

Global Value Chains: new evidence for North Africa

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April 2016

Abstract

This paper analyzes the participation and the position of North African countries into global value chains (GVCs). Exploiting the recently released multiregional Input-Output tables from UNCTAD-Eora, we describe regional and country GVC involvement. North African countries have not been able so far to fully integrate into international production networks. However, large part of their (low) trade is due to value added related activities, mainly in the upstream phases, and the importance of foreign linkages has been increasing over time signalling the existence of unexploited opportunities. We complement the Input-Output analysis with evidence from bilateral trade flows and case studies from specific sectors. This anecdotal evidence is in line with previous findings. Overall, our results suggest that enhancing GVC participation of North African countries is likely to substantially benefit local industries, countries and the whole area. However, the ability to retain such benefits relies on specific characteristics, such as the level of human capital, the trade logistics and the presence of trade barriers, thus leaving room for policy intervention.

Keywords: international production networks, global value chains, Multi-Regional Input-Output tables, North Africa.

JEL codes: F14, F15, L23, O11, O55.

We would like to thank Adam Storeygard, Alessandro Borin, Alessia Amighini and the participants to the OECD workshop "Value chains: global or regional?" in Paris (April, 2015), CSAE conference in Oxford (March, 2016), ITSG workshop in Rome (December, 2015), and the '56th SIE conference in Naples (October, 2015) for useful comments. Usual disclaimers apply.

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1 Introduction

In the last twenty years, falling transport costs, trade policy aimed at reducing barriers and increasing integration, together with the ICT revolution have resulted in production being increasingly unbundled and shared across different countries at different levels of development. As a consequence, trade, especially of intermediate goods, and foreign direct investments have increased substantially, with important shifts also in their composition (Johnson and Noguera, 2012).

These developments are closely linked to the emergence of global value chains (GVCs), a concept that encompasses the full range of activities required to bring a good or service to the final consumer, from the product design to the distribution (Cattaneo et al., 2010). GVCs entail a vertical fragmentation of production stages: parts and components are produced in different countries and then assembled either sequentially along the chain or in a final location (Del Prete and Rungi, 2015a). The networks of involved activities are highly complex, spanning from manufacturing to logistics and transportation, as well as customs agents and other services (Baldwin and Venables, 2013).

The fragmentation of production in turn allowed countries (also developing) to better exploit their comparative advantages, often finding profitable niches of specialization. In the past, each country had to rely on its own forces and possibly "build an entire supply chains domestically". But producing a whole product from scratch was hardly within reach of a developing country, and is even more difficult in an increasingly competitive world. Against this background of international fragmentation of production, a developing country can specialize in a specific segment or task of a production chain, and generate a portion of the goods' or services' value added. Countries and firms have been able to join a production chain without having to provide all the upstream capabilities, by simply supporting the value chain as suppliers of intermediate inputs and act as subcontractors, even several levels down from the ultimate buyer (Humphrey and Schmitz, 2002).

This may be at the expenses of capturing locally a lower share of the value added of exports, but largely increases developing country's opportunities. Participation in a supply chain and cooperation within a network of upstream and downstream partners can enhance information flows and learning possibilities, introduce new business practices and more advanced technology, in turn enhancing growth. Hence, the reallocation of resources from less productive activities to new and more connected ones is crucial to foster competitiveness. However, to enter a value chain requires a certain initial level of capacity, quality, human capital, efficiency, as well as properly working institutions.

Since the '90s, several countries, especially in Asia, have been able to exploit these opportunities and enter global production networks. For instance China has integrated into GVCs by firstly specializing in the activities of assembly and was then capable of upgrading its participation by building a competitive supply base of intermediate goods and by enhancing the quality of its exports (Marvasi, 2013). Contrary to Asia, and China in particular, North Africa (NA) has not been able so far to intercept the main changes in trade patterns nor enter massively into production networks. Despite a relatively good geographic and logistic positioning, most North African firms, especially the smaller ones, have mainly remained "local", producing at home and for the domestic market. Their involvement in GVCs is still limited and mostly on low value added phases. But as China and other Asian countries (and firms) move up the value chain, other countries need to become the next hub (suppliers) of labor intensive productions and expand technological sectors. This opens important opportunities to be exploited. To be left behind at this stage would have severe consequences on growth and development.

The aim of this paper is to provide an a first assessment of North Africa participation and position in GVCs and discuss the possible benefits from a greater integration. Firstly, it analyzes participation, by exploiting a recently released Multi-Regional Input-Output tables (MRIO) database from UNCTAD-Eora. We calculate domestic and foreign value added at aggregate level and then we consider different sectors, highlighting the differences (and their possible consequences). To the best of our knowledge, this is the first attempt to study the NA GVC involvement. The paper also complements this sectoral evidence with an analysis carried out at the bilateral trade level and case studies from specific industries, providing some interesting examples of successful integration.

The analysis refers to the years 1995-2007-2013. While the years are partially determined by data availability, these years have important meaning for the area. The analysis of the period 1995-2007

allows us to focus on a period before the financial and economic crisis, a period where North African countries were integrating, especially with Southern European countries, also thanks to specific trade agreements¹. The period 2007-2013 is, on the other hand, a period characterized by the crisis in the EU (and the world) and, from 2011, political instability and turmoil following the Arab Spring in North Africa. Data for 2013 allow us also to take into account the economic effects of these developments.

The rest of the paper is organized as follows. Section 2 briefly introduces our main data source, i.e. the UNCTAD-Eora GVC database, and the methodology. Section 3 analyzes North Africa participation and positioning into GVCs by comparing regional and country measures. Section 4 provides a finer sectoral analysis, its links with bilateral trade flows and some anecdotal evidence on case studies. This part helps in highlighting the potential sectors where NA could build on its comparative advantages. The Conclusions assess the scope for participation of North African countries in global value chains, discussing possible policies and their implications for competitiveness. More specifically, we try to identify the best trade and exchange rate policies for North Africa to improve its participation and positioning into the international fragmentation of production networks. We highlight the fact that the region has to fill an infrastructure gap, lower tariff and no tariff barriers; however, the most important issue is to improve the business climate and decrease the political uncertainty. Of course education keeps playing a central role (especially tertiary education in Science and Technology).

2 Global Value Chains and methodology

Different stages of the same production process are now easily allocated to different countries; hence, intermediate inputs cross borders multiple times and are then counted each time by gross trade flows. As a result, conventional trade statistics become increasingly misleading as a measure of value produced by any particular country. However, recent improvements in MRIO tables allow us to measure the sources and destinations of value-added trade and, at the same time, also to compute how a country is engaged into a Global Value Chain (Koopman et al., 2010).

In this paper we are among the firsts to exploit the UNCTAD-Eora GVC database in order to analyze the GVC participation and position of North African countries/sectors. This database brings together a variety of primary sources including national I-O tables and main aggregates data from national statistical offices and combines these into a balanced global MRIO, using interpolation and estimation in some places to provide a contiguous, continuous dataset for the period 1990-2013 on 49 African countries and 25 harmonized ISIC-type sectors (Lenzen et al., 2012, 2013)(Giovannetti and Siniscalco, 1986).

In order to compute the "participation" of a country, we rely on the Koopman et al. (2010) (hereafter KWW) decomposition². This methodology single out the domestic and foreign value added components of the gross exports. The foreign value added share (FVA) identifies the share of a country's exports that consist of inputs produced in other countries and thus does not add to the GDP of the country of interest. It captures the extent of GVC participation for downstream firms and industries. By definition, the sum of FVA and domestic value added (DVA), in absolute terms, corresponds to gross exports. The indirect value added exports (DVX) indicates the share of a country's value added exports embodied as intermediate inputs in other countries' exports; it represents the contribution of the domestic sector of a country to the exports of other countries, thus indicating the extent of GVC participation for relatively upstream sectors. Analyzing the FVA and the DVX components of a single country/area, we can get a comprehensive description of GVC participation and position.

¹The Euro-Mediterranean Free Trade Area, launched in 1995, aimed at removing barriers to trade and investment between both the EU and Southern Mediterranean countries and between the Southern Mediterranean countries themselves. Euro-Mediterranean Association Agreements are in force with most of the partners (with the exception of Syria and Libya). The so-called Barcelona Process was an integration process to achieve *sustainable and balanced economic development with the view of creating an area of shared prosperity*. For a complete and updated list of the state of the art in the bilateral agreements, refer to <http://ec.europa.eu/trade/policy/countries-and-regions/regions/euro-mediterranean-partnership/>

²This decomposition is likely to slightly inflate the overall participation picture, as it does not take into account "pure" double-counted terms (Koopman et al., 2014). For more details about the methodology see the Appendix.

Positioning along a value chain also matters, not only how much domestic and foreign value added is embodied in exports. Figures for the positioning along GVCs can be obtained by looking at two further measures, the length of chain and the upstreamness (Antràs et al., 2012; Fally, 2012)³. If the former indicates the number of stages involved in a chain, the latter is a measure of the distance to final demand. In other words, a greater length indicates that the technological features of the production involve many stages, while a higher distance suggests that a country is positioned relatively upstream, as there are many stages before reaching the final consumers.

As a control, we also employ the KWW methodology to compute the FVA component from the World Input Output Database (WIOD) and we retrieve the same figure directly from the OECD-WTO Trade in Value Added (TiVA) database (Timmer et al., 2015; OECD and WTO, 2012) and look at correlations with our findings. The correlations between the 1995 foreign value added share, as computed from the UNCTAD-Eora database and matched against the same country figures provided by WIOD and TiVA are respectively .88 and .76.

3 Country-level Analysis

In this section we consider the involvement in GVCs by looking at two different, complementary, perspectives. First, by analyzing value added components in absolute terms, we are able to get a clear picture of the actual volume of value added trade. Second, as a shares of total export, GVC components also provide information on the importance of fragmentation of production to the creation of value added for each country's exports. In what follows, we firstly compare NA with other major exporters in a trade volume perspective, then we investigate the role of GVCs for NA exports.

The decomposition of gross exports into domestic and foreign value added in absolute terms, is shown in Figure 1⁴, both for the major countries/areas (Figure 1a) and for (selected) NA countries (Figure 1b). Not surprisingly, as a whole export values are mainly concentrated in developed countries⁵. EU exports about 9 trillion USD, which corresponds to a 42% world export share, NAFTA 14% and China 8%, while, with a share of less than 1% of world export, NA plays a very marginal role in world trade. The percentage of domestic and foreign value added is diverse, with higher percentage of domestic for China. Turning to the individual NA countries figure, Algeria, given the composition of its production, biased towards energy, presents the highest exports values, with about 79 bln of USD in 2013, most of it domestic.

This evidence is also confirmed by considering separately the values of foreign value added and indirect value added respectively for each region and for individual NA countries. Figures 2 and 3, focusing on GVC trade volumes of developing areas⁶, confirm that NA has not yet been able to enter GVCs and play a significant role at the world level, making up only about 1% of foreign value added of other countries' value added exports. Despite this, a good deal of heterogeneity emerges when we look at individual countries: three countries have the highest foreign value added values (Figure 2b), namely Algeria, Morocco and Tunisia, while 58% of the whole value of exports of other countries'

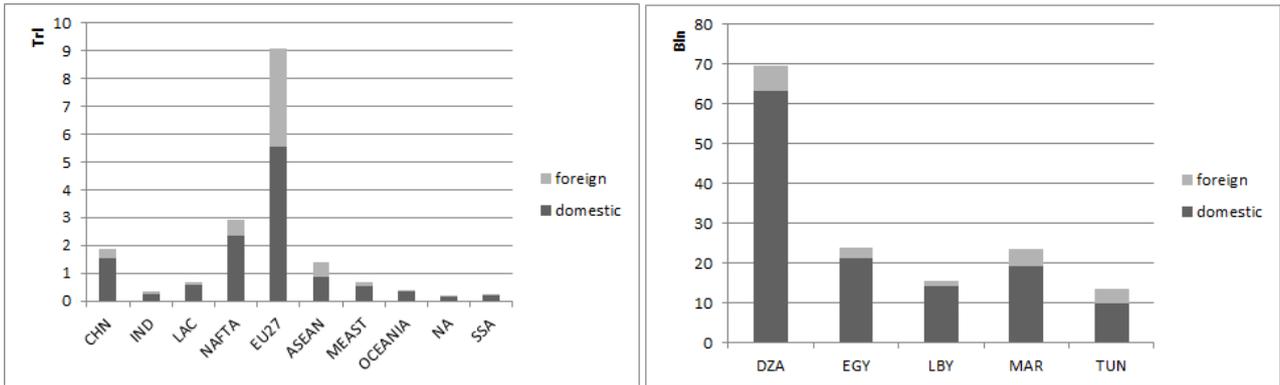
³For details on the construction of these two measures see the Appendix.

⁴In the following figures, CHN stands for China; IND: India; LAC encompasses Argentina, Guyana, Chile, Suriname, Bolivia, Ecuador, Colombia, Brazil, Uruguay, Paraguay, Peru and Venezuela; NAFTA: Mexico, USA and Canada; EU27: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sierra Leone, Slovakia, Spain, Sweden and UK; ASEAN: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam; MEAST: Bahrain, Cyprus, Egypt, Gaza Strip, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, UAE and Yemen; OCEANIA: Australia, Fiji, New Zealand, Papua New Guinea, Samoa and Vanuatu; NA: Algeria (DZA), Egypt (EGY), Libya (LBY), Morocco (MAR) and Tunisia (TUN); SSA: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Cote d'Ivoire, DR Congo, Djibouti, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

⁵Note that considering the individual countries separately, we are likely to inflate the export volumes of the EU27 relative to other large single countries, such as China and India.

⁶Here we exclude EU27 and NAFTA, since they operate at a higher scale. If included, the graph would not allow to see heterogeneity among other countries/areas.

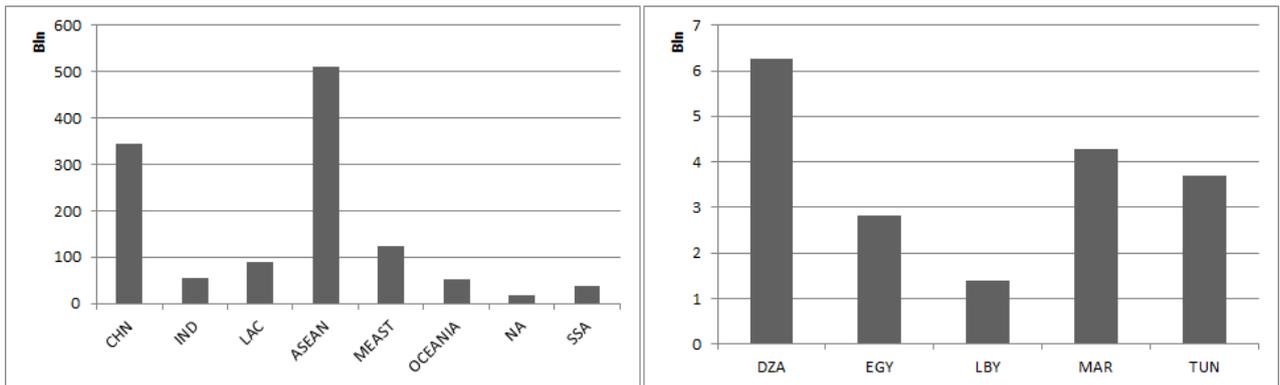
Figure 1: Foreign and Domestic value added trade in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

value added exports (Figure 3b) of the region is only due to Algeria. This suggests that specialization matters.

Figure 2: Foreign Value Added trade volume (excluding EU27 and NAFTA)



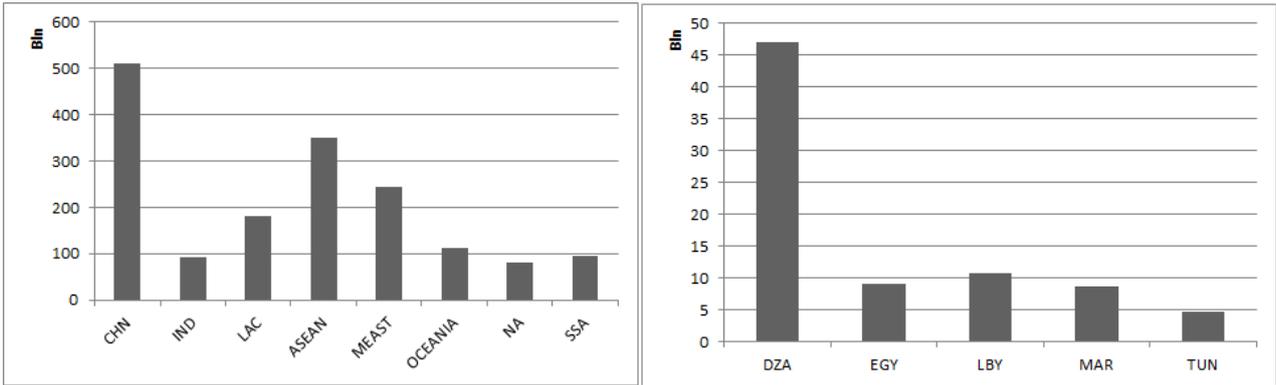
Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Although value added in absolute terms is useful to assess the importance of areas and countries in GVC trade, it has the drawback of a strong dependence on the size of the economy and on its involvement in international trade. In a different perspective, GVC participation, computed as the sum of foreign value added and indirect value added shares of exports, i.e. FVA and DVX, indicates the extent of exports due to value added trade (Figure 4).

The fact that advanced and ASEAN countries are heavily integrated in GVCs is hardly surprising. What is more interesting, and in line with the results of Foster-McGregor et al. (2015), is that NA has some of the highest rates of GVC participation, matching the levels found in Europe (68% in 2013). In particular, Libya presents the highest GVC participation rate, followed by Algeria and Tunisia, respectively with 78%, 77% and 62%. Figure 4 also presents the evolution of the phenomenon over time, as it compares the GVC participation in 1995, 2007 and 2013. Figure 4a indicates that GVC participation has been increasing in most regions, from around 50% to 59% worldwide. The growth rate of GVC participation in NA has also been similar to that of other countries, with GVC participation increasing by 19% for NA and 18% for all countries over the period 1995-2013 (Figure 4a). Figure 4b details the differences between NA countries and shows that, between 1995, 2007 and 2013, Libya GVC participation grew by 36%, while that of Algeria by 18% and Tunisia by 11%.

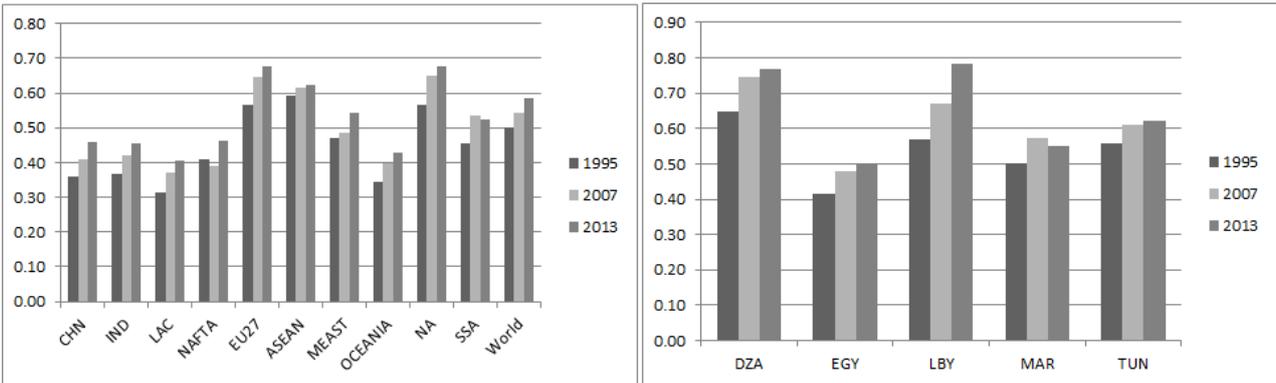
Following Koopman et al. (2010) approach, in Figure 5 and 6 we split the total GVC participation

Figure 3: Indirect Value Added trade volume (excluding EU27 and NAFTA)



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Figure 4: GVC participation in 1995, 2007 and 2013



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

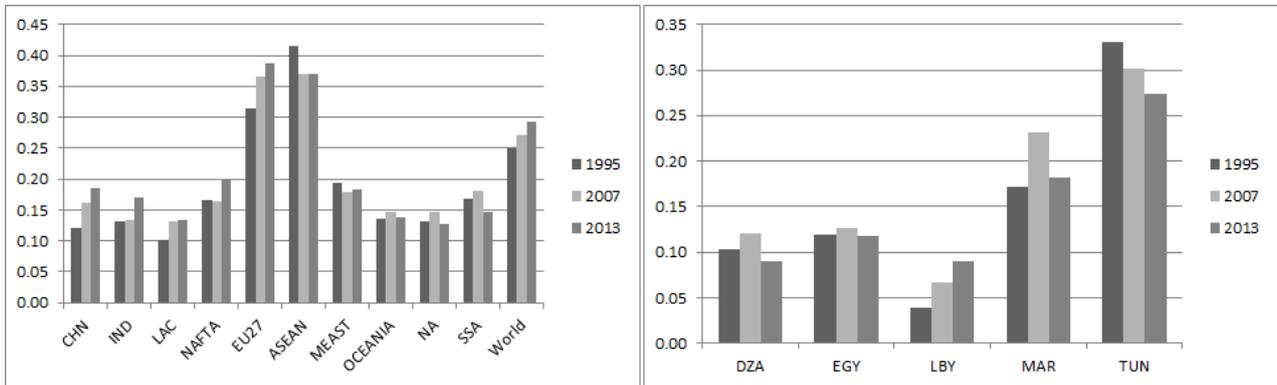
into its FVA and DVX components, i.e. the foreign value added in exports and the value of exports of intermediates in value added exports of other countries as shares of total exports. As mentioned above, the former indicates the extent to which a country's exports are dependent on imported content, the so-called backward integration. It is therefore likely to be higher if a country (or sector) is involved in downstream production. Conversely, the DVX measure is likely to be higher for countries (and sectors) involved in upstream production, with output and exports of that country feeding into the production and exports of downstream producers (i.e. forward integration). The analysis of backward and forward integration can provide hints on the positioning of a particular country within a GVC. While in the literature upstream stages are often associated with the production of knowledge assets at the beginning of the value chain, in a developing country context, where rates of innovation are low, it is more likely associated with the production of raw materials and other basic inputs, which may have little scope for upgrading (Foster-McGregor et al., 2015).

At the global level, the average FVA was approximately 30% in 2013 (Figure 5a). That means, roughly, that around 6 trillion of the 21 trillion in 2013 world exports of goods and services was contributed by foreign countries for further exports and is thus "double counted" in global trade. The remaining 15 trillion is the actual value added contribution of trade to the global economy. FVA has tended to rise over time for all countries, though the increase has been largely driven by the advanced countries. Overall, FVA increased by around 16% between 1995 and 2013 with large increases occurring

in China 52% and South America 31%. For other developing regions a decline in FVA was observed between 1995 and 2013 with the largest declines in the SSA (by 13%) and ASEAN (10%).

In 1995 foreign value added in NA was 13%, increased to 15% in 2007 and returned back to the values of the initial period in 2013 (Figure 5a). At a higher detail, Tunisia (27%) and Morocco (18%) present the highest FVA in the region (Figure 5b).

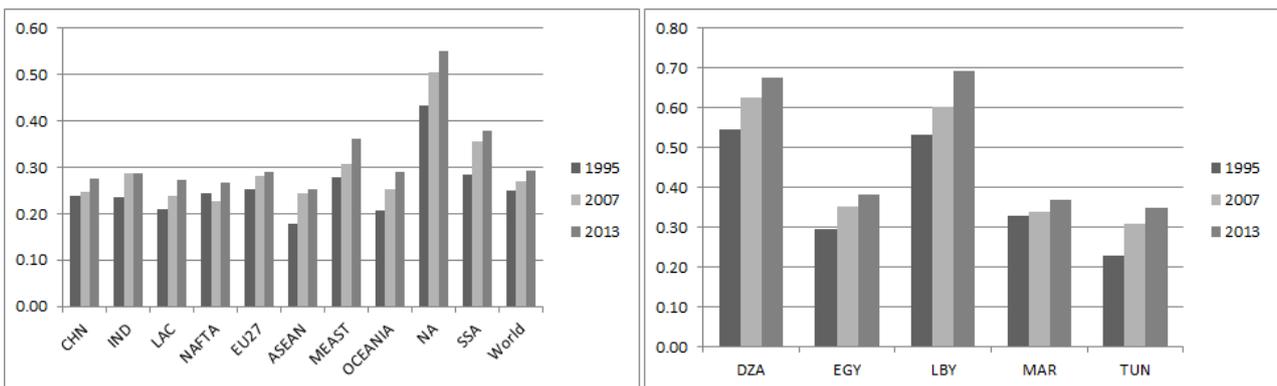
Figure 5: Foreign Value Added component (FVA) in 1995, 2007 and 2013



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Figure 6 reports similar figures for DVX and suggests an increase in the indirect value added of exports for all regions. In 2013, North Africa has the highest DVX share (55%). The region also shows a high increase in the DVX measure between 1995 and 2013, with an increase of 26%. Large growth rates also occurred in SSA countries (33%) and ASEAN (43%) countries. Not surprisingly, increases were much larger for developing than for advanced countries, already integrated at the beginning of the period.

Figure 6: Indirect Value Added component (DVX) in 1995, 2007 and 2013



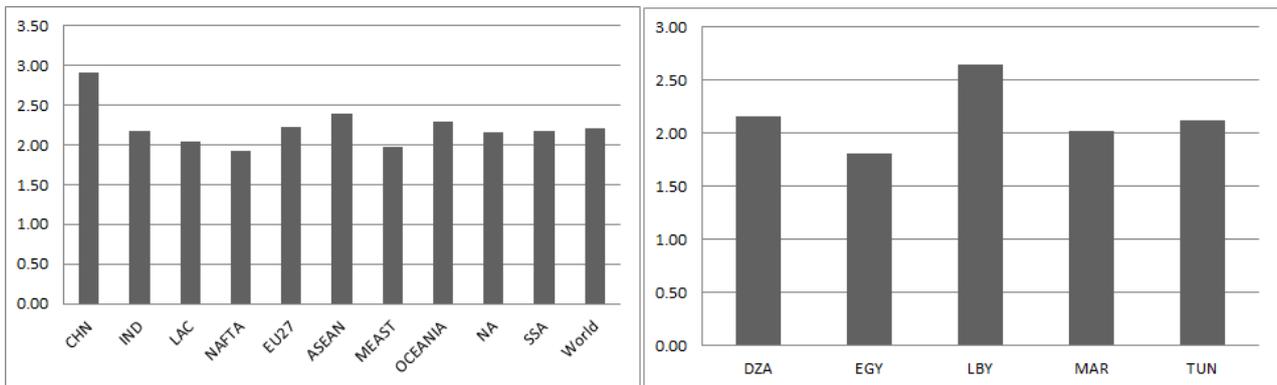
Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

The large values for the DVX variable combined with the relatively small values for the FVA variable in the case of NA further reinforces the view that it has struggled in breaking into downstream production and that much of its involvement in GVCs is in upstream productions (e.g. natural resource and simple manufacturing). Indeed if we consider the share of total GVC participation that is due to the DVX measure, we find that it accounts for 80% in 2013, a fact that highlights the importance of forward integration in the region. However there is evidence of some country heterogeneity. While Algeria and Libya follow this pattern, Morocco and Tunisia show a greater share of FVA in total

GVC participation, with a 33% and 44% of share respectively, suggesting a slightly more downstream position (Figure 6a,b) and with some potential to better integrate in higher value-added phases.

The above results on the position of NA countries along GVCs are supported, with some differences, by the evidence on the upstreamness metrics, which is an index of the distance from final consumers. As mentioned above, this index identifies how many stages of production remain before the good reaches final demand. The longer the distance, the farthest from final demand a country is. Figure 7 shows the area and country aggregate indicators of upstreamness. In 2013, given a high specialization in raw materials, NA is relatively upstream, more than other countries, with the exception of China. The latter could be justified by a specialization in design and in the production of intermediates used in the first stages of the product development. Again at a more disaggregated country level, there is confirmation of regional disparities, with Algeria and Libya being the most upstream NA countries. In particular, Libya matches the level found for China in 2013.

Figure 7: Upstreamness in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

To sum up, according to different methodologies and measures, our results show that NA is still a marginal player of GVCs and has not yet been able to exploit the opportunities coming from the emergence of global production networks. But, while NA plays a secondary role for the actual volumes of value added related activities at the world level, GVCs are found to be of primary importance for NA trade: participation in the international fragmentation of production has been steadily increasing in the last decades and the share of NA exports due to value added trade is now in line with that of other major areas. The overall figures, furthermore, hide an important fact: NA takes part in GVCs by contributing mainly to the upstream phases, being confined to low value added stages of production, with few exceptions.

4 Sectoral analysis

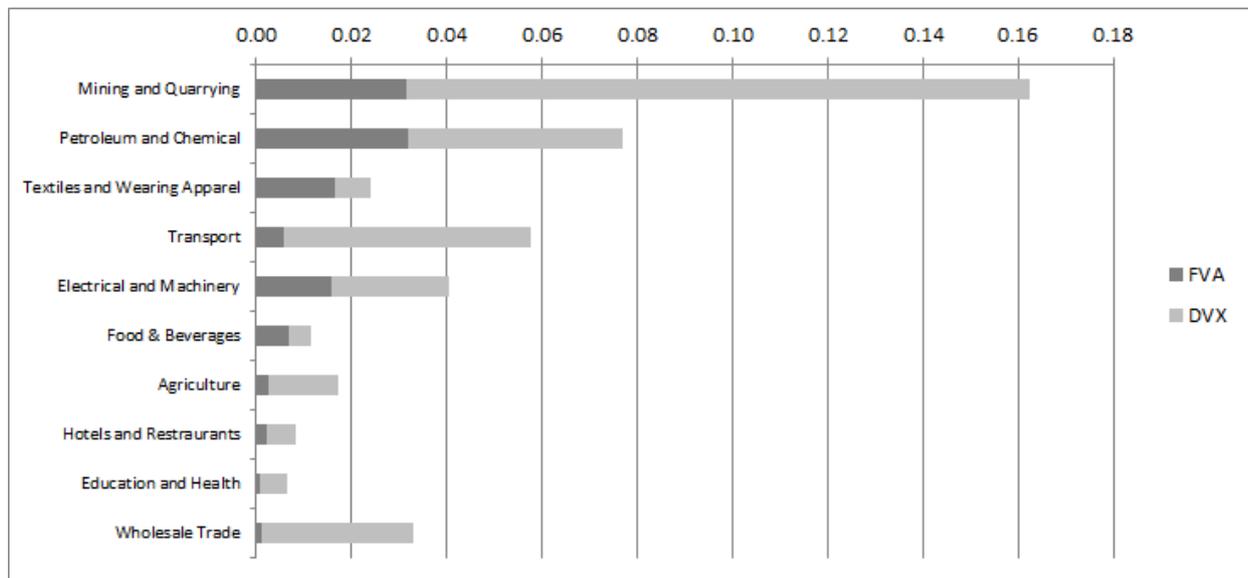
The heterogeneous involvement of North African countries in GVCs depends on the productive structure of the different economies, their endowments as well as some characteristics such as education level and quality, presence of tax benefits, technological parks etc. In what follows we analyze the sectoral dimension of the phenomenon, linking it with some practical examples of GVC participation in NA. Although, as mentioned above, the area is mainly involved in stages of the production far from the final consumers, for some countries there is some evidence of downstream integration. Here the possibilities of upgrading are potentially stronger, and as such it is crucial to understand the sectoral specialization of their economies.

We compute the sectoral contributions to the measures of GVC participation described above for NA region and for the set of NA countries. The sum across the sectors therefore equals the value of total NA GVC participation reported in Figure 4. Figure 8 shows the contribution of the first ten sectors⁷,

⁷See Table Appendix for a correspondence table between the harmonized 25 EORA sectors and the ISIC-Rev 3

according to their export volumes in 2013, to the involvement in GVCs as measured by the sum of FVA and DVX. The figure shows that the primary and upstream sectors of Mining and Quarrying, Petroleum and Chemicals and Transport make up the vast majority of NA GVC participation (30%). However, when considering its decomposition into backward (i.e. FVA) and forward (i.e. DVX) integration, we find that Petroleum and Chemicals tend to be relatively more backward integrated, along with Textiles and Apparel, and Food & Beverages, while Mining & Quarrying and Transport present higher shares of forward integration.

Figure 8: North Africa Sectoral GVC Participation (FVA + DVX) in 2013



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Although the analysis of the DVX and FVA components already provides an indication of the sectoral positioning along the value chain, it is still useful to consider the distance to final demand, as in the country-level case (Antràs et al., 2012). Figure 9 shows that in line with the above results, sectors in which North Africa DVX is high tend to be relatively distant from final consumers (e.g. Mining and Quarrying). Textile & Apparel and Food & Beverages are instead closer to final demand, as also the high FVA component in total GVC participation would show.

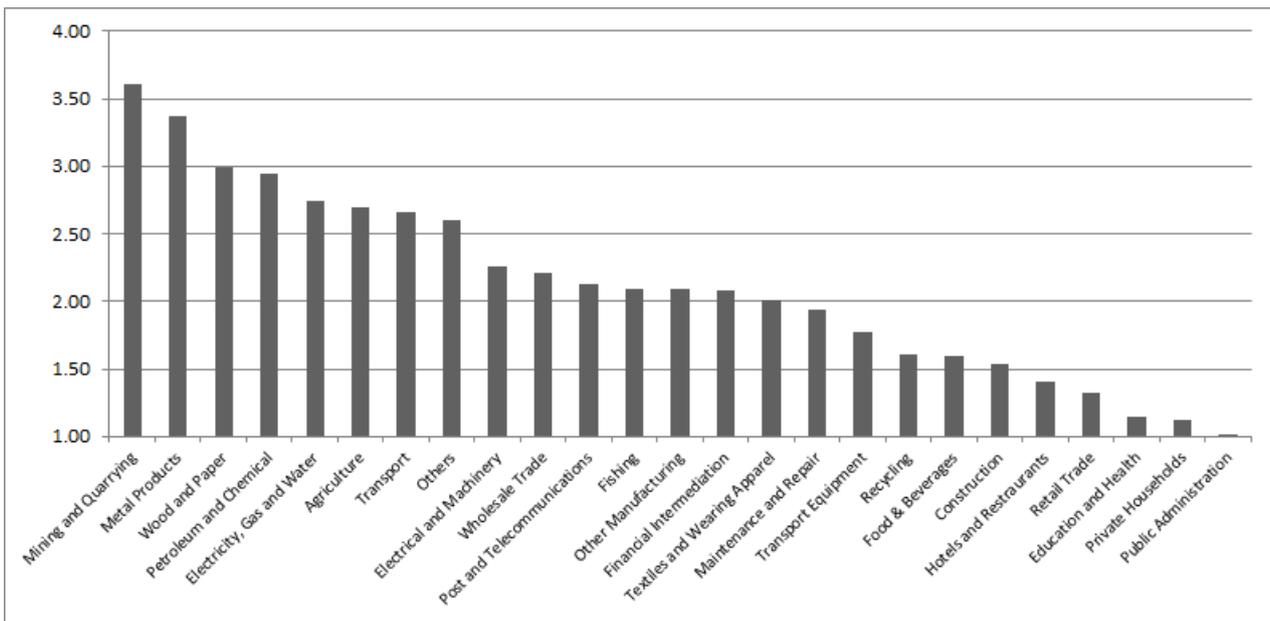
Figure 9 also reveals the existence of some sectoral common features, which could be the results of the peculiar characteristics of production processes rather than that of individual countries. A high GVC participation characterizes sectors that, by their nature, are more likely to include many production stages. Similarly, when the stages in a production process are relatively numerous, it becomes more likely to participate in the upstream stages of the chain. As noted above, a useful indicator of the number of production stages is the length of GVC (Fally, 2012). Figure 10, which shows the sectoral length of GVC for NA countries in 2013, reveals that some of the sectors with highest GVC participation are indeed sectors that require a high number of production stages and in which NA countries tend to occupy relatively upstream positions.

4.1 Country-Sector Evidence

The sectoral level results, while providing further details with respect to the aggregate regional and country-level analysis, still consider the region as a whole. However, as maintained above, NA countries are fairly heterogeneous, justifying a focus on selected country cases, their bilateral trade data and anecdotal evidence of value chain participation.

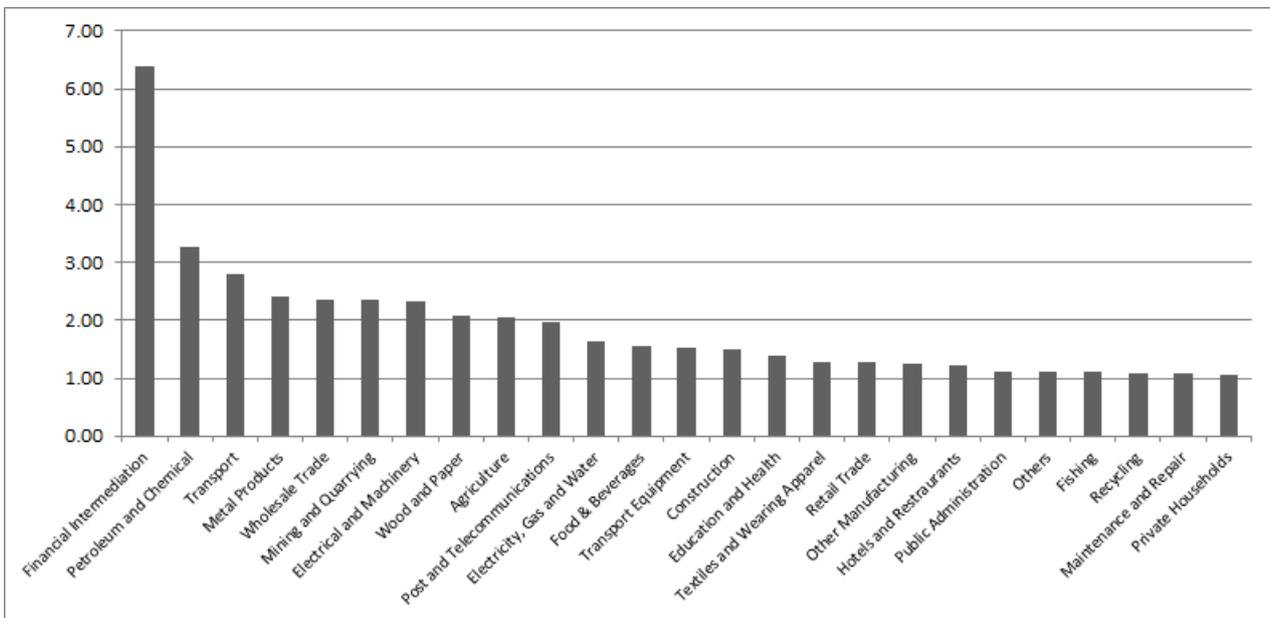
classification.

Figure 9: NA sectoral upstreamness in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Figure 10: NA sectoral length of GVC in 2013.

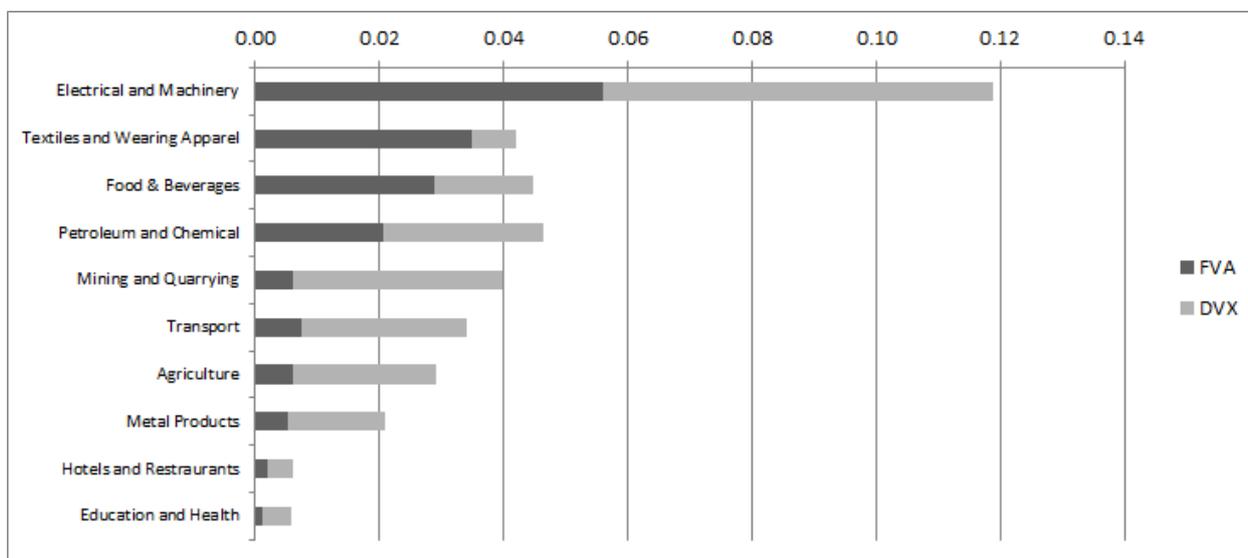


Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Against this background, an interesting case to focus on is Morocco, one of the most globally integrated country in the region. Figure 11, ranks the Moroccan sectors according to their gross exports in 2013. It suggest that Morocco's involvement in production networks is mainly due to the Electrical and Machinery and Textiles and Wearing Apparel industries. More precisely, it is due to their downstream stages, as the relatively high shares of FVA show. The country is indeed "a rear

base for the French aerospace industry" (ISIC rev.3 code 29). All Airbus aircraft machineries delivered worldwide fly with parts manufactured by the Moroccan aeronautics industry, which employs 10,000 people and plans to double the number of companies in the sector by 2020 with 20,000 jobs into the bargain⁸. The development of the aeronautics sector is a very promising global value chain, which relies on a pool of skilled human resources. With 100% of its production aimed at exports, the sector includes nearly 100 companies of international scope involved in activities covering production, services and engineering. EADS, Boeing, Safran, Ratier Figeac and, more recently, Eaton and Hexcel, are all present in the country. Moreover, the Moroccan garment industry (ISIC rev.3 codes 18, 19) is a key supplier for fast fashion supply chains, such as Zara, also thanks to its proximity to the EU market. The latter is a crucial driver of fast supply chains because of the speed and responsiveness of suppliers to meet changes in demand effectively. The national textile industry association has been able also to create over time a sector-led code of conduct and social label called Fibre Citoyenne, which the fashion retailers find attractive, leading to a successful upgrade into global fashion value chains. Their workers shared in the gains from economic upgrading, improving skills and benefiting from measurably improved standards (AfDB et al., 2014).

Figure 11: Morocco Sectoral GVC Participation (FVA + DVX) in 2013



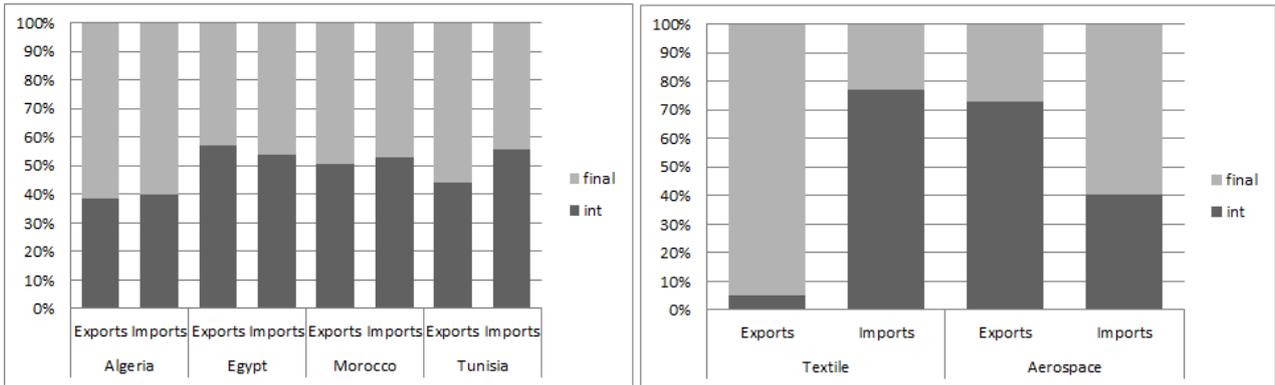
Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

This anecdotal evidence is supported by our data and further reinforced by looking at trade in intermediates, a different, perhaps rough way to detect participation in GVC related activities. As of today about 60% of global trade consists of intermediates and services, incorporated at different stages of production (UNCTAD, 2013). NA trade in intermediates was about 50% in 2012, with Egypt showing the highest intermediates export share (57%) followed by Morocco (53%). Tunisia, on the other hand, shows the highest intermediate share for imports (59%) (Figure 12a). Figure 12b suggests that Morocco is highly involved in the aerospace value chain, by importing intermediates and exporting components of the aircraft. In the textile sector, Morocco is instead very close to the final consumers. It mainly imports intermediate goods and, once processed, exports final goods and this pattern is compatible with being a source of known brands such as Zara or Armani.

Two other Moroccan industries are involved in international production networks. The automotive sector, which has been able to enter the Renault-Nissan value chain which started operations in Tangiers in 2012, has an annual production capacity of 340,000 vehicles, 90% of which are intended

⁸These numbers appeared in the news in 2015. See, for instance, the article "Morocco's fledgling aeronautics sector spreads its wings" published on the Financial Times, November 23.

Figure 12: Trade in intermediates in NA countries and Morocco

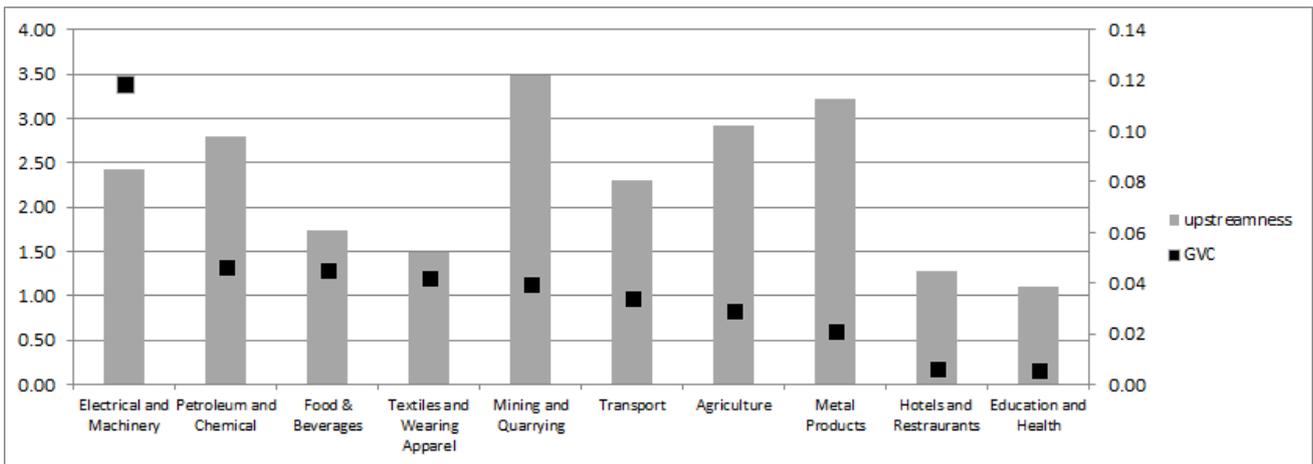


Source: Authors'elaboration based on STAN Bilateral Trade in Goods by Industry and End-use (BTDIxE), ISIC Rev.4.

for export, in particular to Europe. This chain is quite interesting since it started with a large investment of the Renault group, then resulted in a policy of local integration; it aimed at increasing the number of components that are locally sourced, thanks to savings achieved through lower logistics costs. Second, the phosphate industry, that has finally positioned itself in all parts of the value chain from the production of fertilizer to that of phosphoric acid as well as derivative products (AfDB et al., 2014).

Figure 13 shows the moroccan sectoral decomposition according to the GVC participation and the upstreamness of each sector. Notably, the involvement of the aerospace sector seems to be relatively far from final demand, as the high upstreamness measure shows (2.4) while that of garment industry is more downstream (see also Figure 15, as suggested also by bilateral trade data by end -use).

Figure 13: Morocco sectoral upstreamness in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

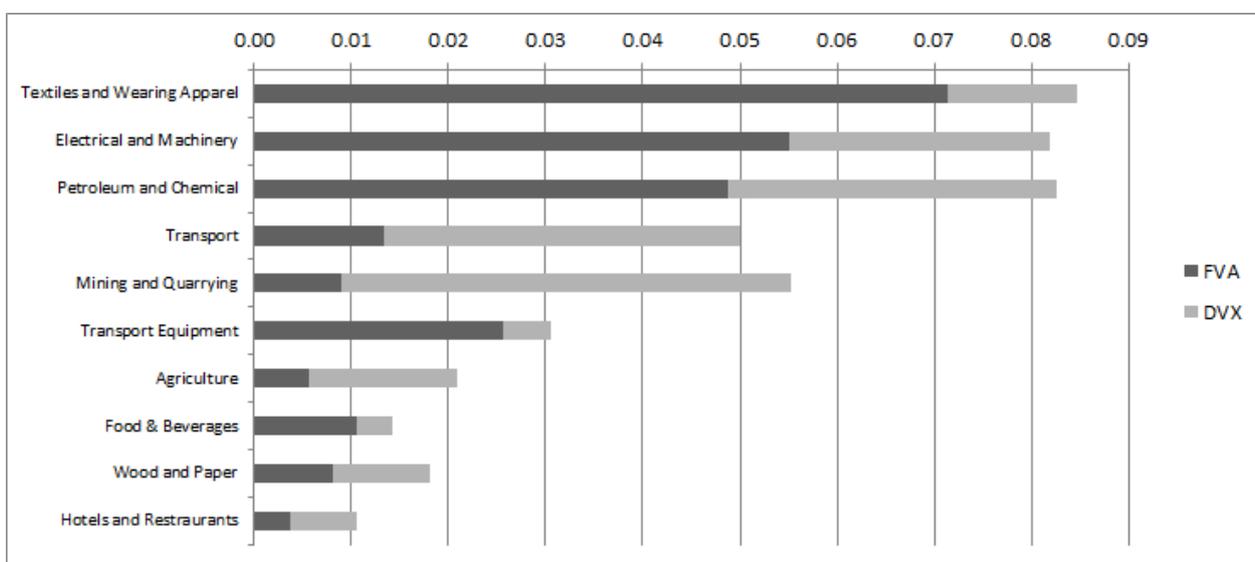
If Morocco is at the forefront, also Tunisia is one of the most export-oriented African economy. The country has historically been well integrated in three industries: textiles, leather and footwear; food products (Frederick and Gereffi, 2011), beverages, and tobacco and electrical and optical equipment (AfDB et al., 2014). These account for 75% of the country's exporting firms and more than 65% of jobs in industry. An interesting example of GVC, different from the Moroccan ones, to show how different opportunities to join international production networks exist, is solar component manu-

facturing. Tunisia is actually producing several high tech components for different final producers of solar panel.

Since the early 2000s, furthermore, the development of information and communication technologies has fostered the rise of new service activities and a greater integration into GVCs. Call centers have developed, as well as other outsourced service activities, e.g. accounting services. Our previous analysis has shown that Tunisia has stronger backward linkages into GVCs, thus resulting in a more downstream position than other NA countries. This is shown in more detail in both Figure 5b and in Figure 14.

This is also related to the importance of FDI in the country, which have been actively enhanced by favorable regulations of foreign business activity, including profits tax exemptions, tax-free raw materials imports and investment subsidies (WORLD-BANK, 2016). Different industries have invested in Tunisia, from telecommunications (Alcatel and Siemens) to pharmaceuticals (Sanofi Aventis and Pfizer), food processing (Nestlé), automotive (Toyota and Pirelli) and aircraft industry (Zodiac Aerospace) (Bass, 2016).

Figure 14: Tunisia sectoral GVC Participation (FVA + DVX) in 2013.

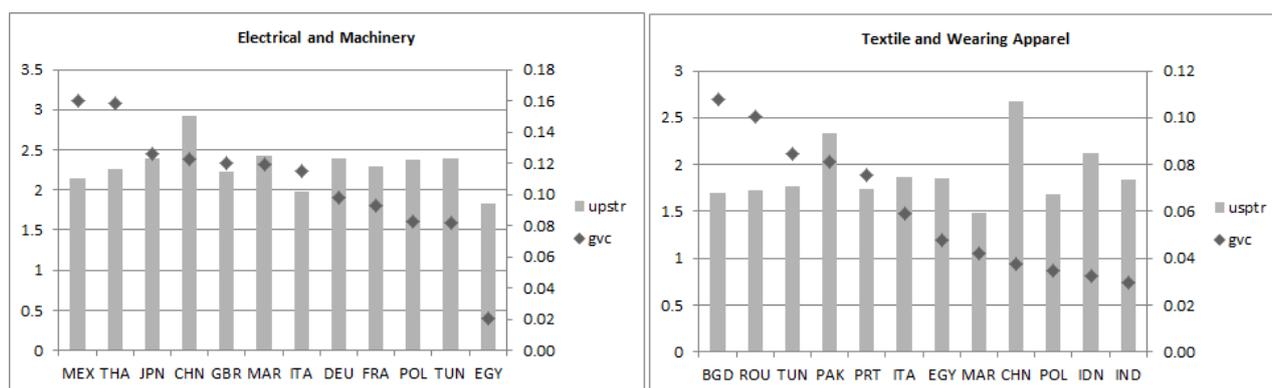


Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

In a cross-country comparison of the Electrical and Machinery industry, both Morocco and Tunisia reveal a good participation share, although remarkably upstream. In the Textile and Wearing Apparel sector they are among the most vertically integrated countries, this time relatively close to the final demand wrt other developing countries, such as Bangladesh, Pakistan and China (Figure 15).

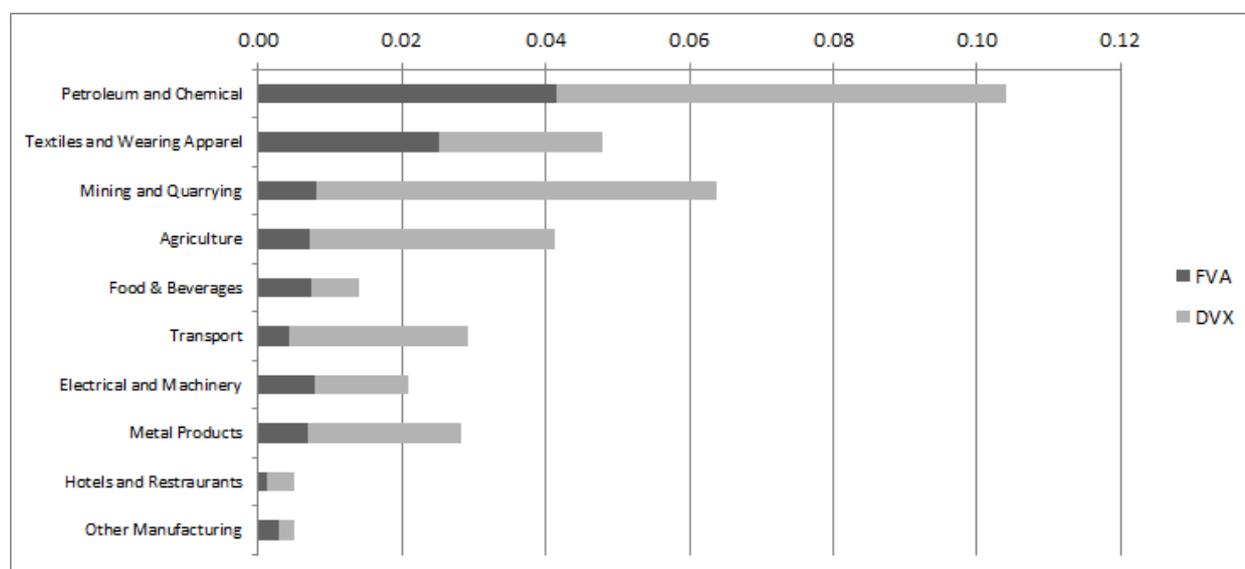
Despite the recent political instability, Egypt is still an interesting case to single out. Vodafone, Orange, Microsoft, Intel and Oracle have set up operations to serve their global clients in the information and communication technology (ICT) sector (AfDB et al., 2014). Traditional IT Services (ITS), such as software installation and testing and IT Enabled Services (ITES), such as call centers, are by far the largest contribution of SMEs and not just packaged software and hardware. The call centers development in Egypt covers from very simple to complex operations, such as marketing, sales, and business and information technology (IT) consulting, though the bulk of the country GVC involvement is due to the Petroleum and Chemicals, Mining and Textiles industries (Figure 16). Again both Figure 15 and Figure 17 reinforce the view that the country is active in stages far from final demand.

Figure 15: Selected sectors GVC participation and upstreamness 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Figure 16: Egypt sectoral GVC Participation (FVA + DVX) in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

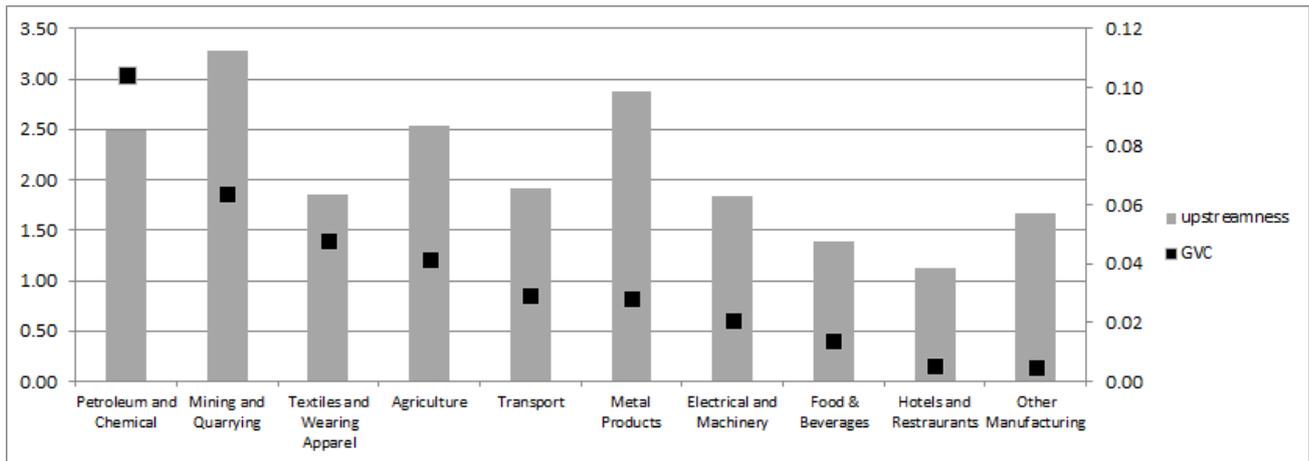
5 Conclusions

In this paper we investigate the involvement into GVCs of North African countries. We describe their participation and provide different measures and indices of positioning along the chains. To a certain extent, our analysis allows us to say that entering GVCs is a way to "denationalize comparative advantages", and has the potential to enhance developing countries export opportunities and their competitiveness.

Our results show that NA has not been able so far to fully enter into global production networks, remaining a very marginal player at the world level. Despite this, NA exports, although quantitatively low, largely and increasingly rely on GVC-related trade and North African countries seem to be finally adapting to the changing environment.

Firms in these countries have only recently started to participate in international production networks. They are no longer just importing intermediates for a mere assembling process, or to serve

Figure 17: Egypt sectoral upstreamness in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

their domestic markets; they are exporting parts and components used in some of the most sophisticated products in industrialized countries: for instance, we have seen that Morocco is manufacturing most components of aerospace then assembled in EU countries. This requires infrastructures, human capital and a series of skills different from those used to produce a whole product from scratch. It allows also developing countries to grab rents from products that they would not otherwise have been able to produce entirely with the local existent technology.

Global Value Chains and international fragmentation of production call for a different approach to policy. There are two main issues: one related to the number of times that a good crosses the borders before reaching final consumers and another related to the likelihood that countries more involved in international fragmentation of production have to sign trade agreements. As for the first issue, tariffs and other protection measures at the border are cumulative when intermediate inputs are traded across borders multiple times. Tariffs and non-tariff measures are therefore more likely to add a significant cost to the price of the finished good, if a country is involved in global value chains (while this is not true for domestic value chains). Effective tariffs on the domestic value added of exports, therefore, are particularly high in those economies (sectors) that have a large share of intermediate imports in their exports. Tariffs and other barriers on imports are indeed a tax on exports. Thanks to the Barcelona agreement of 1995 and further agreements with the EU (and with the US), North African countries have been able to enter GVCs. However, they still impose high tariffs on some goods and a number of restrictions. According to Kowalski et al. (2015), for instance, Morocco and Tunisia, which are still imposing a substantial number of restrictions to trade, could boost their GVC participation by 15% or more if they liberalized their trade policies.

The second issue concerns the likelihood to sign trade agreements at global and/or regional level. Lopez-Gonzalez (2012) argued that countries already engaging in GVCs tend to be more likely to sign trade agreements⁹. Again, North African countries have recently moved in this direction, for instance starting negotiations for Deep and Comprehensive Free Trade Area with the EU and increasing the South partnerships (e.g. with the Agadir agreement between Tunisia, Morocco, Jordan, and Egypt, in force since 2007).

Integration into global value chains can also bring benefits (or have drawbacks) different from

⁹For Tunisia, which was the first country to sign the Barcelona Agreement, for instance, tariff dismantling was completed in 2008, with the resulting Free Trade Area. In October 2015, the EU and Tunisia started negotiations for a Deep and Comprehensive Free Trade Area, encompassing not only trade in goods areas like standards, competition and intellectual property rights and extending to trade in services, government procurement and investment protection. Overall, this could lead to a gradual integration of Tunisia's economy into the EU single market. Similar developments are occurring in the other countries of North Africa.

those traditionally associated to trade in final goods. Indeed, each country can better exploit its comparative advantage niches, with possible benefits from economies of scale. Existing evidence on different countries shows that entering a GVC can result in increased productivity (Antràs and Yeaple, 2014; Giovannetti et al., 2015). To the extent that this is true, a major question becomes how can participation into a value chain be incentivized, in order to enhance competitiveness. Furthermore, gains from participating are not equally distributed along the chain and the amount of value added that a country (sector/firm) can get is likely to depend on its positioning. Hence, it becomes crucial to identify those policies aimed at boosting the "right" positions, which typically have been identified in one or both ends of the chain where higher value added are located (Del Prete and Rungi, 2015b). As with regard to their positioning along the GVC, however, North African countries mostly participates in the upstream manufacturing phases, characterized by lower gains, even if, as noticed above, the area is quite heterogeneous. Different countries are integrated in different ways, with very few successful examples of beneficial participation in a value chain.

Finally, an increase in participation can also challenge the standard relationship between exchange rates and competitiveness, to the extent that imports of intermediates are inputs to exports. The impact of, for instance, an exchange rate depreciation is likely to be different depending on the positioning of the firm along the chain. It is also likely to depend on whether the firm is a buyer, a supplier, or both. More precisely, a country which is more downstream (such as Morocco) is likely to have a higher foreign content relative to domestic content so that the impact of a depreciation is lower, if at all positive. On the other hand, a country such as Algeria or Libya, where the foreign content is lower, is likely to benefit from a depreciation in a "traditional way".

To summarize, the surge of supply chains calls for a more coherent view of trade policies. The fragmentation of production has created potential new opportunities also for developing economies and for small and medium-sized firms. Indeed they can access global markets as suppliers for components (or, in some case, even services) without having to build the entire value chain of a product. At the same time, GVCs place new demands on firms, in particular as far as the need for strong coordination and efficient links between production stages and across countries is concerned. Accent could therefore be placed for instance on trade facilitation, on keeping at reasonable level the numbers of regulations on quality standards, efficient network infrastructures and complementary services. GVCs need well-functioning transport, logistics, finance, communication, and other business and professional services¹⁰. In short, as very well put by Hoekman (2014), given the changes in the trade network that took place in the last twenty years, a new trade policy should be implemented: "think value chain".

¹⁰The industrial policies followed in Morocco, Tunisia and Egypt are spelled out in a recent paper by Ait Ali and Msadfa (2016).

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A Appendix

To compute value added components we require a multi-region input-output (MRIO) table, which builds upon national IO tables by breaking down the use of products by origin. While the rows in a MRIO table indicate the use of gross output from a particular industry in a country, the columns provide information on the technology of production, as they indicate the amounts of intermediates needed for the production of the gross output whose use is then decomposed along the row. Building on this info, we can translate the MRIO table for multiple countries and industries into a standard I–O matrix form, expressed as:

$$\mathbf{x} = \mathbf{Z}\mathbf{j} + \mathbf{y} \quad (1)$$

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{y} \quad (2)$$

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} = \mathbf{L}\mathbf{y} \quad (3)$$

where \mathbf{x} represents the gross output $n \times 1$ vector of n countries, $\mathbf{Z}\mathbf{j}$ the total intermediate demand vector (with \mathbf{Z} being the intermediate demand matrix and, \mathbf{j} an all-one vector), \mathbf{y} the total final demand vector ($\mathbf{y} = \mathbf{Y}\mathbf{j}$, with \mathbf{Y} being the final demand matrix), \mathbf{I} the identity matrix, \mathbf{A} is the technical coefficient matrix and \mathbf{L} is the Leontief inverse matrix. Total value added is obtained from the vector $\mathbf{w} = \mathbf{x} - \mathbf{Z}\mathbf{j}$ as the difference between gross output and intermediates use. To calculate value added trade, we start with the share of value added per unit of output by country (e.g. $v_1 = w_1/x_1$ being the first element of the vector \mathbf{v}), combined with the Leontief inverse matrix \mathbf{L} and aggregate exports by country as retrieved by the sum of the intermediates and final goods sold abroad (e.g. $e_1 = (z_1 - Z_{11}) + (y_1 - Y_{11})$ being the first element of the vector \mathbf{e}). The value added trade matrix can then be written as $\mathbf{T}^{\mathbf{v}} = \mathbf{V}\mathbf{L}\mathbf{E}$, as:

$$\begin{pmatrix} T_{11}^{\mathbf{v}} & \cdots & T_{1n}^{\mathbf{v}} \\ \vdots & \ddots & \vdots \\ T_{n1}^{\mathbf{v}} & \cdots & T_{nn}^{\mathbf{v}} \end{pmatrix} = \begin{pmatrix} v_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & v_n \end{pmatrix} \begin{pmatrix} L_{11} & \cdots & L_{1n} \\ \vdots & \ddots & \vdots \\ L_{n1} & \cdots & L_{nn} \end{pmatrix} \begin{pmatrix} e_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & e_n \end{pmatrix} \quad (4)$$

where the left hand side matrix $\mathbf{T}^{\mathbf{v}}$ describes how the value added contained in the exports of each country (and industry) is generated (by column) and distributed (by row) across countries.

In fact, the columns of the matrix $\mathbf{V}\mathbf{L}$ indicate the amount of value added required from the different row-countries for the column-country to produce 1 unit of gross output and all the columns sum up to 1 by construction.

Similarly, under the assumption of homogeneity between output and export, the columns of the matrix $\mathbf{T}^{\mathbf{v}}$ represents the value added content of exports of the column-country, which is then composed of two parts: on the main diagonal, the term $T_{ii}^{\mathbf{v}}$ denotes the Domestic Value Added (DVA) of country i ; outside the main diagonal, the term $T_{ki}^{\mathbf{v}} = v_k L_{ki} e_i$ with $k \neq i$ denotes, instead, the Foreign Value Added (FVA) generated by row-country k and incorporated in the exports of column-country i . The (column) sums of Domestic and Foreign Value Added, by construction, will yield the total exports of countries (i.e. $\mathbf{e} = \mathbf{T}^{\mathbf{v}}\mathbf{j}$).

The trade in value added $\mathbf{T}^{\mathbf{v}}$ matrix also provides information on how much of each country's domestic value added enters as an intermediate input in the value added exported by other countries. For row-country i , the term $T_{ik}^{\mathbf{v}} = v_i L_{ik} e_k$ represents exported domestic value added that is further incorporated into the exports of column-country k . Hence, by reading the matrix along the row (and excluding the diagonal term), it is possible to measure the "indirect value added exports" (DVX).

To capture the overall participation of countries and industries in GVCs we combine the FVA and DVX measures, by summing up the foreign value-added used in a country's own exports and the value added supplied to other countries' exports, and taking the sum as a ratio to gross exports, i.e. $\text{GVC} = \text{FVA} + \text{DVX}$.

The length of GVC indicator is computed simply as $\mathbf{N} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{j} = \mathbf{L}\mathbf{j}$ and represents a measure of the number of production stages.

To compute the distance to final demand, instead, we need to take a different perspective. Starting from the standard I–O matrix as defined above, using the same notation, we can write:

$$\mathbf{x} = \mathbf{Z}'\mathbf{j} + \mathbf{w} \quad (5)$$

$$\mathbf{x} = \mathbf{B}\mathbf{x} + \mathbf{w} \quad (6)$$

$$\mathbf{x} = (\mathbf{I} - \mathbf{B})^{-1}\mathbf{w} = \mathbf{G}\mathbf{w} \quad (7)$$

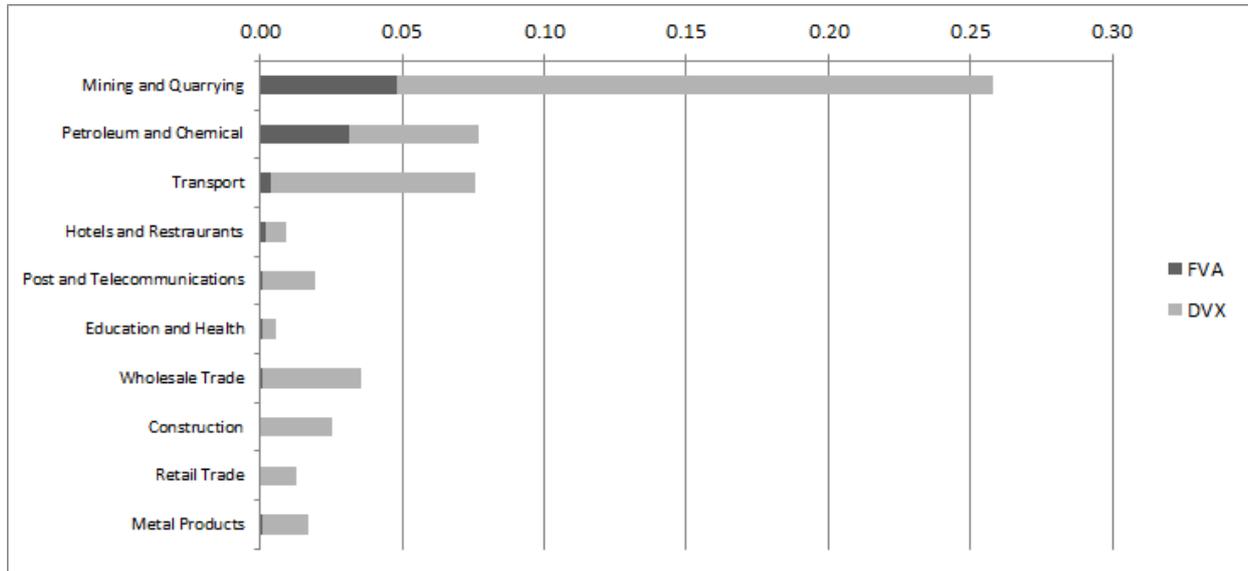
The distance to final demand indicator is then computed as $\mathbf{D} = (\mathbf{I} - \mathbf{B})^{-1}\mathbf{j} = \mathbf{G}\mathbf{j}$, where \mathbf{B} is the matrix of output coefficients and \mathbf{G} is the Ghosh inverse matrix.

B Table Appendix

Figure 18: Common 25 ISIC-type classification.

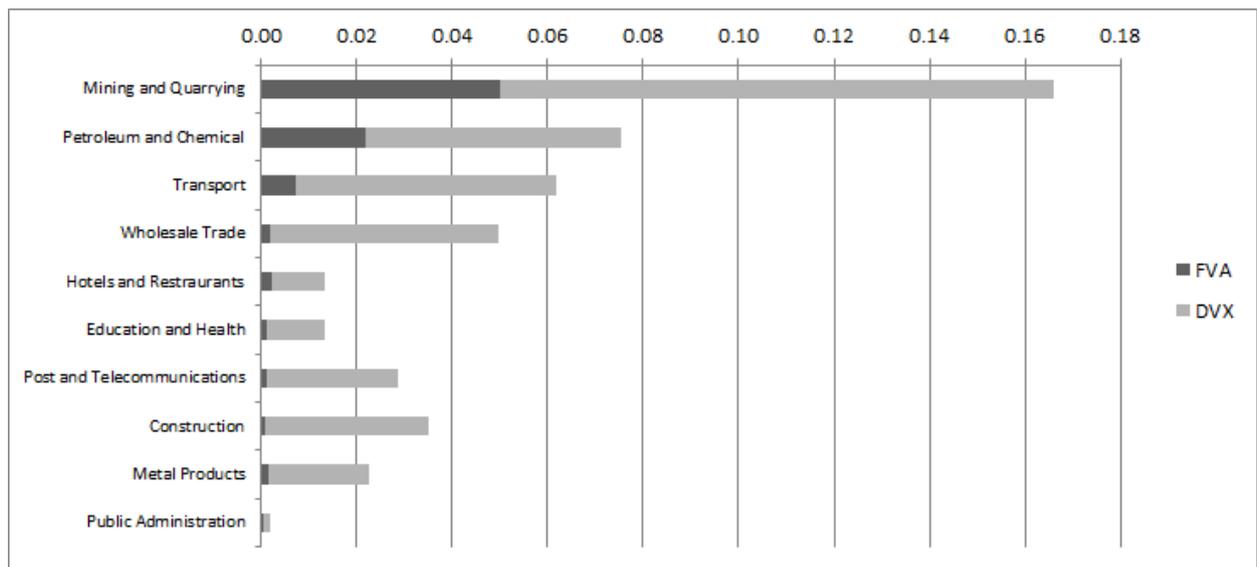
Sector name	ISIC Rev.3 correspondence
Agriculture	1,2
Fishing	5
Mining and quarrying	10,11,12,13,14
Food and beverages	15,16
Textiles and wearing apparel	17,18,19
Wood and paper	20,21,22
Petroleum, chemical and non-metallic mineral products	23,24,25,26
Metal products	27,28
Electrical and machinery	29,30,31,32,33
Transport equipment	34,35
Other manufacturing	36
Recycling	37
Electricity, gas and water	40,41
Construction	45
Maintenance and repair	50
Wholesale trade	51
Retail trade	52
Hotels and restaurants	55
Transport	60,61,62,63
Post and telecommunications	64
Financial intermediation and business activities	65,66,67,70,71,72,73,74
Public administration	75
Education, health and other services	80,85,90,91,92,93
Private households	95
Others	99

Figure 19: Algeria sectoral GVC Participation (FVA + DVX) in 2013



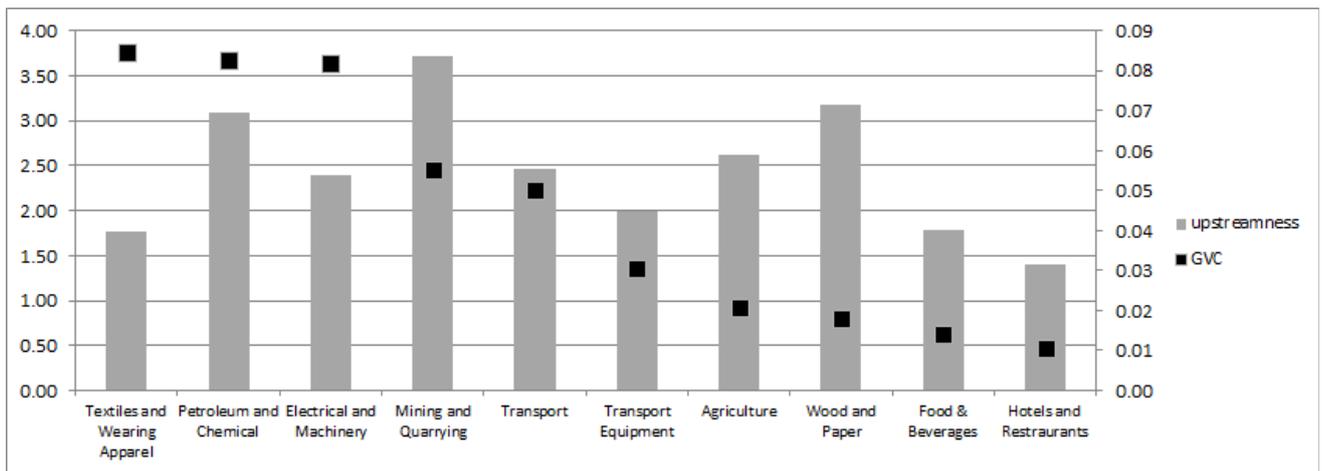
Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Figure 20: Libya sectoral GVC Participation (FVA + DVX) in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.

Figure 21: Tunisia sectoral upstreamness in 2013.



Source: Authors'elaboration based on UNCTAD-Eora GVC Database.