

The Participation and Position of Türkiye in Global Value Chains (GVCs): The Case of Manufacturing Sub-sectors

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Abstract

This paper aims to investigate the participation and position of manufacturing sub-sectors in global value chains (GVCs) for the 1995-2020 period. For this purpose, participation and position indexes are calculated using the study by Koopman et al. (2010). In the paper, OECD TiVA (2023) data covering the 1995-2020 period are used. Results prove that the GVCs participation index has increased in all sub-sectors over the period. From 1995 to 2020, the growth rate of the GVCs participation index ranges between 33% and 68%. In contrast, the GVCs position index is negative in all sub-sectors for all years. The negative position index indicates that sub-sectors are integrated into the international production process through backward linkages. As a result, the import dependency of sub-sectors also increases. The increase in domestic and foreign value added confirms this situation. While domestic value added (DVA) shows a decreasing trend over the period, foreign value added (FVA) demonstrates an increasing trend. Additionally, in the manufacturing industry, the FVA growth rate (94%) is higher than that of DVA (%81) from 1995 to 2020.

JEL Codes: F02, L60, C67.

Keywords: Global Value Chains (GVCs), Manufacturing Industry, Türkiye's Economy, Domestic Value Added (DVA), Foreign Value Added (FVA).

1. Introduction

In the post-1980 period, global value chains (GVCs) have emerged as a prominent characteristic of the world economy. Because of the liberalization policies, the process of international fragmentation production has accelerated (Miroudot et al., 2013). For that reason, GVCs have become a significant key topic in development and trade policy (Kummritz, 2016). There are different ways for firms operating in a country to participate in GVCs, which have become more important since 2000. Accordingly, a country can participate in GVCs through activities such as extraction of natural resources, design, management, research and development (R&D), different types of manufacturing, marketing, distribution, or after-sales services in the production process of any goods or services (Kowalski et al. 2015). In this way, each country specializes in different stages of production and generates value added. Due to improved information and communication technologies, developing countries' participation in GVCs has increased and they can easily access global markets by carrying out stages in the production process (Pahl & Timmer, 2020). It can be argued that as a developing country, Turkey is rapidly integrating into global trade and GVCs. For this purpose, Figure 1 and Figure 2 are drawn, which show the exports and the domestic and foreign value added of the Türkiye's manufacturing industry.

Figure 1 illustrates Türkiye's overall economy and manufacturing industry gross exports between 1995 and 2020. The data prove that both total and manufacturing industry gross exports increased over the period. In 1995, Türkiye's gross exports were approximately \$37 billion, while in 2020 gross exports increased \$182 billion. Similarly, manufacturing gross exports increased from \$16 billion in 1995 to \$107 billion in 2020. Between 1995 and 2020, gross exports increased by 79%, whereas the manufacturing gross exports surged by 85%. Manufacturing gross exports constitute around 52% of total exports, which indicates that the manufacturing industry accounts for a significant portion of gross exports.

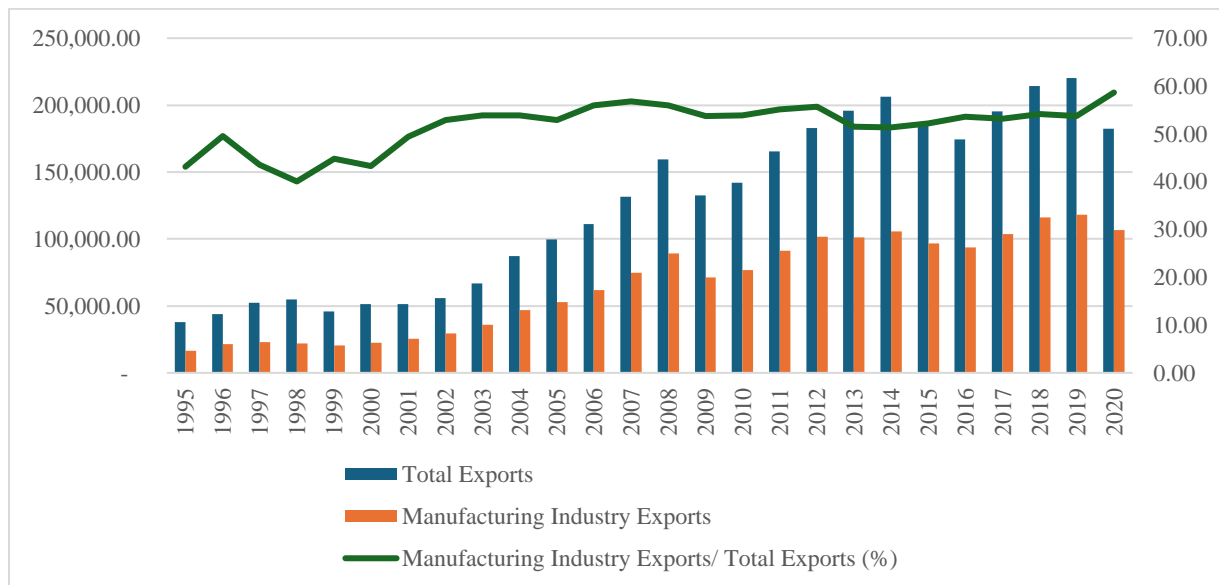


Figure 1: Manufacturing Industry Exports 1995-2020 (Millions).

Source: OECD-TiVA (2023).

Domestic Value Added (DVA) and Foreign Value Added (FVA) are two important components of GVCs. Figure 2 presents DVA and FVA in the manufacturing industry for the 1995-2020 period. Turkey's manufacturing gross exports have been growing steadily, as shown in Figure 1. In line with the increase in exports, DVA and FVA in manufacturing gross exports are also

rising. However, when looking at the shares of FVA and DVA in the manufacturing gross exports, it can be observed that DVA tends to decline over the period, while FVA tends to increase. In 1995, DVA and FVA of gross exports were 88% and 12% respectively, whereas in 2020 they are 72% and 28% respectively. These results indicate that the dependency on imported intermediate input of exports increased over the period.

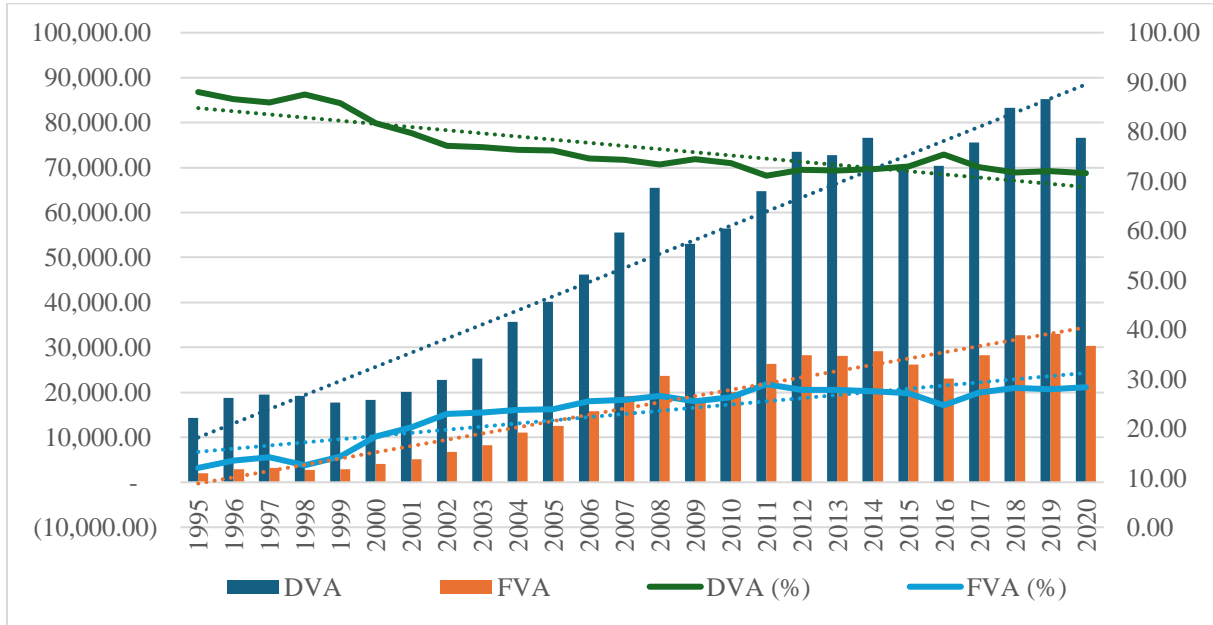


Figure 2: Domestic Value Added (DVA) and Foreign Value Added (FVA) 1995-2020 (Millions)

Source: OECD-TiVA (2023).

The aims of this paper scrutinize the position and importance of Türkiye's manufacturing industry in GVCs for the 1995-2020 period. Hence, OECD-TiVA (2023) database, which is the most up-to-date edition, are used. This paper is expected to contribute to the literature due to the limited number of studies on Türkiye's economy in the literature and the fact that the existing studies are not up-to-date. This paper consists of four sections. The first section of the paper includes the introduction. The second section summarizes a brief of the empirical literature. The third section describes the data, and methodology, and provides empirical findings. The fourth section offers the conclusion.

2. Literature Brief

Phuong & Hai (2023) scrutinize Vietnam's position and participation in the GVCs for the automotive sector. The paper recommends that although Vietnam's automotive sector provides high participation in GVCs, it is located downstream of global production. This shows that the automotive sector participates in GVCs mostly through backward linkages. Kersan-Skabic (2017) determines the importance and characteristics of GVCs in the EU's new member states over the period of 1995-2011. The author posits that among these countries, Hungary is the most integrated into GVCs, while Croatia is the least integrated. Concurrently, the author emphasizes that backward linkages effects are more dominant in the participation in GVCs. Banga (2013) used OECD-TiVA database to calculate GVCs for different countries over the 1995-2011 period. The paper proves that 67% of total GVCs are created by OECD countries, 25% of total GVCs are created by BRICS and NICs countries, and 8% of total GVCs are created by other developing countries. Another important finding of the study is that in developed countries, forward linkages are higher than backward linkages. In developing countries,

however, backward linkages are higher than forward linkages. Los et al. (2015) explore participation in the GVCs across 40 countries using input-output models. Similarly, the results of this study also show that foreign value added increases continuously as countries integrate into global production processes.

It can be posited that studies on Türkiye's economy are relatively scarce in the existing literature. Some studies in the literature on Türkiye's economy are summarized as follows: For example, in the study conducted by Alkın (2020), in Türkiye's manufacturing industry for the 2000-2014 period, it was found that while exports' domestic value added is higher in the agriculture and services sectors, exports' foreign value added is higher in the manufacturing industry. Therefore, this also indicates that the participation of the manufacturing industry in GVCs occurs mainly through backward linkages. Dağıstan (2019) investigated vertical specialization in Türkiye's foreign trade by input-output model. The results of the paper register that the exports' foreign value added increased throughout the 1995-2011 period. Wigley et al. (2018) analyzed the integration process of Türkiye's manufacturing industry and sub-sectors to GVCs in the period 2000-2011. The authors argue that manufacturing industry sectors significantly integrated into GVCs in this period. The computed GVCs position index in the study shows that the participation of manufacturing industry sectors in GVCs occurred mainly through backward linkages. According to Dağıstan (2017), from 1995 to 2011, it suggest that the domestic value added in Turkey's exports decreased, while foreign value added increased. The increase in foreign value added over the period demonstrates that sectors participate in GVCs through backward linkages in Türkiye. Gündoğdu & Saraçoğlu (2016) examined, utilizing input-output models, the Türkiye's participation in GVCs for the 1995-2011 period. The results of the paper indicate that backward participation in GVCs increased from 1995 to 2011. In addition, the authors suggest that the vertical specialization in the mid-high and high-tech sectors is greater than that in the mid-low and low-tech sectors.

3. Research Methodology, Data and Results

In this paper, the OECD-TiVA (2023) database is used to examine the position of Türkiye's manufacturing industry in GVCs. The most recent edition of TiVA (Trade in Value Added) is available for all the years from 1995 to 2020. TiVA indicators use an industry based on the International Standard Industrial Classification Revision 4 (ISIC Rev. 4), and it consists of 45 sub-sectors and covers 76 countries (OECD, 2023)¹.

The papers of Koopman et al. (2010) and Koopman et al. (2012) are followed to calculate the position and participation of the manufacturing industry in GVCs. According to papers, participation and position in GVCs are calculated as follows:

$$\text{GVCs participation} = \text{DVA}/\text{EXP} + \text{FVA}/\text{EXP} \quad (1)$$

$$\text{GVCs position} = \log(1 + \text{DVA}/\text{EXP}) - \log(1 + \text{FVA}/\text{EXP}) \quad (2)$$

Equation (1) indicates the sectors' GVCs participation index. Equation (2) indicates the sectors' GVCs position index. In equations, EXP is gross exports, DVA is the domestic value added in foreign exports (forward linkages), and FVA is the foreign value added in domestic exports (backward linkages) (Dağıstan, 2017; Wigley et al. 2018). The GVCs participation index measures the extent to which a country is involved in a vertically fragmented production process. A country's participation in GVCs is either through forward linkages (intermediate export) or backward linkages (intermediate import). In this regard, as seen in Equation (1), the

¹ Also see <https://stats.oecd.org/#>

GVCs participation index is the sum of forward and backward linkages (Wigley et al. 2018). The GVCs position index is an indicator of a country's specialization in the first or last stage of production. The GVC position index grows when a country's forward linkages are stronger than its backward linkages. In this context, if a country is upstream/downstream in the production network (first stages of production / last step of production), it is likely that it has a high value of forward participation/backward relative to backward/forward. If the backward participation of a country is higher (specializes in the last steps of production), it indicates that the country has a high import dependency on intermediate input (Kersan-Skabic, 2017; Wigley et al., 2018).

Figure 3² proves the DVA of gross exports increased by %81 and the FVA of gross exports increased by 94 in the manufacturing industry (C) from 1995 to 2020. Over the period of 1995-2020, only in the coke and refined petroleum products (C19), DVA decreased by -2%. In general, in other sub-sectors, DVA increased. The sub-sector with the highest increase (94%) in DVA is fabricated metal products (C25). During the period, in all sub-sectors, the rate of increase of FVA is higher than DVA. The sub-sector with the highest increase (98%) in FVA is motor vehicles, trailers and semi-trailers (C29), while the sub-sector with the lowest increase (74%) in FVA is coke and refined petroleum products (C19).

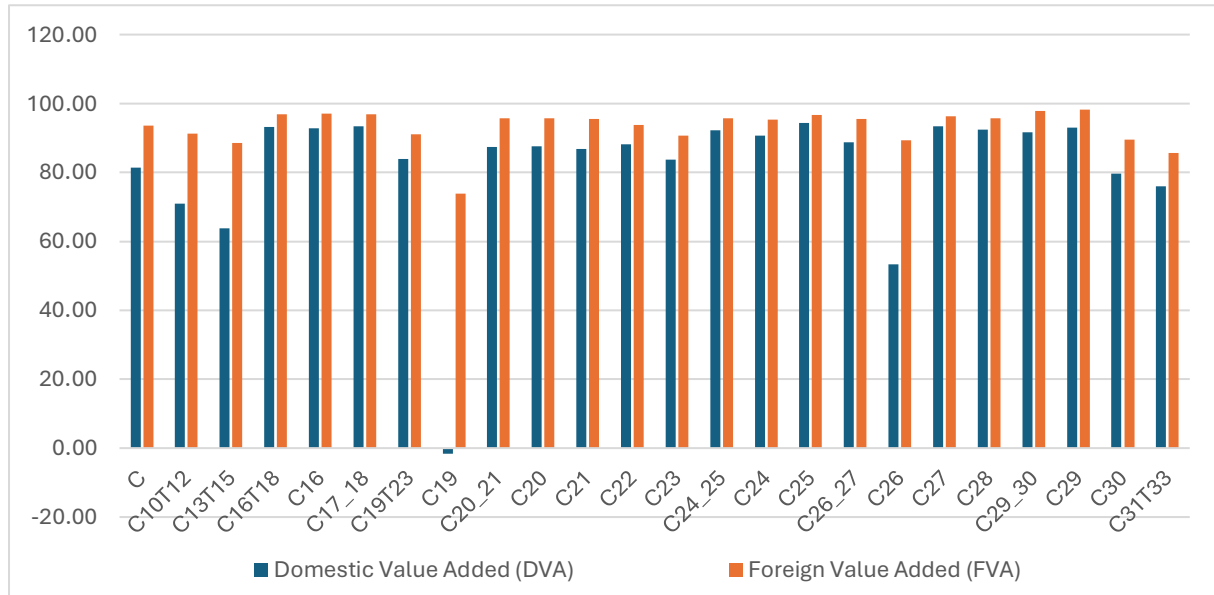


Figure 3: Domestic and Foreign Value Added in Manufacturing Industry, 1995-2020 (%).

Source: Authors' Calculation based on OECD-TiVA (2023).

Figure 4 shows the percentage change in the share of DVA and FVA in gross exports from 1995 to 2020. In all sub-sectors, as seen in Figure 4 the share of DVA in gross exports decreased from 1995 to 2020. In the manufacturing industry (C), the share of DVA in gross exports decreased by 23% from 1995 to 2020. Over the whole period, the sub-sector with the highest decrease (107%) in the share of DVA in gross exports is the coke and refined petroleum products (C19), while the lowest decrease (10%) is other non-metallic mineral products (C23). The percentage of share FVA in gross exports increased in all sub-sectors in the 1995-2020 period. In the manufacturing industry (C), the percentage of share FVA in gross exports increased by 56% from 1995 to 2020. From 1995 to 2020, in the manufacturing industry, the sub-sector with the

² Sectors' codes and description are given in the Annex Table 1

highest increase (70%) in the share of FVA in gross exports is computer, electronic and optical products (C26), while the lowest increase (33%) is electrical equipment (C27).

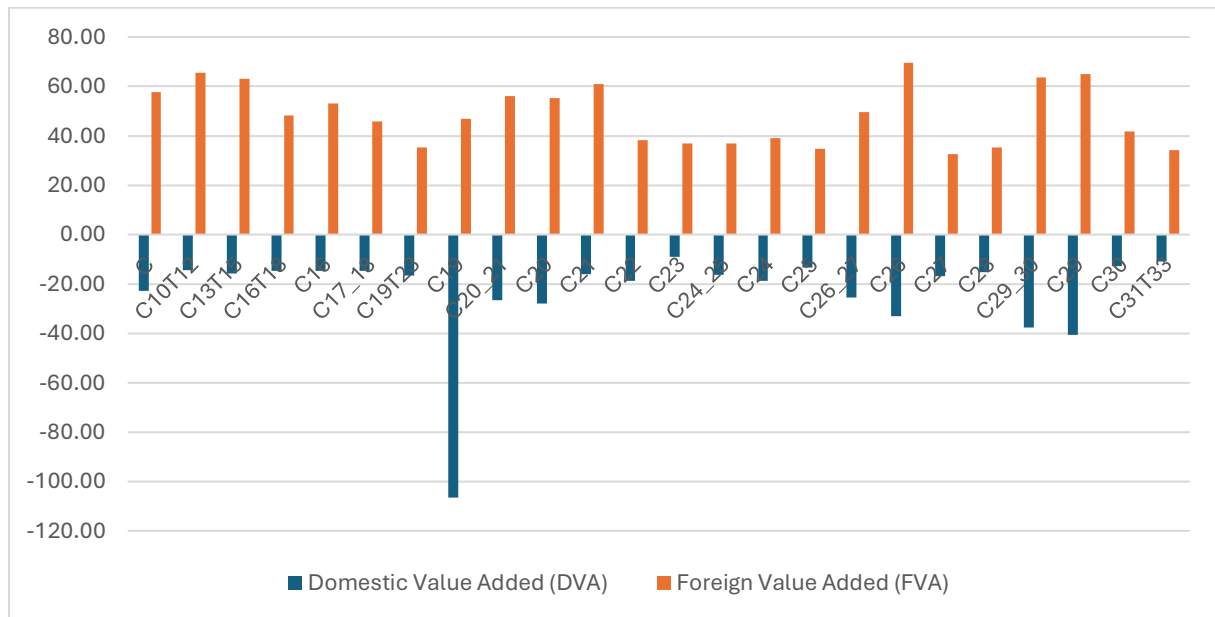


Figure 4: Domestic and Foreign Value Added Share of Gross Exports in Manufacturing Industry, 1995-2020 (%).

Source: Authors' Calculation based on OECD-TiVA (2023).

Based on Equation 1, the GVCs participation index has been calculated. Table 1 shows the GVCs participation index for the manufacturing industry over the period of 1995-2020. Results prove that manufacturing industry sub-sectors have increased participation in GVCs in 2020 in comparison with 1995. Similarly, the total economy has increased participation in GVCs in 2020 comparison with 1995. The GVCs participation index for the total economy is 20.5 in 1995, and it is 38.7 in 2020. The GVCs participation index for the manufacturing industry (C) is 19.3 in 1995, and it is 40.7 in 2020. In particular, since the year 2000, the GVCs participation index in the manufacturing industry (C) has been higher than that of the total economy. Over the entire study period, the sub-sector with the highest GVCs participation index is the coke and refined petroleum products (C19), while the sub-sector with the lowest GVCs participation index is food products, beverages and tobacco (C10T12). From 1995 to 2020, the sub-sector with the highest increase in the GVCs participation index is computer, electronic and optical products (C26), while the sub-sector with the lowest increase is electrical equipment (C27).

Table 1: GVCs Participation Index for Manufacturing Industry, 1995-2020.

| | 1995 | 2000 | 2001 | 2002 | 2008 | 2009 | 2010 | 2011 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Total | 20.5 | 28.4 | 28.9 | 30.4 | 35.5 | 32.0 | 33.7 | 37.5 | 36.2 | 35.5 | 37.7 | 39.2 | 38.3 | 38.7 |
| C | 19.3 | 27.7 | 29.8 | 32.4 | 37.4 | 34.9 | 36.4 | 40.3 | 37.9 | 36.5 | 38.9 | 40.1 | 39.4 | 40.1 |
| C10T12 | 7.0 | 10.0 | 11.0 | 11.1 | 14.2 | 11.7 | 12.6 | 15.4 | 16.6 | 14.6 | 17.2 | 18.4 | 18.2 | 18.7 |
| C13T15 | 8.6 | 11.0 | 12.4 | 13.4 | 20.7 | 18.8 | 18.8 | 20.7 | 22.0 | 17.3 | 20.2 | 21.0 | 20.5 | 21.0 |
| C16T18 | 12.4 | 18.4 | 20.2 | 23.0 | 24.6 | 21.4 | 23.3 | 25.5 | 30.9 | 21.9 | 24.5 | 24.6 | 24.5 | 23.8 |

| | | | | | | | | | | | | | | |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| C16 | 10.2 | 17.7 | 20.4 | 22.7 | 23.2 | 21.0 | 21.2 | 24.2 | 37.6 | 19.6 | 22.5 | 22.4 | 22.6 | 21.7 |
| C17_18 | 13.2 | 18.5 | 20.0 | 23.2 | 25.1 | 21.4 | 24.2 | 26.0 | 28.3 | 22.7 | 25.2 | 25.3 | 25.1 | 24.4 |
| C19T23 | 22.0 | 30.2 | 30.8 | 32.8 | 34.4 | 32.4 | 34.0 | 38.2 | 38.5 | 30.7 | 34.8 | 37.3 | 39.4 | 34.2 |
| C19 | 37.0 | 52.5 | 53.6 | 55.1 | 53.4 | 53.9 | 61.7 | 63.3 | 85.9 | 66.7 | 69.2 | 69.2 | 73.5 | 69.9 |
| C20_21 | 14.8 | 18.4 | 18.1 | 18.5 | 26.7 | 24.4 | 31.2 | 34.0 | 33.0 | 29.1 | 32.0 | 33.3 | 33.8 | 33.2 |
| C20 | 15.6 | 19.2 | 18.9 | 19.1 | 28.1 | 26.4 | 32.1 | 34.9 | 34.2 | 30.3 | 33.0 | 34.1 | 35.0 | 34.4 |
| C21 | 8.2 | 11.2 | 11.8 | 12.5 | 13.2 | 9.0 | 23.4 | 25.3 | 21.9 | 18.0 | 21.2 | 22.2 | 20.8 | 21.1 |
| C22 | 20.5 | 27.4 | 28.5 | 31.1 | 34.3 | 31.9 | 32.7 | 35.7 | 31.1 | 30.5 | 33.2 | 35.7 | 35.2 | 33.3 |
| C23 | 12.4 | 18.3 | 19.2 | 21.9 | 19.2 | 18.5 | 18.2 | 19.9 | 29.3 | 16.6 | 19.7 | 21.4 | 20.4 | 19.7 |
| C24_25 | 20.2 | 27.5 | 28.5 | 32.1 | 29.6 | 30.4 | 30.7 | 33.0 | 31.1 | 26.5 | 28.1 | 30.7 | 29.9 | 32.5 |
| C24 | 20.4 | 27.6 | 28.3 | 31.7 | 29.2 | 31.0 | 31.3 | 33.5 | 34.2 | 26.8 | 27.8 | 31.4 | 30.3 | 33.7 |
| C25 | 18.4 | 25.4 | 26.9 | 30.7 | 27.9 | 26.4 | 26.3 | 28.8 | 23.3 | 23.7 | 26.6 | 27.0 | 27.0 | 28.2 |
| C26_27 | 18.1 | 27.3 | 29.7 | 32.9 | 32.9 | 31.0 | 36.1 | 39.2 | 30.0 | 32.0 | 34.5 | 34.5 | 33.9 | 35.3 |
| C26 | 10.5 | 17.1 | 20.5 | 24.7 | 31.4 | 27.4 | 36.3 | 37.1 | 29.6 | 36.4 | 37.4 | 31.4 | 31.4 | 33.0 |
| C27 | 23.3 | 29.7 | 31.4 | 34.3 | 32.4 | 31.0 | 35.3 | 38.7 | 29.3 | 30.6 | 33.4 | 34.3 | 33.6 | 34.8 |
| C28 | 20.3 | 27.2 | 29.4 | 33.5 | 31.3 | 30.5 | 29.3 | 32.4 | 26.3 | 29.2 | 30.2 | 30.0 | 28.9 | 31.3 |
| C29_30 | 14.6 | 23.9 | 27.3 | 31.6 | 35.3 | 35.7 | 37.8 | 39.9 | 34.3 | 39.4 | 40.8 | 39.0 | 37.2 | 39.9 |
| C29 | 14.4 | 24.2 | 27.7 | 31.9 | 36.1 | 36.3 | 38.2 | 40.3 | 35.1 | 40.3 | 41.5 | 39.6 | 37.7 | 40.9 |
| C30 | 13.8 | 19.4 | 21.5 | 24.2 | 19.5 | 23.2 | 26.2 | 29.6 | 19.3 | 20.7 | 23.2 | 22.3 | 22.1 | 23.7 |
| C31T33 | 16.2 | 21.9 | 23.4 | 25.2 | 24.9 | 21.3 | 21.7 | 24.1 | 21.7 | 21.1 | 23.2 | 24.1 | 23.6 | 24.6 |

Source: Authors' Calculation based on OECD-TIVA (2023).

Table 2 presents the GVCs position index for the manufacturing industry between 1995 and 2020. Results prove that the GVCs position index for the total economy is positive in the 1995-2000 period. However, it is observed that the GVCs position index is negative for all years after 2000. But, in the manufacturing sector (C) and all sub-sectors, the GVCs position index is consistently negative across all years. In the manufacturing industry (C), the GVCs position index is -0.043 in 1995, and -0.139 in 2020. In other words, the value of the GVCs position index decreased from 1995 to 2020. In 1995 and 2020 years, the sub-sector with the highest GVCs position index is food products, beverages and tobacco (C10T12), while the sub-sector with the lowest GVCs position index is the coke and refined petroleum products (C19).

Table 2: GVCs Position Index for Manufacturing Industry, 1995-2020.

| | 1995 | 2000 | 2001 | 2002 | 2008 | 2009 | 2010 | 2011 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total | 0.026 | 0.012 | -0.010 | -0.031 | -0.031 | -0.041 | -0.037 | -0.043 | -0.030 | -0.006 | -0.023 | -0.028 | -0.029 | -0.038 |
| C | -0.043 | -0.078 | -0.094 | -0.115 | -0.133 | -0.137 | -0.137 | -0.146 | -0.137 | -0.109 | -0.130 | -0.136 | -0.137 | -0.139 |
| C10T12 | -0.052 | -0.080 | -0.091 | -0.092 | -0.122 | -0.099 | -0.107 | -0.132 | -0.141 | -0.121 | -0.146 | -0.156 | -0.154 | -0.159 |
| C13T15 | -0.059 | -0.083 | -0.094 | -0.105 | -0.170 | -0.156 | -0.156 | -0.172 | -0.182 | -0.139 | -0.164 | -0.172 | -0.168 | -0.172 |
| C16T18 | -0.113 | -0.163 | -0.180 | -0.203 | -0.216 | -0.190 | -0.206 | -0.224 | -0.266 | -0.194 | -0.216 | -0.216 | -0.216 | -0.208 |
| C16 | -0.095 | -0.161 | -0.184 | -0.203 | -0.207 | -0.189 | -0.190 | -0.215 | -0.317 | -0.177 | -0.201 | -0.200 | -0.202 | -0.195 |

| | | | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| C17_18 | -0.120 | -0.166 | -0.179 | -0.205 | -0.220 | -0.192 | -0.215 | -0.229 | -0.246 | -0.201 | -0.221 | -0.222 | -0.220 | -0.215 |
| C19T23 | -0.177 | -0.236 | -0.242 | -0.257 | -0.259 | -0.253 | -0.260 | -0.287 | -0.291 | -0.233 | -0.264 | -0.281 | -0.298 | -0.258 |
| C19 | -0.313 | -0.417 | -0.424 | -0.436 | -0.418 | -0.425 | -0.474 | -0.481 | -0.614 | -0.503 | -0.520 | -0.518 | -0.543 | -0.524 |
| C20_21 | -0.125 | -0.152 | -0.152 | -0.155 | -0.219 | -0.204 | -0.256 | -0.273 | -0.268 | -0.238 | -0.260 | -0.268 | -0.274 | -0.267 |
| C20 | -0.134 | -0.163 | -0.160 | -0.164 | -0.233 | -0.222 | -0.266 | -0.284 | -0.282 | -0.252 | -0.271 | -0.279 | -0.286 | -0.282 |
| C21 | -0.077 | -0.102 | -0.108 | -0.114 | -0.120 | -0.082 | -0.207 | -0.222 | -0.193 | -0.160 | -0.187 | -0.197 | -0.185 | -0.186 |
| C22 | -0.183 | -0.237 | -0.245 | -0.266 | -0.290 | -0.272 | -0.278 | -0.298 | -0.264 | -0.259 | -0.280 | -0.298 | -0.295 | -0.280 |
| C23 | -0.115 | -0.164 | -0.172 | -0.196 | -0.174 | -0.168 | -0.165 | -0.180 | -0.255 | -0.150 | -0.176 | -0.190 | -0.182 | -0.176 |
| C24_25 | -0.168 | -0.222 | -0.228 | -0.254 | -0.226 | -0.235 | -0.236 | -0.247 | -0.244 | -0.206 | -0.217 | -0.236 | -0.232 | -0.250 |
| C24 | -0.175 | -0.229 | -0.235 | -0.260 | -0.231 | -0.249 | -0.249 | -0.259 | -0.275 | -0.218 | -0.224 | -0.252 | -0.243 | -0.269 |
| C25 | -0.163 | -0.219 | -0.231 | -0.261 | -0.237 | -0.225 | -0.225 | -0.244 | -0.202 | -0.204 | -0.227 | -0.230 | -0.230 | -0.240 |
| C26_27 | -0.148 | -0.215 | -0.235 | -0.262 | -0.262 | -0.249 | -0.286 | -0.308 | -0.239 | -0.255 | -0.274 | -0.274 | -0.269 | -0.278 |
| C26 | -0.087 | -0.139 | -0.170 | -0.205 | -0.261 | -0.231 | -0.298 | -0.303 | -0.247 | -0.298 | -0.306 | -0.261 | -0.261 | -0.273 |
| C27 | -0.204 | -0.253 | -0.266 | -0.288 | -0.270 | -0.259 | -0.292 | -0.317 | -0.246 | -0.256 | -0.276 | -0.283 | -0.277 | -0.286 |
| C28 | -0.170 | -0.225 | -0.242 | -0.273 | -0.253 | -0.249 | -0.239 | -0.260 | -0.214 | -0.235 | -0.243 | -0.241 | -0.233 | -0.251 |
| C29_30 | -0.116 | -0.184 | -0.208 | -0.239 | -0.262 | -0.272 | -0.284 | -0.296 | -0.250 | -0.281 | -0.293 | -0.280 | -0.268 | -0.290 |
| C29 | -0.118 | -0.191 | -0.216 | -0.247 | -0.274 | -0.284 | -0.294 | -0.304 | -0.261 | -0.294 | -0.305 | -0.291 | -0.279 | -0.302 |
| C30 | -0.126 | -0.172 | -0.189 | -0.211 | -0.173 | -0.203 | -0.226 | -0.254 | -0.169 | -0.181 | -0.201 | -0.194 | -0.192 | -0.205 |
| C31T33 | -0.145 | -0.193 | -0.205 | -0.219 | -0.215 | -0.188 | -0.189 | -0.209 | -0.189 | -0.182 | -0.200 | -0.207 | -0.203 | -0.211 |

Source: Authors' Calculation based on OECD-TIVA (2023).

The GVCs participation index is a measure of the extent to which a sector's exports are integrated into international production networks through forward and backward linkages. This index is also a measure of the extent to which a sector is dependent on integrated production networks (Wigley et al, 2018). Evaluating the GVCs participation index in Table 1, from 1995 to 2020, it can be asserted that the dependence of manufacturing sub-sectors on integrated production networks increased significantly. That's because the GVCs participation index increased in all sub-sectors. In addition to this, the findings in Table 2 prove that the participation of sub-sectors in GVCs is realized through backward linkages (foreign value added). The fact that the GVCs position index is negative indicates that sectors' participation in GVCs is mostly integrated through foreign value added. This also shows that the sub-sectors' import dependency is high. In other words, the backward linkages indicate that sub-sectors are highly dependent on the import of intermediate inputs for the production and export of final products (Kersan-Skabic, 2017). It is not necessarily the case that a country will gain more from higher participation in GVCs. In this process, net value added is important for countries and sectors. Net value added is defined as the ratio of forward linkages to backward linkages. If this ratio is higher than one, the country's participation in GVCs yields high gains (Banga, 2013; Wigley, 2018). In the total economy, net value added ratio is higher than one for 1995-2020 period, while it is less than one after 2000. In the manufacturing industry and sub-sectors, the net value added ratio is less than one for all years. Consequently, it can be contended that none of the manufacturing industry's sub-sectors has experienced a net gain from participation in GVCs.

4. Conclusion



The integration of Türkiye's economy into the international production process and its participation in GVCs accelerated after 2000. This paper concentrates on the manufacturing industry's participation and position, which consists of a significant share of gross exports, in GVCs. From 1995 to 2020, the ratio of the manufacturing industry to gross exports increased from 43% to 52%. The gross exports of the manufacturing industry increased by around 85% over the period. Foreign and domestic value added of exports also increased significantly. However, the growth rate of foreign value added is higher than that of domestic value added. At the same time, the ratio of domestic value added to gross exports decreased, while the ratio of foreign value added to gross exports increased. Therefore, backward linkages are more decisive in the process of manufacturing's participation in GVCs. In the manufacturing industry, the GVCs participation index increased from 19% to 39% between 1995 and 2020. In the sub-sectors as well, the participation index has significantly increased, and the growth rate of the participation index in the sub-sectors ranges from 33% to 68%. Another important index is the position index. The GVCs position index is negative in the manufacturing industry and entire sub-sectors. The negative position index indicates that the backward linkage effects are more intense in sectors' participation in GVCs. At the same time, this situation also proves an increase in sectors' import dependency. It can be concluded that the process of the manufacturing industry and sub-sectors participating in GVCs has been realized through foreign value added. Another important finding is that sub-sectors do not gain net value added in the process of participation in GVCs.

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Annex Table 1: Sectors' Codes and Descriptions

| Codes | Description |
|--------|--|
| C | Manufacturing |
| C10T12 | Food products, beverages and tobacco |
| C13T15 | Textiles, wearing apparel, leather and related products |
| C16T18 | Wood and paper products and printing |
| C16 | Wood and products of wood and cork |
| C17_18 | Paper products and printing |
| C19T23 | Chemicals and non-metallic mineral products |
| C19 | Coke and refined petroleum products |
| C20_21 | Chemicals and pharmaceutical products |
| C20 | Chemical and chemical products |
| C21 | Pharmaceuticals, medicinal chemical and botanical products |
| C22 | Rubber and plastics products |
| C23 | Other non-metallic mineral products |
| C24_25 | Basic metals and fabricated metal products |
| C24 | Basic metals |
| C25 | Fabricated metal products |
| C26_27 | Computer, electronic and electrical equipment |
| C26 | Computer, electronic and optical products |
| C27 | Electrical equipment |
| C28 | Machinery and equipment n.e.c |
| C29_30 | Transport equipment |

| | |
|--------|---|
| C29 | Motor vehicles, trailers and semi-trailers |
| C30 | Other transport equipment |
| C31T33 | Manufacturing nec; repair and installation of machinery and equipment |