

MAPPING THE PARTICIPATION OF GREECE IN GLOBAL VALUE CHAINS

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ABSTRACT

The aim of this paper is to map Greece's participation in Global Value Chains (GVCs) at the country and sector level. We utilise and extend established empirical methodologies on the quantification of participation in GVCs to develop a novel dataset of relevant indicators at the country and sector level. To this end, we estimate standard input-output based measures of GVC participation by applying a production-based decomposition of value-added flows and offer a comprehensive mapping of the different dimensions of GVC integration at the country and sector levels. We use this to map the participation of Greece in GVCs in terms of both forward and backward production linkages and identify its most GVC-intense sectors.

KEYWORDS: Global Value Chains (GVCs); Input-Output Analysis; Backward GVC participation; Forward GVC participation

INTRODUCTION

The international fragmentation of production and the rise of global value chains (GVCs) have revolutionized production, as national and organizational boundaries no longer bound firms' production activities. Instead, outsourcing and offshoring can disperse their activities to different locations based on efficiency and cost-minimization criteria. ^[1,2] This emergence of GVCs gives rise to a finer international division of labour and activities across countries and sectors, resulting in significant opportunities for greater specialisation gains. Therefore, each country is challenged to identify and better understand its structural weaknesses and perceived comparative advantages and leverage them to design strategies to secure maximum gains from GVC participation. ^[3]

Given the importance of this new production paradigm, assessing the extent of the integration of a country within GVCs has become key to drawing comparisons with other similar economies, identifying strategic opportunities and shaping its industrial policy. Issues such as the positioning and participation patterns in GVCs have been extensively considered for the comparative assessment of national economic performance. ^[4] The estimation of these metrics broadly relies on identifying the proportion of value-added that is embodied in the exported goods and services that are then used as intermediate inputs for production abroad. From the early work of Hummels et al. ^[5] where gross exports were divided between domestically produced items and imported inputs embedded in exports, to Johson and Noguera's ^[6] value-added export (VAX) ratio. More recent studies ^[7,8] formalized measures of aggregate GVC trade and specific types of GVC participation: i) backward participation in GVCs, which covers the VA originating from upstream suppliers abroad, and ii) forward participation, which contains the VA sent to downstream partners abroad. Further elaborating on this duality of GVC participation types, Wang et al. ^[9] developed a framework that further split backward and forward participation in two distinct sub-types: simple participation, that refers to production sharing involving exports/imports of intermediates that cross borders only once, and complex activities, which include exports/imports of intermediates across multiple borders and production stages.

METHODOLOGY

The methodological procedure of this paper utilizes the latest set of OECD's inter-country input-output tables^[10] (ICIOs), covering 45 NACE rev.2 sectors for 76 countries from 1995 to 2020. We apply the production-based decomposition^[9] to obtain the bilateral value-added flows that concern the GVC components of international trade for forward (panel a) and backward (panel b) participation, as briefly illustrated in Figure 1.¹

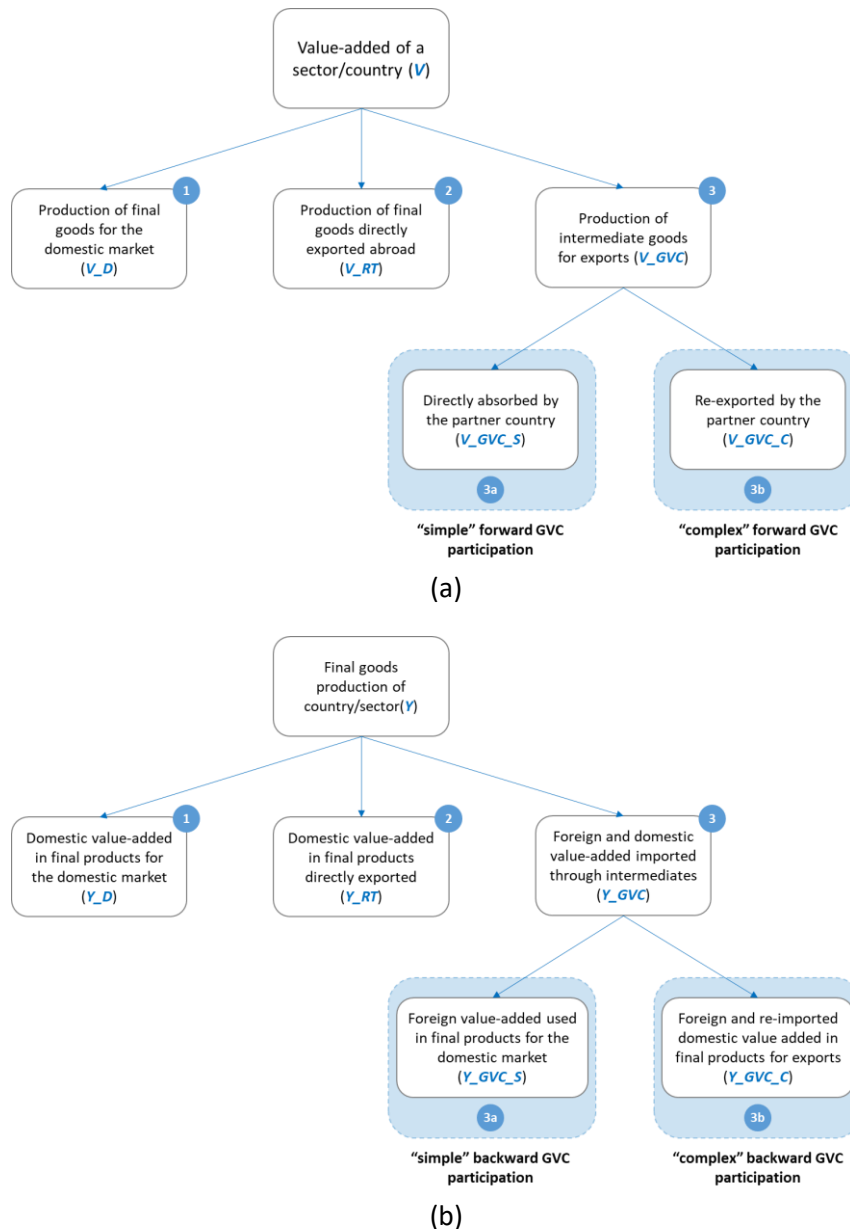


Figure 1. Disaggregation of value-added (a) and final goods (b) production of a country-sector in terms of its forward (a) and backward (b) simple and complex participation in GVCs. Source: Authors' elaboration on Wang et al. ^[9].

Drawing on this framework, we estimate measures of GVC participation for all 45 NACE rev.2 Greek sectors. This enables the study of Greece's integration in GVCs from multiple points of view and maps its evolution over a period containing multiple structural shifts and shocks in the world economy (from the dot-com bubble of the early 2000's to the 2008 crisis and lastly, the COVID-19

¹ For more information on the decomposition framework and the analytical procedures, see Wang et al. ^[9]

pandemic). The key insights, patterns and trends that emerge from the analysis are of significant value for evidence-based policymaking and can help refine the country's national industrial strategy in the future.

RESULTS AND DISCUSSION

The first set of results is concerned with the mapping of Greece's aggregate participation in GVCs in comparison with the rest of the EU-27 in Figure 1. It is evident the country's participation pattern across the examined period mirrors that of the EU, for both forward (panel a) and backward (panel b) participation, but at a lower magnitude. Three distinct patterns emerge: i) a trend of GVC deepening from 1995 to 2008, a period that is widely acknowledged as the "era of GVCs"^[3], ii) a steep decline in participation in 2009-2010, caused by the financial crisis and its corresponding shocks in the global supply network, and iii) a resurgence in GVC activities in a new steady state from approximately 2012 onwards.

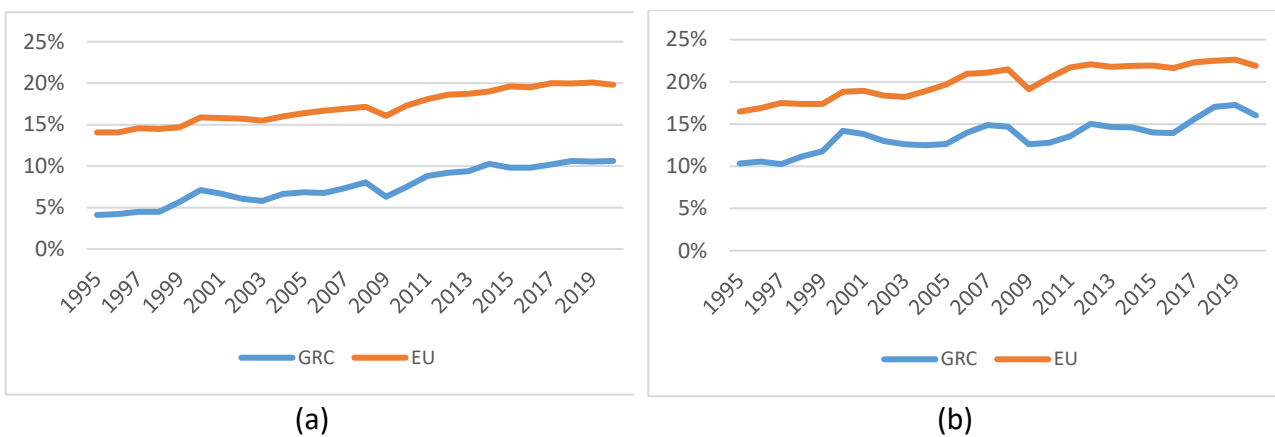
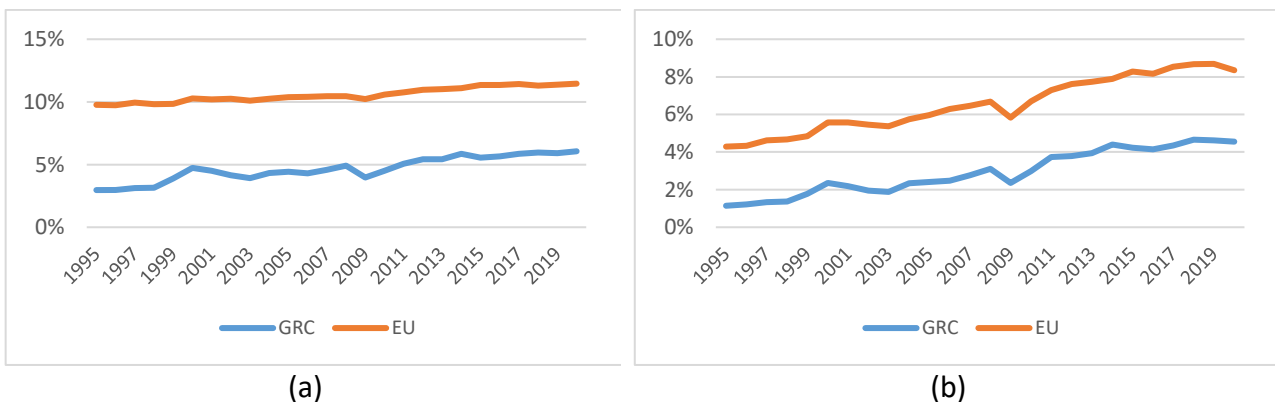


Figure 2. Forward (a) and backward GVC participation for Greece (GRC) and the EU from 1995 to 2020. Source: Authors' calculations on OECD's ICIOTs.

Delving deeper into the intricacies of GVC participation, we separate simple from complex GVC participation activities in Figure 3. It is evident that simple and complex forward participation patterns between Greece and the EU are quite similar, but again at a different scale (EU participation is nearly twice as high as Greece). In terms of backward participation, we observe that simple backward participation for Greece and the EU is approximately at the same level for the examined period, while complex backward participation for the EU is significantly higher (but again the trend is similar). In both cases, complex GVC activities appear to be the most affected by the financial crisis effects in 2009.



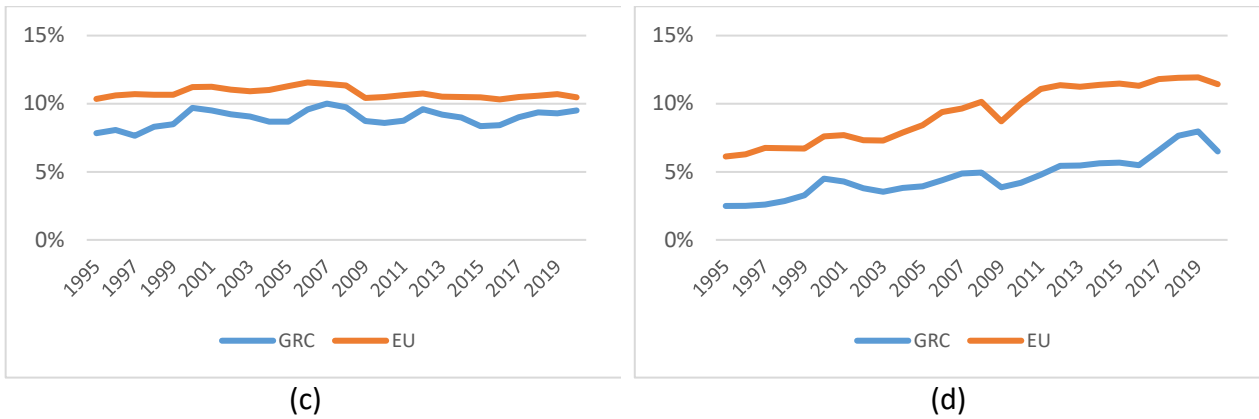


Figure 3. Timeline of Greece's simple forward (a), complex forward (b), and simple backward (c) and complex backward (d) GVC participation from 1995 to 2020. Source: Elaboration by authors based on OECD's ICIOTs.

But GVC participation is not merely a matter of national economies; it is deeply influenced by sectoral specialization and industrial dynamics. Following this, we disaggregate the national GVC performance into the participation patterns of each of Greece's 45 NACE Rev-2 sector that OECD's ICIOTs cover. In Table 1, we present the top performing sectors in terms of forward GVC participation in three cut-off points, 1995 (beginning), 2010 (middle) and 2020 (end). The top performing sectors retain their status across the examined period, and include basic metals (C24), water transports (H50), mining supporting activities (B09), and mining of metals and mines and quarries (B07_08). Other notable sectors include petrochemicals (C19), chemicals (C20), and rubbers and plastic products (C22). It is worth noting that the latter three manufacturing sectors have significantly increased their participation since 1995, with petrochemicals (C19) in particular emerging as a top exporter of Greek intermediates from 2010 onwards.

Table 1. Top performing sectors (NACE Rev. 2 classification) in forward GVC participation (%) for 1995, 2010, and 2020.

1995	2010	2020
C24 (36.9%)	H50 (59.9%)	C24 (84.7%)
C19 (21.6%)	C24 (50.1%)	B07_08 (73.2%)
H50 (21.4%)	B09 (31.7%)	B09 (61.4%)
B07_08 (18.4%)	B07_08 (30.1%)	H50 (56.9%)
C20 (17.9%)	H52 (28.5%)	H51 (42.5%)
C22 (16.6%)	H51 (28.1%)	C19 (42.3%)
A03 (16.2%)	C20 (24.0%)	C20 (34.4%)
B09 (16.0%)	C19 (23.4%)	H52 (34.4%)
H52 (10.9%)	C22 (21.5%)	B05_06 (31.8%)
C27 (9.84%)	A03 (17.6%)	C22 (31.0%)

To contrast sectoral embedment in forward and backward production linkages, we plot the two GVC participation components for 2020 in Figure 4, where the diagonal is useful in the identification of

sector orientation, i.e., to which direction of GVC participation is more inclined. It is evident from the graph that electronics and opticals (C26), machinery and equipment (C28), electrical equipment (C27), fabricated metals (C25), and petrochemicals (C19) are heavily orientated towards backward participation, while sectors such as water transports (H50), rubbers and plastics (C22), non-metallic minerals (C23), and software and computer services (J62-J63) present a more balanced orientation pattern in their GVC participation activities. It should be noted that, most of the Greek manufacturing sectors are in fact backward orientated, a finding that implies possible high dependency in critical inputs from abroad. On the other hand, mining, and quarrying activities (B sectors) along with basic metals (C24) dominate the landscape of forward participation, as we already discussed in Table 1.

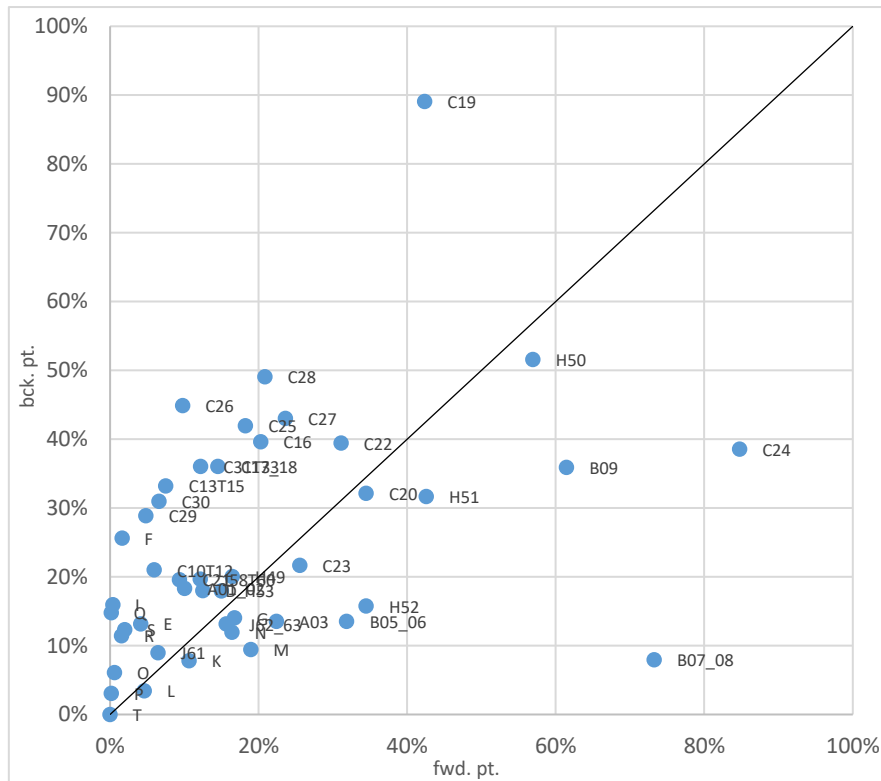


Figure 3. A snapshot of backward and forward GVC participation of Greek sectors (NACE Rev.2 classification) in 2020

At the last stage of our analysis, we divide the available time frame in three periods: 1995-2007 which covers a period of global GVC deepening and national economic prosperity for Greece, 2008-2014, a period characterized by the economic crisis, the disruptions caused in global supply chains and the stagnation/recovery years that followed shortly after, and 2015-2020, which entailed the new steady-state in global markets and value chain trade right before the COVID-19 pandemic. For each period, we estimate the relative changes of forward GVC participation in industrial sectors (including mining, quarrying, manufacturing, energy and water supply, and waste treatment), in Table 2. Different leading sectors emerge in each time frame, with interesting observation being the significant increase of forward participation in mining and quarrying activities (B sectors) emerging in the 2015-2020 period, which signals a new emerging dimension to the country's GVC participation patterns, that is its role as supplier of raw materials and energy inputs.

Table 2. Top performing industrial sectors (NACE Rev. 2 classification) in forward GVC participation (%) for 1995-2007, 2008-2014, and 2015-2020.

1995-2007	2008-2014	2015-2020
C21 (195%)	C30 (267%)	B07_08 (50.4%)
C31T33 (125%)	C23 (164%)	B05_06 (33.6%)
D (117%)	B07_08 (124%)	C19 (31.1%)
C25 (98.2%)	C16 (122%)	C21 (22.6%)
C28 (59.9%)	C19 (87.2%)	C24 (18.2%)
C27 (57.1%)	C26 (79.1%)	C20 (16.9%)
C22 (56.7%)	D (71.6%)	C28 (12.5%)
C16 (53.4%)	C31T33 (65.1%)	C17_18 (11.7%)
E (51.6%)	C25 (64.6%)	C27 (11.7%)
C13T15 (50.6%)	C29 (62.5%)	C13T15 (11.0%)

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