in gross exports of the manufacturing sector increased more than the increase in the output of the sector (see Figure 4). This can partly be explained with the fact that major enterprises in the sector were bought by large multinational companies in the early 2000s and were integrated in the international supply chains of those companies. Data from EUROSTAT shows that in the

⁷ In this paper data for **Total Manufactures** as specified in the OECD TiVA database includes the following sub-categories: food products, beverages and tobacco, textiles; textile products, leather and footwear; wood, paper, paper products, printing and publishing; chemicals and non-metallic mineral products; basic metals and fabricated metal products; machinery and equipment nec; electrical and optical equipment; transport equipment; manufacturing nec; recycling. Data for **Total Services** incorporates as follows: wholesale and retail trade; hotels and restaurants; transport and storage, post and telecommunication; final intermediation; real estate, renting and business activities.

Bulgarian manufacturing sector the share of production value generated by foreign-owned⁸ firms in total production value has increased from 37.1% in 2003 to 54.6% in 2011. This has led Bulgarian affiliates to increase their usage of foreign inputs, produced elsewhere in the supply chain, which in turn led to an increase in the foreign value added component of these companies' exports.

Figure 4: **Manufacturing Sector in Bulgaria**

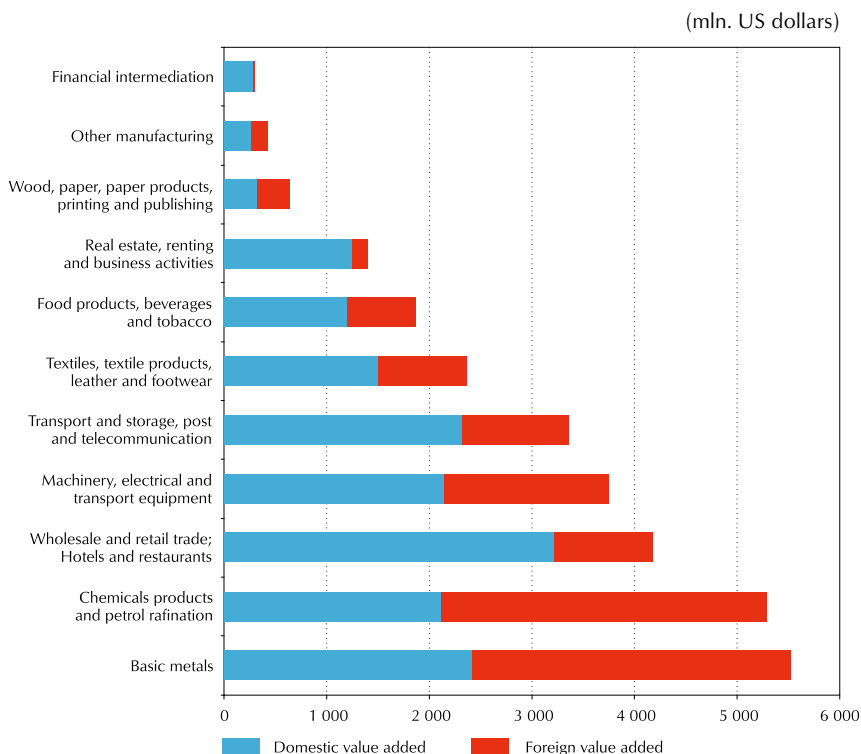


Source: NSI, BNB, OECD TiVA database, own calculation.

Despite that manufacturing appears to be the engine of Bulgarian exports growth between 2000 and 2011 (see Figure 3) we should have in mind that the benefits that the Bulgarian economy gets from exporting (in the form of employment, skills and income growth) could be larger in the services sector due to its higher level of domestic value added in exports. A closer look at the industry breakdown confirms that, indeed, manufacturing exports have a significant share of foreign value added and in 2011 two of the top three sectors in terms of exported domestic value added are services sectors (see Figure 5). This ambiguous role of the services sectors is why we will examine their contribution to overall trade performance in more detail in Section 7.

⁸ According to the EUROSTAT definition, foreign-owned firms are the ones where the controlling institutional unit is resident in a different country from the one where the institutional unit over which it has control is resident. http://ec.europa.eu/eurostat/cache/metadata/en/fats_esms.htm

Figure 5: Value Added in Bulgarian Exports (2011)



Source: OECD TiVA database, own calculations.

Now that we have established the general industrial structure of Bulgarian exports we can examine Bulgaria's role in GVCs and see whether the industries that led the overall exports growth are also the ones that are the most active participants in GVCs.

6. GVCs-specific Indicators

6.1. Participation Index

The participation index provides a direct way to establish the degree to which a country is involved in GVCs. As indicated in Section 3, by using this index, we are able to show the extent to which Bulgaria is taking part in vertically fragmented production chains as an importer of foreign inputs (backward participation) and as a supplier of intermediate products used in other counties' exports (forward participation).

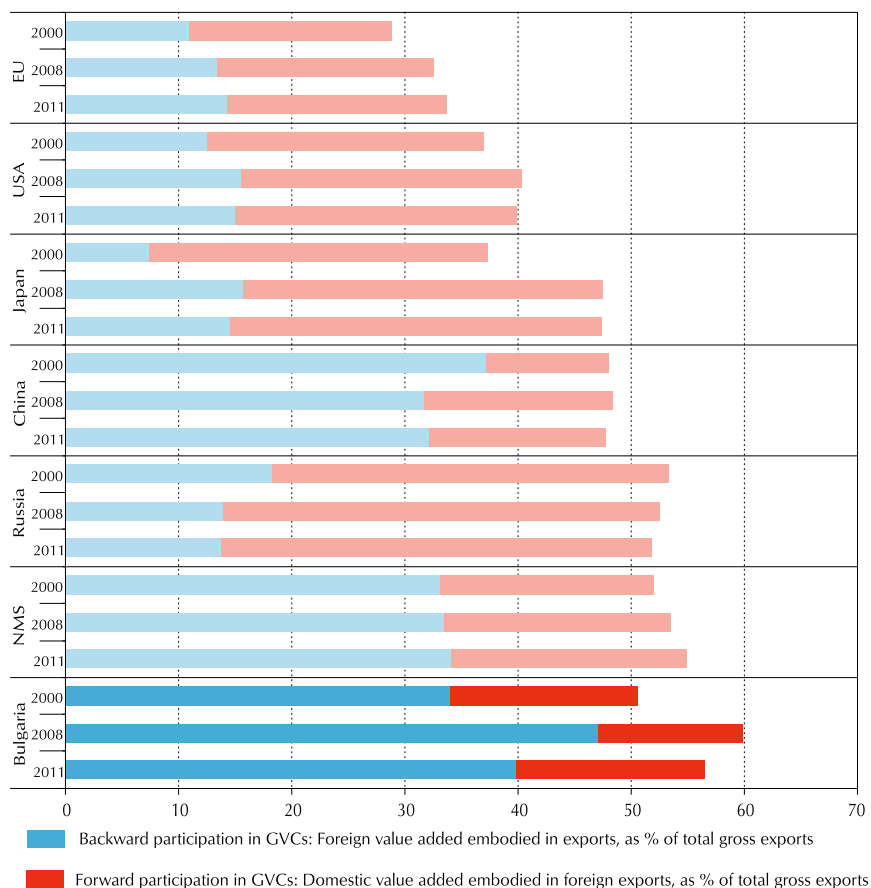
The participation index for Bulgaria is higher than the participation indices for the rest of the countries in the reference group (see Figure 6), which is mainly due to the high degree of backward participation of the country. This finding is consistent with our initial expectations. As a small open economy, Bulgaria sources more foreign inputs than large economies such as the US and the EU. Moreover, the large dependency on foreign inputs of the Bulgarian participation is even more evident when comparing it with a natural resource exporter such as Russia. This predominant backward participation of Bulgaria could be beneficial for the country since studies find that increases in foreign value added are associated with consequent increases in domestic value added (IMF, 2013) and that foreign value added in exports is a major channel of productivity increases through knowledge and technological transfers (Van der Marel, 2015). The result for Bulgaria's GVCs participation index is most similar to the one for the NMS⁹, both in terms of participation intensity and in terms of composition (with backward participation accounting for the largest part of the index). This is not surprising, given the similar level of economic and institutional developments in these countries, related to their membership in the EU.

Looking at the period 2000–2008 we observe that, with the exception of Russia, the countries in the reference group have recorded an increase in the participation in GVCs and this suggests an increase in the vertical specialisation of production (Di Mauro et al., 2013). This increase in the participation index is particularly evident for Bulgaria and could be related to the EU pre-accession period and the potential deepening of the integration of Bulgaria in EU GVCs.

Even though the global financial crisis in 2009 has contributed to a slow-down in the GVCs integration, Figure 6 illustrates that by 2011 the average participation in GVCs shows signs of recovery. For the case of Bulgaria the GVCs participation index in 2011 is lower than the level registered in 2008. It should be noted, however, that the country's forward participation has increased, which is a sign that Bulgaria is increasingly participating in the production of inputs used in third countries' exports. Even though Bulgaria hasn't fully recovered its pre-crisis GVCs participation rate by 2011, it still exhibits the highest value of the participation index compared to the rest of the countries in the reference group, which is indicative for the high integration of Bulgaria in GVCs.

⁹ From here on in this analysis NMS should be understood as the averaged result across the NMS countries.

Figure 6: GVCs Participation across Countries

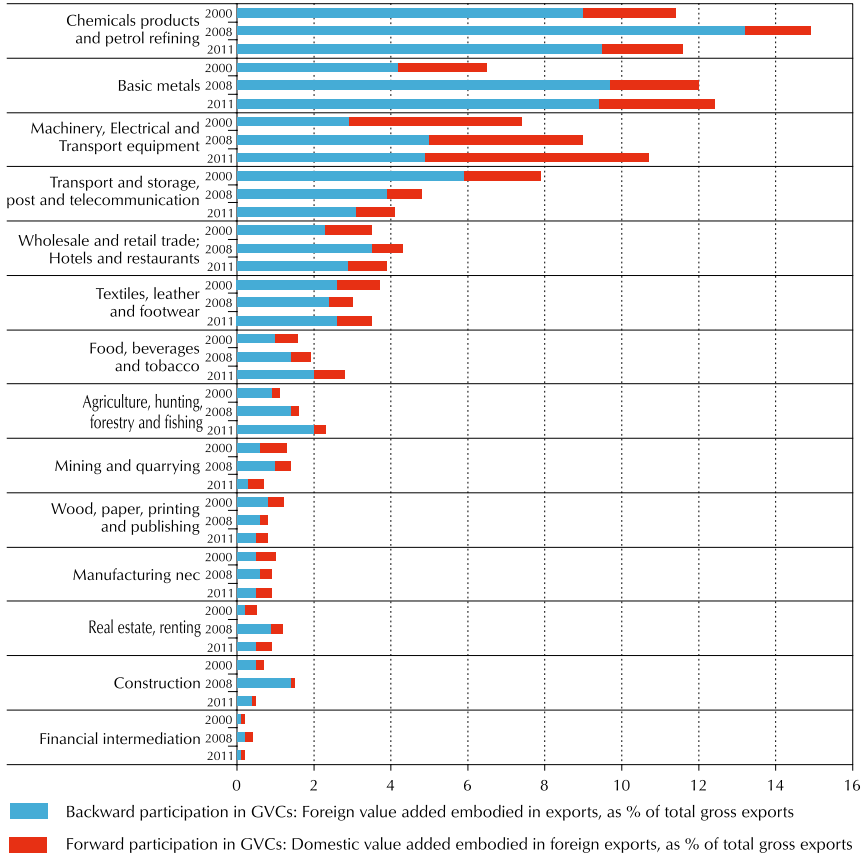


Source: OECD TiVA database, own calculations.

An industrial breakdown of the participation index (see Figure 7) shows that Bulgaria is most active in GVCs in the processing sectors of the manufacturing industry and mainly as an importer of foreign intermediate products (backward participation). By 2011 chemical products and petrol refining, basic metals and machinery, electrical and transport equipment had established themselves as the sectors with the highest participation index for Bulgaria. Overall, the country's role in GVCs in these sectors is mainly through the foreign value added embodied in exports (backward participation) but its forward participation has registered an increase compared to

its 2008 level. Moreover, Bulgaria's participation in the machinery industry has accelerated notably and this acceleration was defined to a large extent by Bulgaria's forward participation. This is evidence that Bulgaria is moving towards integration in supply chains in technology intensive sectors with higher value added production.

Figure 7: Bulgaria's Participation in GVCs across Industries



Source: OECD TiVA database, own calculations.

We should note that our results for the participation index and mainly the backward participation component of the index might be affected by price effects. The effect of prices on the amount of foreign value added in a country's exports is discussed by Cappariello and Felettigh (2015) and

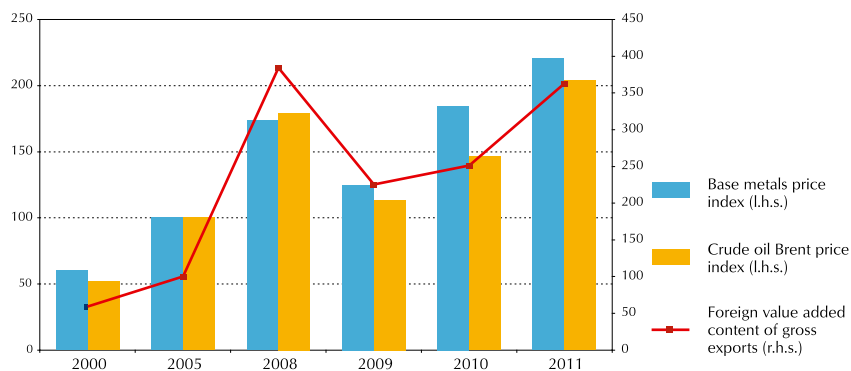
Nagengast and Stehrer (2015). Both papers conclude that the effect of prices is not the main driver of changes in the foreign value added content of gross exports but, nevertheless, should not be overlooked.

Since the value added is calculated from nominal data, an increase in prices of foreign inputs is likely to lead to an increase in foreign value added content of exports and, thus, to an upward shift in the relative importance of the backward component of the GVCs participation index to the forward one (given that we hold domestic value added more or less constant). This is quite evident in countries that specialise in processing since companies in that sector generally add certain value to the inputs they process. This domestic value added (which would represent the company's mark-up) is more or less stable in the short run since companies are constrained by their production technologies. On the other hand, input costs may vary significantly (like the international price of petrol and base metals) and since gross exports and domestic and foreign value added components are calculated using nominal data, it is likely that the foreign value added component of gross exports is more volatile.

This is relevant for the case of Bulgaria, where most of the participation in the GVCs and foreign value added is concentrated in the processing industry (for example, petrol products, metals and chemical products). This in turn explains why we see such significant movements in the foreign value added content of gross exports in line with the international business cycle, while the domestic value added, embodied in foreign exports, is much more stable (see Figure 6). According to Figure 8 in periods of cyclical upturns, when global economic activity is accelerating and prices of primary commodities (and thus prices of processing inputs) are rising, the foreign value added of gross exports tends to increase. On the other hand, in periods of global economic downturns, when global demand weakens and international prices of primary commodities are falling, the foreign content of gross exports also tends to fall.

Figure 8: Relationship between International Prices of Commodities and Foreign Value Content of Bulgarian Gross Exports

(index 2005=100, US dollars)

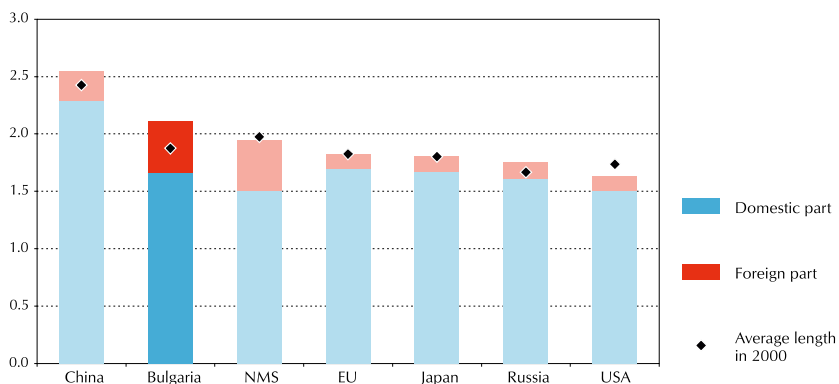


Source: ECB, OECD TiVA database, own calculations

6.2. Length of Global Value Chains Index

Thus far we have discussed the most widely used GVCs indicator, namely the participation index. However, in order to get a full picture of the role of Bulgaria in GVCs, this analysis looks at a complementary index which gives more information on the particular characteristics of the GVCs in which the country participates. The indicator for the average length of GVCs could be interpreted as showing the degree of production fragmentation in GVCs (see Figure 9).

Figure 9: Average Length of GVCs across All Industries (2009)

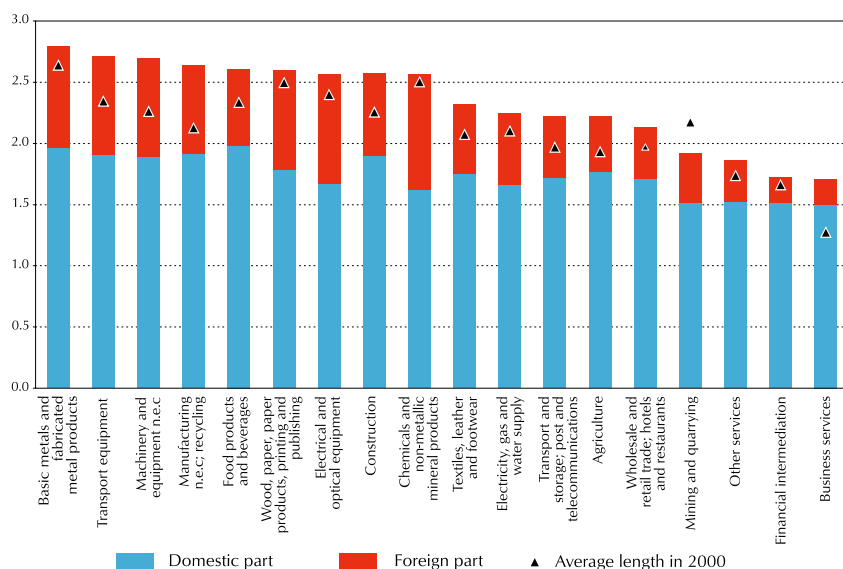


Source: OECD GVCs indicators database, own calculations.

As expected in our initial hypothesis, Bulgaria has one of the highest average lengths of GVCs across the considered countries, which is in line with the fact that Bulgaria has the highest rate of participation in the group and that its participation is dominated by sectors with highly fragmented production processes.

As noted in Section 3, production stages can be divided into domestic and foreign and through that the average length index can be divided into a domestic part and a foreign part. The ‘length of GVCs’ indicator shows that for all countries in our reference group, including Bulgaria, the domestic part is much higher than the foreign part. However, we should indicate that Bulgaria and the NMS have the highest foreign share of the average length of GVCs which could be attributed to the lower level of self-sufficiency they have compared to bigger and more developed economies like the US and Japan. Furthermore, this relatively higher foreign part is in accordance with the significant share of backward participation that both Bulgaria and the NMS register.

Figure 10: Length of GVCs by Industry (2009)



Source: OECD GVCs indicators database, own calculations.

The index shows that for the case of Bulgaria, unlike the US, Japan and the EU, there has been an increase in the average length of GVCs in the period 2000–2009 (see Figure 10). The notable increase of the index for

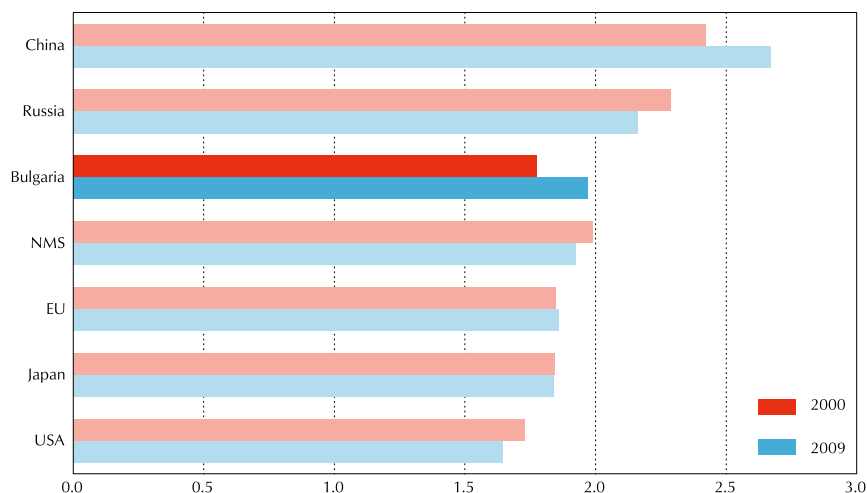
Bulgaria compared to the rest of the reference group could be due to the increasing role of the manufacturing sector for Bulgaria's exports. Fally (2012) finds that fragmentation of production in the US has been decreasing over time mainly because of the increasing role played by services relative to the manufacturing sector in the US economy. In the case of Bulgaria it could be the opposite – the increasing role played by the manufacturing sector compared to that of the services sector could have led to the increase in the average length of GVCs that the country participates in. We can assess this hypothesis by investigating the industrial breakdown of the average length of GVCs for Bulgaria and its dynamics.

At industry level, the average length of GVCs index shows highest values for Bulgaria for industries in which the participation in GVCs index is also high. In the period 2000–2009 sectors with high fragmentation of production such as machinery and equipment, transport equipment and basic metals have registered significant increases in the average length of their GVCs. This confirms our hypothesis that the overall increase in the average length of GVCs in which Bulgaria participates is a result of an increase in the importance and length of GVCs related to the manufacturing sector. Conversely, the length of the chains for Bulgaria in the services industries such as financial intermediation is quite low and has registered a decrease in the period 2000–2009 due to the generally low fragmentation of production in these sectors (see Section 4).

6.3. Distance to Final Demand Index

In this section we examine the position of Bulgaria in GVCs through the distance to final demand index. Using this index we establish whether Bulgaria's participation is at the beginning of the GVCs or closer to the final consumers. The value of the index is to a large degree defined by the production specialisation of the country. According to Figure 11, Bulgaria, similarly to the NMS, has a high distance to final demand index. The index establishes Bulgaria in the reference group as more involved in the initial stages of the production process (an "upstream country") and further away from final consumers, compared to large developed economies like the USA, EU and Japan. The only countries that register higher distance to final demand are China and Russia. In the case of China this can be explained with the country's role as a world leader in terms of assembly and processing functions. Russia, on the other hand, is a country rich in natural resources, which are typically used at the beginning of the production process. This explains why Russia's exports are far from final demand.

Figure 11: Distance to Final Demand for Bulgaria



Source: OECD GVCs indicators database, own calculations.

Bulgaria's distance to final demand index has increased between 2000 and 2009 (see Figure 11). This can be interpreted as a sign that the country is deepening its specialisation in the production of inputs. Studies find that on average, most countries move upstream (their distance to final demand increases) which is explained with the overall increase in the length of GVCs and the outsourcing phenomenon. When the production of some inputs is outsourced, their value added is moved backward to the industries supplying intermediate inputs and the distance to final demand increases (De Baker and Miroudot, 2014). In the case of Bulgaria the increase in the distance to final demand between 2000 and 2009 is likely to reflect the increased outsourcing as part of the country's integration in production processes with higher fragmentation. The fact that Bulgaria has moved upstream is consistent with the observed increase in the length of the GVCs that the country participates in.

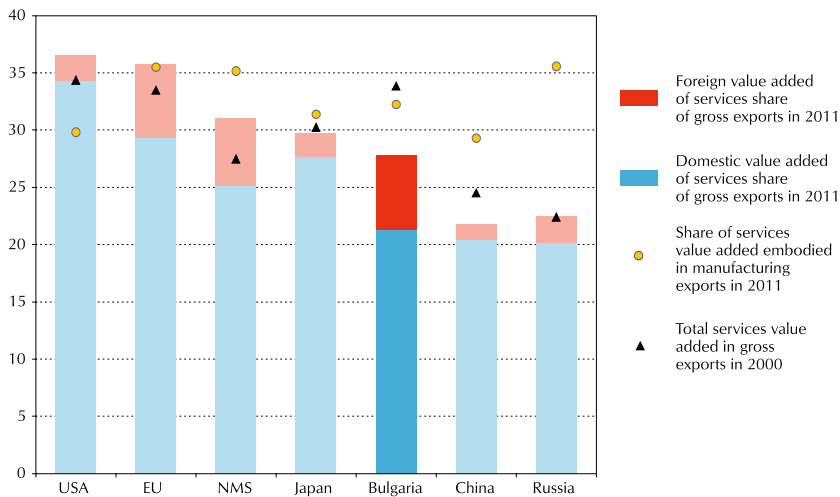
7. The Role of Services

Production in GVCs increases the need for the co-ordination and efficient linking of production stages across countries, with services playing a particularly prominent role. Production in GVCs relies heavily on logistics, information and communications technologies and therefore on efficient network infrastructures and complementary services (OECD, 2013). In

fact, a significant part of the international production networks of MNEs are geared towards providing services inputs to their country affiliates (UNCTAD, 2013). The importance of services becomes evident once data on trade in value added is used. According to UNCTAD (2013), the share of services in gross exports worldwide is only around 20%, while around 40% of the value added inputs to exports is contributed by service-sector activities since most manufacturing exports require significant services inputs for their production. Therefore, in order to complete our analysis of the role of Bulgaria in GVCs we look further at the role of services.

Figure 12: **Services Value Added (2011)**

(%)



Source: OECD TiVA database, own calculations.

According to Figure 12 the share of services value added in gross exports of Bulgaria is lower than the one for developed economies like the USA, EU and Japan. It is also lower than the average for its EU peers from Central and Eastern Europe and, thus, suggests that Bulgaria's services sector is still underdeveloped compared to the other NMS. Unlike the NMS and the EU as a whole the share of services value added in total Bulgarian gross exports has fallen compared to 2000, which can be explained by the increasing importance of manufacturing sector exports (relative to that of the services sector exports) for the overall growth of gross exports (illustrated in Figure 3). We could expect that as Bulgaria catches up with more developed economies the importance of services value added for

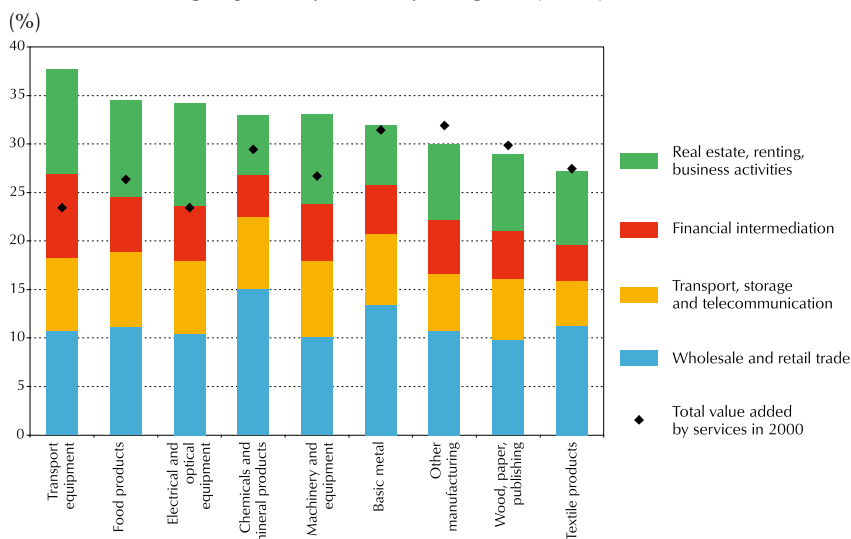
exports will increase, becoming a vital source of productivity growth and competitiveness.

Despite the lower importance of the services sector for the country's overall gross exports, Bulgaria shares some similar characteristics with NMS and the EU in terms of the relatively high share of foreign services value added in gross exports and the high share of services value added embodied in manufacturing exports. Both characteristics are related to the high fragmentation of production across countries in the EU. Numerous studies like IMF (2013) show that since the 1990s large labour cost differentials together with geographical proximity and cultural similarities have led many firms from developed euro area countries (especially Germany) to shift part of their manufacturing production (like motor vehicles and other transport equipment) to Central and East European countries, while retaining control over functions with high domestic value added such as production management, design, marketing and R&D. This can explain the high share of foreign services value added in gross exports and the high share of overall services value added in manufacturing exports in Central and East European countries.

As mentioned earlier, manufacturing includes more and more value added from service-related activities. Firms use logistics, communication services and business services in order to facilitate the efficient functioning of the production process in GVCs. At the same time firms use services like design, development, marketing, warranties and after-sales care to differentiate, customise and upgrade products, allowing them to capture more value. According to OECD (2013), value created by services as intermediate inputs represents over 30% of the total value added in manufactured goods. The results for Bulgaria are similar – almost 33% of Bulgaria's manufacturing exports represent services value added (see Figure 12). This is lower compared to the percentage in the rest of the NMS and the average level for the EU, which may reflect the different product structure of Bulgarian manufacturing exports.

Distribution and transport services contribute more than half of the services value added in Bulgarian manufacturing exports as they provide the necessary links in supply chains. Business and financial services which are aimed at improving the efficiency of goods production inside the GVCs generally contribute to a lesser extent in the case of Bulgaria (see Figure 13). It appears that manufacturing sectors that have considerably increased their usage of services inputs are part of the more complex and higher value added machinery production industry.

Figure 13: Services Value Added Embodied in Manufacturing Exports by Industry, Bulgaria (2011)



Source: OECD TIVA database, own calculations.

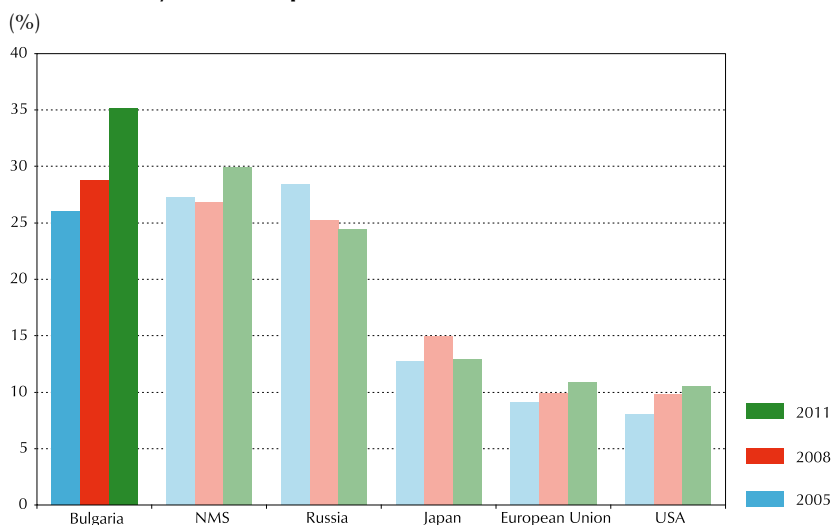
Although there are signs of increasing usage of services in fast-growing higher value added sectors such as machinery production, the role of services for Bulgaria's exports remains less significant than the one for more developed economies. The underdeveloped services sector is one of the reasons why Bulgaria's participation in GVCs is mainly through the usage of foreign value added in its exports.

8. Impact of Participation in GVCs on Bulgaria

Our results so far suggest that Bulgaria's exports are predominantly intermediary products, which are far away from final consumers and have low domestic value added content. This poses the question of whether Bulgaria is able to benefit from its, as we saw, extensive participation in GVCs.

Despite the fact that domestic value added content of exports is relatively low for Bulgaria the share of domestic value added in exports to GDP is higher than that of the other countries from the reference group because of the large volume of exports relative to the size of the economy (see Figure 14).

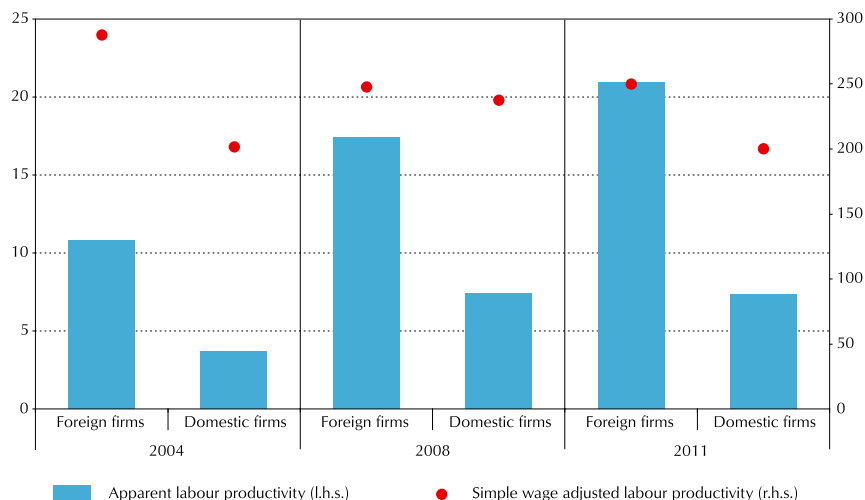
Figure 14: Domestic Value Added Embodied in the Country's Gross Exports as a Share of GDP



Source: OECD TiVA database, IMF WEO April 2016, own calculations.

Figure 14 shows that in the period 2005–2011 the domestic value added embodied in gross exports as a share of GDP increased most significantly in Bulgaria compared to the other reference countries and regions. This also corresponds to a period of increasing participation of Bulgaria in GVCs. This would imply that the increased exports that resulted from Bulgaria's deeper integration in GVCs has stimulated the generation of domestic value added, which is likely to have boosted economic activity by increasing the demand for labour and investment.

Section 5 illustrated that foreign direct investment has played a crucial role for the deeper integration of Bulgaria in GVCs and that foreign-owned firms account for a large part of the production value (around 39% of total production value in 2011), especially in the sectors that register highest GVCs participation rates for Bulgaria (e.g. the manufacturing sector, where foreign-owned firms account for around 55% of total production value in 2011). Evidence suggests that foreign-owned firms in Bulgaria exhibit higher productivity rates compared to domestically-controlled firms and thus raise the overall productivity of the economy (see Figure 15).

Figure 15: **Productivity of Foreign- and Domestically-owned Firms in Bulgaria**

Note: Apparent Labour Productivity is calculated as gross value added per person employed; Simple wage adjusted labour productivity is calculated as gross value added by personnel costs, expressed in percent (%).

Source: EUROSTAT, own calculations.

What is more, the presence of these more productive foreign-owned firms on the local market is likely to have positive spill over effects on the rest of the economy through knowledge and technology transfers, as well as through increased competition.

9. Conclusion

The production of goods has become increasingly fragmented across countries due to the expansion of GVCs, which defines the need for policy makers to be well-informed about the position of their countries in such chains. In this paper we analyse the role of Bulgaria in GVCs by using value added data from the OECD TiVA (October 2015) and OECD Global Value Chains (May 2013) databases. The use of these databases offers a number of advantages in examining participation in GVCs compared to standard gross trade statistics. However, it should be noted that the low frequency of the data in the databases as well as the significant lag with which the data is published represent a limitation to the analysis.

For the purpose of comparison we present the results for Bulgaria alongside those for a chosen reference group of countries within which we

pay particular attention to the countries from Central and Eastern Europe that joined the EU after 2004. The analysis on the participation in GVCs is centred around three main indicators, namely “Participation in GVCs”, “Length of GVCs” and “Distance to final demand”. The paper also discusses the role of services for Bulgaria’s export performance, given their increasing importance in the operations of GVCs.

Our findings show that Bulgaria has increased its involvement in GVCs in the years prior and after the country’s accession in the EU and as of 2011 registers the highest GVCs participation rate among the countries from the chosen reference group. Bulgaria’s involvement in GVCs is mainly in terms of the manufacturing sector, where the increased participation in supply chains was facilitated by the large inflows of FDI, especially in the years before the global financial crisis. Our results point to the conclusion that Bulgaria participates in GVCs mainly as an “upstream” country, which specialises in processing functions. As such Bulgaria requires the use of considerable amounts of foreign inputs which in turn leads to a high share of foreign value added in total Bulgarian exports. Despite that the share of domestic value added in Bulgaria’s exports appears to be low, the welfare gains from trade are larger for Bulgaria than for the rest of the countries in the reference group due to the large volume of trade relative to the size of the Bulgarian economy. Our results also suggest that given Bulgaria’s specialisation in processing functions, the country participates in highly fragmented production chains and exports mostly intermediary products, which are situated far away from final consumers. The increased participation of Bulgaria in highly fragmented production chains of the manufacturing sector between 2000 and 2009 has led to an increase in both the average length of GVCs in which Bulgaria participates and the distance to final demand of the country’s exports. Our analysis shows that the services sector in Bulgaria remains less developed compared to advanced economies and the NMS, both in terms of the direct exports of services and the extent to which services are used to facilitate the efficient production of other sectors in GVCs. However, as Bulgaria catches up with more developed economies the importance of services value added for exports will increase, becoming a source of productivity growth and competitiveness. Such a tendency can already be observed in some fast-growing higher value added manufacturing sectors, where the importance of services’ inputs has been increasing.

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