Services Liberalization and Global Value Chains Participation: Evidence from Egypt

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With the growing 'servicification' of the manufacturing sector, efficient and competitive services are key to developing countries' engagement in today's production structure relying on global value chains. The objective of this paper is, therefore, to assess the impact of restrictive services trade policy on manufacturing firms' participation in global value chains by combining data from the Services Trade Restrictiveness Index from Jafari and Tarr (2017) with Egyptian firm-level data from the World Bank Enterprise Surveys. The paper uses a novel multi-tiered approach introduced by Dovis and Zaki (2020) to measure different degrees of firms' participation in global value chains that extend beyond simple two-way trade. Results from the empirical exercise suggest that services restrictions reduce the likelihood of manufacturing firms' participation in global value chains. This impact is more pronounced for larger firms and for more complex forms of global value chain integration involving trade, international certification, and foreign ownership.

Key Words: manufacturing sector, servicification, foreign direct investment, services trade restrictiveness index

INTRODUCTION

Since the early 2000s, global production and trade are dominated by value chains. Although other renowned terms such as fragmentation and specialization are often used in reference to global value chains (GVCS), the latter is a more complex phenomenon that extends beyond trade in inputs and outputs according to countries'

comparative advantages. GVCS are characterized by an intensive international exchange of production-related 'activities' or 'tasks,' services, technology, and know-how among firms within the same industry across the globe (Baldwin 2011; The World Bank 2020; Taglioni and Winkler 2016).

Services play a crucial and multi-faceted role in the success and expansion of manufacturing value chains. First, services are necessary inputs across all stages of the manufacturing production and exports (Low and Pasadilla 2015; Heuser and Mattoo 2017). Today, the share of services in the value-added of manufacturing exports exceeds 30 % (OECD 2020; 2013; Miroudot 2017). Second, efficient and timely services such as transport, telecommunications, and business services are crucial for the coordination and management of tasks between firms along GVCS (Francois, Manchin and Tomberger 2015; Lanz and Maurer 2015; Kowalski et al. 2015). Third, as part of this growing 'servicification' of the manufacturing sector, firms can increase their competitiveness and secure market niches by offering services and manufacturing goods in differentiated and innovative 'bundles' or 'solutions' (Miroudot 2019; 2017; OECD 2017; Thangavelu, Wang, and Oum 2018).

The crucial role services play in GVCS and the increasing servicification of the manufacturing sector have important policy implications, especially for developing countries where services trade restrictions are persistently high: more open services trade policies are likely to increase competition in the domestic market, introduce new services, and improve the quality of existing services. This would benefit the manufacturing sector in many ways: first, efficient services inputs would generate productivity gains in downstream manufacturing activities and enable manufacturing firms to enter the exports market or to increase their exports. Firms may also be able to upgrade towards more sophisticated products along GVCS, which could generate shifts in their countries' comparative advantage (Heuser and Mattoo 2017; Van der Marel 2016). Second, manufacturing firms in developing countries would benefit from efficient transport and communication services to coordinate their tasks with other firms across the globe. Finally, firms could also

increase their international competitiveness by targeting specific niches with differentiated product solutions, including innovative and high-quality services.

In the current global context, the world is witnessing changes in GVC patterns in the form of near-shoring or re-shoring of production. Developing countries like Egypt have, therefore, an opportunity to successfully attract repatriated FDI and act as a regional manufacturing hub in the MENA region and the Euro-Mediterranean space. Given the size of the Egyptian economy, the relatively diversified manufacturing sector, and the relative abundance of labor, the country has a promising opportunity to support its manufacturing sector and to deepen its participation in global and regional value chains by creating favorable market conditions and lifting unnecessary and burdensome services restrictions.

[247]

The objective of this paper is, therefore, to assess the impact of services trade policies on Egyptian manufacturing firms' participation in GVCS. Using pooled data on Egyptian manufacturing firms from the World Bank Enterprise Surveys (2013, 2016, and 2020, see https://www.enterprisesurveys.org), I estimate the impact of services policy restrictions on the likelihood that a firm participates in a GVC. Following Dovis and Zaki (2020), I use several indicators of GVC participation that range from simple two-way trade to more complex forms involving foreign ownership and international certification of firms. Firm heterogeneity is accounted for by introducing an interaction between services policies and firm size. Overall, the results suggest that services restrictions reduce the likelihood of Egyptian firms' participation in GVCS. This effect is more pronounced for complex levels of GVC integration involving foreign investment. Finally, services restrictions are found to matter more for larger firms, given that these are more productive, and hence more likely to integrate in GVCS.

The contribution of this work is threefold: First, the paper builds a bridge between two active literatures on GVCS and trade in services by contributing to the relatively small, but growing literature on services liberalization and its impact on firms' GVC participation. Second, the choice of Egypt as a MENA country contributes

to the scarce literature on trade and trade policy in the region and makes the case for potential benefits of services liberalization in developing countries. Third, data limitations make it difficult to measure GVC participation in developing countries. Against this backdrop, I adopt a comprehensive definition of GVC participation following the novel approach introduced by Dovis and Zaki (2020). This approach suggests four GVC participation levels ranging from simple two-way trade to more complex forms involving international certification and foreign ownership. This multi-tiered definition responds to the active literature on GVCS, where trade and FDI are considered two complementary rather than substitute features of GVCS. Moreover, for firms to export and expand their export destinations, foreign certification is required to guarantee commitment to international standards. Therefore, the indicators of GVC participation take into account these additional dimensions. To the author's knowledge, this paper is the first attempt to explore the nexus between services policies and participation in GVCS using this definition.

[248]

The remainder of the paper is organized as follows: Section 2 is devoted to the concept of GVCS and the literature on services trade liberalization and GVC participation. Section 3 presents some stylized facts about the state of firms' GVC participation in Egypt and across different regions, in addition to the actual state of services restrictions. Section 4 describes the data and the methodology used for the empirical investigation. The main findings are discussed in Section 5. Finally, Section 6 concludes and underlines the main policy implications.

LITERATURE REVIEW
GVCS and GVC Participation: An Overview

GVCS can be defined as the full range of activities (design, production, marketing, distribution, and customer support) that firms and workers across the globe do to bring a product from its conception to its end use and beyond (Gereffi and Fernandez-Stark 2011; De Backer and Miroudot 2013). GVCS can also be defined as interconnected functions and operations through which goods and

services are globally produced, distributed, and consumed (Kano, Tsang, and Yeung 2020). While the term fragmentation is often used interchangeably with that of GVCS, there are fundamental differences between both. First, specialization and the resulting fragmentation is not (only) in products (inputs, intermediate goods, and final products), but rather in tasks or activities. Hence, not only goods, but also services, technology, and know-how are internationally exchanged (OECD 2017). Second, this new form of fragmentation results into hyper-specialization and a strikingly higher level of geographical dispersion of activities within a single industry (De Baker and Miroudot 2013). Third, GVCS reveal stronger forward and backward linkages as compared to fragmentation in the past. Fourth, GVCS are characterized by strong firm-to-firm relationships, as those who trade are not countries, but rather firms (The World Bank 2020). In other terms, GVCS can be thought of as cross-border 'factories' where tasks and business functions are distributed globally or regionally (Taglioni and Winkler 2016).

[249]

There are two types of GVCS. The first type is a vertical chain or a 'snake,' where each country imports inputs to process and export them later to the next firm, adding value along the chain in a sequential way. The second (most common) form of GVCS is a network or a 'spider,' where different components (goods and services) of the final product are assembled from different parts of the world with no specific order (Baldwin and Venables 2013; OECD 2013).

As a result of the increase in GVCS, nearly 70% of today's international trade takes the form of trade in raw materials, parts, components, and services (OECD 2020). Several factors explain the rise of trade along GVCS over the past decades. The first relates to the reduction in trade costs resulting from liberalization of trade and investment. The second factor is the rapid technological progress in backbone services such as transport and telecommunications, which facilitated the management and coordination of globally dispersed tasks and activities. The third driver is the entry of developing countries as new players into the global economic scene: the emergence of GVCS lowered barriers to entry for developing countries and offered them a fast-track industrialization as they can

'plug' into GVCS and specialize in specific activities without having to establish the entire chain locally (Nano and Stolzenburg 2021). Developing countries taking part in GVCS have an opportunity to enter new industries and to benefit from the transfer of technology and know-how to upgrade their exports. Additional benefits include the motivation to adopt international standards to increase competitiveness and gain access to foreign markets and capital. GVCS also carry an opportunity for smaller economies to expand their market and benefit from economies of scale, and for less diversified economies to find niches in the global economy. Finally, SMES in developing countries can benefit from access to global markets. However, this largely depends on the overall investment climate and the availability of high-quality backbone services (Cusolito, Safadi, and Taglioni 2016).

Indicators of GVC participation are currently available for OECD countries and a growing number of non-OECD countries. GVC participation can be measured using forward and backward linkages. Forward (downstream) linkages are measured as the share of a country's value added in the exports of another country (indirect value added in the exports to a third country). Backward (upstream) linkages are the share of intermediate imports in a country's exports, or the share of foreign value added in a country's total exports. The sum of both types of trade constitutes the country's total participation in GVCS (De Backer and Miroudot 2013).[1] GVC intensity is measured as the share of a country's total GVC participation in its total trade (Qiang, Liu, and Steenbergen 2021).

The complexity of measuring trade along GVCS and the lack of consistent data makes it challenging to construct indices of GVC participation for developing countries. Thus, Dovis and Zaki (2020) introduce a new integral measure of GVC participation that allows for the analysis at the firm level. This measure consists of 4 levels of GVC integration, ranging from simple to more complex forms. First,

[1] The GVC participation indicators are available for a total of 66 countries. For more information on the GVC participation index, see the Trade in Value Added (TiVA) database (http://oe.cd/tiva).

firms that import and export simultaneously are likely engaged in GVC activities. Second, firms engaged in GVCS trade may also opt for international certification. This is particularly relevant for firms that are vertically integrated in GVCS. Third, firms that export and import are also likely owned by foreign entities to serve as their exporting platforms. Finally, the deepest form of GVC integration includes two-way trade, international certification, and foreign ownership. This approach is discussed in detail in the third section and adopted in the empirical estimation in the fourth section.

[251]

Services Liberalization and Manufacturing GVCS

There are several channels through which services liberalization can affect manufacturing GVCS. First, services are the 'glue' that holds fragments of GVCS together (Francois, Manchin and Tomberger 2015; Lanz and Maurer 2015). For example, transport and telecommunications facilitate transactions through space, while business services facilitate transactions through time (Kowalski et al. 2015). An early work by Deardorff (2001) highlights that the more trade is taking place though fragmentation, the greater the benefits from liberalizing trade in services. Thus, the additional cost from restrictive services regulations can act as an impediment to the sustainability and smooth functioning of GVCS.

Next, services are necessary inputs across all stages of the manufacturing value chains, ranging from pre-production services (such as research and design) to producer services (such as engineering services) and services supporting the delivery of goods at the end of the value chain (such as marketing and distribution services) (Low and Pasadilla 2015; Heuser and Mattoo 2017). Since manufacturing value chains are becoming increasingly fragmented at the global level, services embedded in goods are also exported along GVCS. Services represent more than one third of the total value-added of manufacturing exports (OECD 2020; 2013; Miroudot 2017) and account for 60% of the value-added of foreign affiliates of multinational enterprises around the world (Andrenelli et al. 2018).

Lastly, there is an increasing trend of 'servicification' of the manufacturing sector. Servicification can be understood not only as the

increased use of domestic and imported service inputs in manufacturing, but also the increased bundling of services and manufactured goods together as differentiated and competitive 'solutions' (Miroudot 2017; 2019; OECD 2017; Thangavelu, Wang, and Oum 2018). Since barriers to trade in services are higher than those in goods, servicification means that manufacturing firms face higher trade barriers by intensifying their use of services. Thus, high-quality and cheap services increase manufacturing firms' productivity and competitiveness and potentially increases firms' participation in GVCS. Introducing new services, and improving and expanding the existing upstream services through liberalization and competition leads to productivity gains in downstream manufacturing activities. These gains allow firms to enter GVCS, to increase their manufacturing exports, or to upgrade towards more sophisticated products along the value chain. Improved services not only increase productivity, but can also stimulate possible shifts in countries' comparative advantage (Heuser and Mattoo 2017; Van der Marel 2016).

The empirical literature on services liberalization and GVC participation is scarce. Most studies focus on indicators of manufacturing performance, such as productivity and/or exports. For example, a positive impact of improvements in upstream services on productivity downstream manufacturing firms was found in several studies – Arnold et al. (2016) for Indian firms, Arnold, Javorcik, and Matoo (2011) for Czech firms, Arnold, Matoo, and Narcisso (2008) for 10 countries in Sub-Saharan Africa, Shepotylo and Vakhitov (2012) for Ukrainian firms, Bas and Causa (2013) for Chinese firms, Fernandes and Paunov (2008) for Chilean firms, and Winkler (2018) for a group of 105 low- and middle-income countries. Some studies also interact services reforms with the quality of institutions to highlight the key role of the latter in creating manufacturing productivity gains through services reforms (Beverelli, Fiorini, and Hoekman 2017; Fiorini and Hoekman 2017; Hoekman and Shepherd 2017). Another group of studies considers other performance indicators, such as exports and exports differentiation. For example, Bas (2014) found that services reforms positively affect manufacturing

exports at the extensive and intensive margins in India. The effect is stronger for initially more productive firms. Similarly, Karam and Zaki (2020) found that for MENA countries, service protection has a negative and significant effect on the extensive margin to trade, but does not affect the firm's intensive margin. The effect of service barriers is more pronounced for small firms and for firms operating in high value-added sectors. Liu et al. (2020) found a positive relationship between financial and business services development and the exports of manufacturing sectors that use these services intensively. Andrenelli et al. (2018) demonstrated that services restrictions are associated with lower output of foreign affiliates in the manufacturing sector and affects firms' decisions to engage in exports. Ariu et al. (2019) found that increased servicification allows Belgian manufacturing firms to increase export revenues by 25%. Francois and Woerz (2008) found significant and strong positive effects from increased business service openness on exports of industries like machinery, motor vehicles, chemicals, and electric equipment in OECD countries.

A smaller yet growing body of literature examines the impact of services liberalization and GVC participation using more GVC-specific measures. For example, Nordås and Rouzet (2015) measured GVC participation for 40 countries by taking into account bilateral exports, imports, and intra-industry trade using the OECD Trade in Value Added (TiVA) Database. The gravity results suggest a negative relationship between services restrictions and trade performance of the manufacturing sector. A recent study by Lee (2019) relied on bilateral GVC trade data from the OECD Inter-Country Input-Output tables for 61 countries and 37 sectors. Lee (2019) used a gravity model to estimate the impact of services trade agreements on participation in manufacturing GVCS. GVC participation is measured using three indices: gross exports of intermediate products, backward GVC exports, and forward GVC exports. Results suggest that having a services agreement is associated with high gross exports of intermediate goods, and with higher GVC trade by developing countries. Biryukova and Vorobjeva (2017) assessed the impact of services restrictions (measured by the OECD Services Trade

[253]

Restrictiveness Index) in nine services sectors on GVC participation (measured by the GVC participation index) in BRICS countries. They found that liberalizing transport and financial services in Russia, Brazil and South Africa is likely to increase their GVC participation and upgrade along the value chain. For India, Goldar, Banga, and Banga (2018) assessed the impact of services imports on the manufacturing sector's performance at the country and industry level using the TiVA/World Input Output Database. The analysis is supplemented by firm-level data to assess the impact of imported services on firms' exports. Their findings suggest that servicification increases exports extensive and intensive margins at the firm-level.

STYLIZED FACTS

Services Trade Restrictiveness in Egypt

The conclusion of the General Agreement on Trade in Services (GATS) opened the door for international services negotiations. Barriers to trade in services are however, profoundly different from those affecting trade in goods. Due to the different and multifaceted nature of services provision and trade, their intangibility and proximity requirements, and the significant movement of capital and natural persons they entail, barriers often arise from behind-the-border regulatory policies that discriminate against foreign services, foreign service providers, and foreign capital. Unlike tariffs on goods, barriers to trade in services are rather qualitative and therefore more challenging to measure. To overcome this problem, qualitative data on discriminatory regulations affecting the different modes of services provision must be translated into a quantitative index that is comparable across countries. One of these measures is the Services Trade Restrictiveness Index (STRI)[2] developed by the World Bank for 103 developing countries and 5 major services sectors that are important inputs in manufacturing production and vital for international trade. These five broad sectors are profes-

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[2] Data on the STRI scores and countries' regulatory restrictions can be extracted from the Services Trade Restrictions Database (http://i-tip.wto.org/services/default.aspx).

sional, finance, telecommunications, transport, and retail services.[3]

To construct the STRI, information on discriminatory regulations affecting trade in services are collected using questionnaires[4] and are categorized by mode of supply.[5] Each policy measure is assigned a score ranging from 0 to 1 based on its degree of restrictiveness, with 1 being the most restrictive, 0 meaning the absence of restrictions, and intermediate values indicating the presence of relative restrictions to foreign supply. For each of the 4 modes of supply, a score is calculated to illustrate the restrictiveness of the policy regime per mode (for example, an STRI score of 1 in mode 3 means that a given service sector is completely closed to foreign investment).

To estimate the overall policy restrictiveness in a service sector, a weighted average of the 4 modes is calculated. Larger weights are assigned to more relevant modes of provision of a specific service. An overall index score of 1 is the most restrictive and indicates that the market is completely closed to foreign service provision across the four modes of supply, and a score of zero means the absence of restrictions (a completely open regime). Intermediate scores reflect different levels of policy restrictiveness per service sector. For example, a service market may be open with minor restrictions, or virtually closed in the presence of substantial restrictions.

Table 1 presents the STRI for Egypt and six regions by sector. On average, the MENA region has the most restrictive services trade policies in the world. The STRI is consistently higher than other regions across the five services sectors. A second observation is that

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[3] The STRI is also available for 11 subsectors included under these 5 broad service categories. These are: banking, accounting, legal, insurance, fixed-line, mobile-line, maritime transport, air transport, road transport, rail transport, and retailing services.

[4] For more information on STRI methodology, see Borchert, Gootiiz, and Mattoo (2012).

[5] Services modes of supply are cross-border trade (mode 1), consumption abroad (mode 2), commercial presence/FDI (mode 3), movement of natural persons (mode 4). For more details on services modes of supply, see https://www.wto.org/english /tratop_e/serv_e/cbt_course_e/c1s3p1_e.htm.

TABLE 1   STRI by Sector: Egypt and Regional

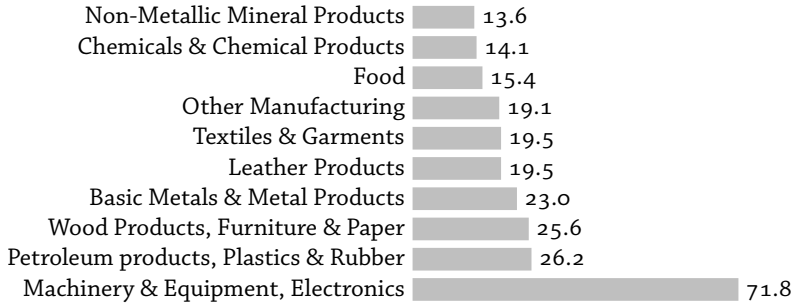| Category	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Professional	0.815	0.380	0.550	0.385	0.685	0.590	0.500
Transport	0.548	0.290	0.378	0.340	0.508	0.508	0.305
Financial	0.450	0.180	0.200	0.230	0.365	0.275	0.250
Telecoms	0.380	0.225	0.330	0.240	0.450	0.415	0.395
Retail	0.410	0.140	0.160	0.160	0.320	0.250	0.170

NOTES   Column headings are as follows: (1) Egypt, (2) Europe and Central Asia, (3) East Asia and Pacific, (4) Latin America and Caribbean, (5) Middle East and North Africa, (6) South Asia, (7) Sub-Saharan Africa. Based data from Jafari and Tarr (2017).

Egypt's STRI scores are higher than the MENA average score, except for the telecommunications sector. With an index value of more than 0.81, the professional services sector is nearly closed to foreign competition. Restrictions in the transport sector are also higher than other regional STRI averages. An index of 0.54 suggests that major restrictions exist for foreign services or service providers. The state of restrictions on the transport sector in Egypt is comparable to the MENA and South Asia regions (STRI of 0.5). The international provision of financial services in Egypt is also relatively restricted as compared to the MENA region and to other regions in the world. At a regional level, Europe and Central Asia have the lowest STRI for financial services, indicating that the sector is virtually open to foreign trade. The financial services sector is also relatively open in East Asia and Latin America and the Caribbean, with an STRI value below 0.25. In telecommunications, the STRI score for Egypt (0.38) is lower than the STRI averages in the MENA region (0.45), in South Asia (0.41), and in Sub-Saharan Africa (0.39). Again, Europe and Central Asia has the lowest STRI score, suggesting an open regulatory regime for the provision of foreign telecom services. Finally, the retail sector in Egypt has a score of 0.41, suggesting that non-trivial restrictions are in place. The retail sector is relatively open in Europe and Central Asia, East Asia and Pacific, Latin America and the Caribbean, and Sub-Saharan Africa (STRI ranging from 0.14 to 0.17).

Non-Metallic Mineral Products 13.6
Chemicals & Chemical Products 14.1
Food 15.4
Other Manufacturing 19.1
Textiles & Garments 19.5
Leather Products 19.5
Basic Metals & Metal Products 23.0
Wood Products, Furniture & Paper 25.6
Petroleum products, Plastics & Rubber 26.2
Machinery & Equipment, Electronics 71.8

FIGURE 1   Weighted STRI by Sector (based on data from Jafari and Tarr 2017 and the World Input Output Database)

For a better understanding of the impact of these services restrictions on the manufacturing sector in Egypt, figure 1 shows the weight of the STRI in 10 manufacturing sub-sectors. Following Karam and Zaki (2020), the weighted average of services restrictions on the manufacturing sector is obtained by multiplying the STRI for each services sector by its corresponding weight in the manufacturing sector from the Input/Output Table. The weight of services restrictive policies as featured by the STRI is highest for machinery and equipment, electronics, and vehicles (71.8). In fact, these industries rely heavily on producer services. When these are subject to restrictive policy measures, manufacturing sectors that use these services intensively must bear this additional cost of restriction. For the rest of the manufacturing sectors, the weight of services restrictions is significantly lower than for machinery and equipment (23, 25.6 and 26,2 for basic metals, wood products and furniture, and petroleum products, plastic, and rubber respectively). The lowest weight of services restrictions is in non-metallic mineral products, chemicals, and food products, that have relatively a lower contribution of services.

Another measure of services policy restrictiveness is the ad-valorem equivalent (AVE). The AVE is an economically interpretable measure that reflects the impact of the different restrictions on trade in services on a measure of price or cost.[6] Jafari and Tarr

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[6] Estimations of services AVES follow two main methodologies. The first one is the
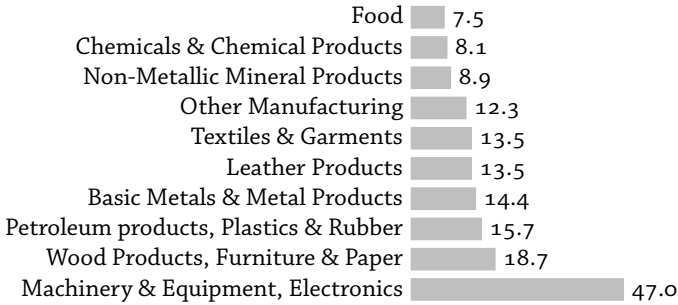
FIGURE 2   Weighted AVE by Sector (based on data from Jafari and Tarr 2017 and the World Input Output Database)

(2017) use the STRI database to produce services AVES of trade in the abovementioned service sectors. Following the pioneering work of the Australian Productivity Commission (APC)[7] and its extensions, they econometrically estimate the impact of the STRI on a measure of quantity or price of a given service, while controlling for other explanatory variables. Using a partial equilibrium framework, the AVE is estimated as the difference between the 'free trade' price and the price in the presence of restrictions. If necessary, price impacts of policy restrictions are first derived from quantity measures using price elasticities of demand.

Figure 2 depicts the ad-valorem equivalent (AVE) of services restrictions by manufacturing sector. Similar to the STRI, the AVE of services restrictions by manufacturing sector is obtained from the average of each service's AVE weighted by its share in the corresponding manufacturing sector. In line with the results from fig-

gravity model approach, where the estimated differences between actual and predicted levels of bilateral services trade reflect the presence of trade barriers. These are translated into an AVE using demand elasticities (for example, see Francois and Hoekman 1999; Francois et al. 2007). The second approach is to econometrically estimate the AVE using a quantitative measure of policy restrictiveness (such as the STRI) together with a set of independent variables that are thought to affect the price or cost of the service (for example, see Warren 2000; Doove et al. 2001; Dihel and Shepherd 2007). Jafari and Tarr (2017) adopt the second approach to estimate the AVES of services.

[7] For a summary of the APC work, see Findlay and Warren (2000).

ure 1, figure 2 shows that machinery, equipment, electronics, and vehicles have the highest services AVE (47%). The AVES in other manufacturing sectors are also relatively high. In wood products and furniture, petroleum products, plastic and rubber, basic metals and metal products, leather, textile and garments, and other manufactures, the AVES range between 12.3% and 18.7%.

[259]

Participation of Egyptian Firms in GVCS

Measuring GVC participation is a challenging exercise in the presence of data limitations. Conceptually, it is also necessary to bring other dimensions of GVC participation into the discussion. Building on the conclusion of Gereffi and Fernandez-Stark (2011) that countries must not only integrate in two-way trade along GVCS, but also capture the full gains from GVC participation, this work relies on the multi-tiered definition of GVC participation suggested by Dovis and Zaki (2020).

According to this new definition, the basic form of GVC integration is for firms to be engaged in exporting and importing activities simultaneously. Indeed, when a given firm in a given industry both imports and exports, it is natural to conclude that this firm participates in GVCS (World Bank 2020). Another more advanced form of participation in a GVC is when a firm imports, exports, and has an international certification, especially if the firm is vertically integrated in a value chain. The third definition of GVC participation implies that a firm imports, exports, and is (fully or partially) owned by a foreign entity. Since multinational companies lead GVCS, the latter involve international trade with the company's foreign affiliates (Taglioni and Winkler 2016; Amador and Cabral 2014). Andrenelli et al. (2019) find that in GVCS, FDI and trade are not substitutes, but rather complements or parallel activities practiced by multinational firms. Finally, the most integral definition includes firms that import, export, have an international certification and foreign ownership.

Table 2 compares Egyptian firms' integration in GVCS with regional averages. Despite the proliferation of GVCS over the past decades, significant differences exist across regions. For example,

TABLE 2 GVC Participation: Egypt and Regional

Category	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exports and Imports	11	27	9	13	13	7	15	13
Certification	7.5	15	6	5	6	3	7	7
Foreign Capital	2	5	3	3	2	0	4	3
All measures	1.7	3	2	2	1	0	2	2

NOTES   In percent. Column headings are as follows: (1) Egypt, (2) Europe and Central Asia, (3) East Asia and Pacific, (4) Latin America and Caribbean, (5) Middle East and North Africa, (6) South Asia, (7) Sub-Saharan Africa, (8) World. Adapted from Dovis and Zaki (2020); data on Egypt are from the World Bank Enterprise Survey.

Europe and Central Asia is the most integrated region across all four definitions of GVC participation. According to the World Bank (2020), Europe is also the most regionally integrated, with regional value chain linkages being four times higher than global linkages. The expansion of regional value chains was accelerated with the successive rounds of EU enlargement. East Asia is also more regionally than globally integrated. Meanwhile, Latin America, South Asia, Sub-Saharan Africa, and the MENA region are rather globally integrated.

Overall, Egyptian firms' participation in GVCS is lower than the world average for 3 out of the 4 definitions. For example, 11.1% of Egyptian firms export and import. The share is lower than the world average (13%), the equivalent share in the MENA region, Latin America and the Caribbean (13%), and Sub-Saharan Africa (15%). Firms in Europe and Central Asia are the most integrated in GVCS. According to the first definition, 27% of all firms are trading two ways.

The share of Egyptian firms participating in GVCS decreases significantly as the definition of the integration includes additional characteristics. According to the second level of GVC integration, only 7.5% of Egyptian firms are engaged in two-way trade and have an international certification. This share is slightly higher than the world average (7%) and all regional averages except for Europe and Central Asia (15%). A lower share (2.2%) of Egyptian firms import,

export, and have a share of foreign capital. This share is lower than the world average (3%) and lower than all other regions, except South Asia. The low presence of foreign ownership of trading firms could be attributed to restrictive investment regulations and to a relatively poor investment climate. Indeed, Egyptian firms reported licensing procedures, access to finance and electricity, tax rates, labor regulations among the top ten obstacles facing firms investing in Egypt (Aboushady and Zaki 2019).

[261]

Finally, 1.7% of all Egyptian firms satisfies the four conditions and can be considered deeply integrated into GVCS. Again, this share is lower than the world average (2%) and as compared to all other regions, except for the MENA region (1%) and South Asia (less than 1%).

METHODOLOGY AND DATA

The objective of this paper is to estimate the impact of services restrictions on the likelihood that a manufacturing firm takes part in a GVC. In line with the framework of heterogenous firms founded by the work of Roberts and Tybout (1997), Melitz (2003), and Bernard et al. (2003), the decision of a firm to enter the exports market depends on its observed (exogenous) productivity level. Only firms whose level of productivity is initially above a certain threshold will be able to export. Hence, liberalization of services can increase productivity in manufacturing firms that use these service inputs intensively. Against this backdrop, the impact of services input liberalization on manufacturing exports through the channel of productivity has been empirically investigated (Bas 2014; Bas and Causa 2013; Karam and Zaki 2020). Along the same line, a burgeoning body of literature suggests increased participation in manufacturing GVCS at the firm level (for example, Goldar, Banga, and Banga 2018). The present study adds to this strand of the literature, where the impact of services restrictions on manufacturing firms' participation in GVCS is investigated. The linear probability model is used to estimate the following regression:

$$GVC_{ikt} = \alpha_0 + \alpha_1 \ln Age_{ikt} + \alpha_2 Size_{ikt} + \alpha_3 \ln serv_{kt} + \alpha_4 t + \varepsilon_{ikt}, (1)$$

where GVC_{ikt} is the probability for a firm i operating in sector k in time t to engage in a GVC. GVC is a discrete variable that takes the value of 1 if the firm engages in a GVC and zero if not. Following Dovis and Zaki (2020), the four definitions of GVC participation (GVC1 = two-way trade; GVC2 = trade + international certification; GVC3 = trade + foreign ownership; GVC4 = trade + international certification + foreign ownership), are used in separate regressions.

Age_{ikt} is the age of the establishment, measured as the difference between the year of establishment and the year of the survey. Firm age is found to be positively associated to exports. The longer the firm has been established, the more likely it is to enter the exports market (Aitken, Hanson, and Harrison 1997; Roberts and Tybout 1997).

$Size_{ikt}$ is a categorical variable that captures firm size. I adopt the World Bank definition for small (less than 20 employees), medium (20 to 99 employees), and large enterprises (100 employees and more). Larger firms are more productive, hence more likely to enter the exports market (Bernard and Jensen 2004; Melitz 2003) and eventually engage in GVCS.

The explanatory variable of interest, $Serv_{kt}$ represents restrictiveness of services policy faced by the manufacturing sector k in year t. Against the background of increasing servicification of the manufacturing sector, restrictions on international trade in services affect firms' productivity, exports, and eventual integration in GVCS (Heuser and Mattoo 2017). To construct this variable, I follow Karam and Zaki (2020) and Ehab and Zaki (2020), where services restrictions in the manufacturing sector are calculated as the sum of each service sector restrictiveness weighted by its share in the manufacturing sector. Services restrictions are captured by the STRI from Jafari and Tarr (2017) and the services shares in the different manufacturing sectors from the World Input Output Database (see https://www.rug.nl/ggdc/valuechain/wiod/).[8]

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[8] It is worth mentioning that the input-output coefficients reflecting the share of services in the different manufacturing sectors are not available for Egypt in the World Input Output Database. To solve this problem, I use the coefficients of the

Hence, the variable $Serv_{kt}$ is constructed as follows:

$$Serv_{kt} = \sum_s \text{STRI}_{st}\text{IO}_{sk}, \qquad\qquad (2)$$

where s are the services sectors, STRI_{st} is the STRI for service s in year t, IO_{sk} is the share of service s in manufacturing sector k. The five services sectors of interest are professional, financial, transport, telecommunication, and retail services. The variable $Serv_{kt}$ is calculated in the natural logarithm to capture the effect of changes in services policy measures on the likelihood of firms integrating a GVC.

[263]

Given that the share of firms followed over time is small in most World Bank Enterprise Surveys, year fixed effects t are included. Errors are clustered by sector given that firms operating the same sector face the same impediments.[9]

Data on firms' participation in GVCS come from the World Bank Enterprise Survey for Egypt (2013, 2016, and 2020). The survey offers a wide scope of economic data on establishments in the manufacturing and services sectors, including data on firm age, size, exporting and importing status, foreign ownership, and international certification. Since this study focuses only on firms in the manufacturing sector, the pooled data consist of 5420 manufacturing firms. To merge data on manufacturing firms from the World Bank Enterprise Survey with data on services restrictions in manufacturing sectors from the World Input Output Database, the disaggregation of the manufacturing sectors in the World Input Output Database was adapted to the sectoral disaggregation of the World Bank Enterprise Survey.

For robustness checks, I proceed in multiple ways: initially, I use an alternative measure to capture the weight of services restrictions on manufacturing: the AVE estimated by Jafari and Tarr (2017) for

'Rest of the World' available in the database. This implies that the production technique reflected in share of services in the different manufacturing sectors are assumed to be the same across all countries included in the category 'rest of the world.'

[9] Sector specific effects were not included given the collinearity with the measure of services restrictions.

each of the five services sectors. As explained before, the AVE is an economically interpretable measure that indicates the presence of an additional cost coming from restrictive services policies in the production and trade of manufacturing goods. Similar to the STRI, the AVE of services restrictions is obtained by calculating the weighted average of services AVE in each manufacturing sector. Hence, the AVE of services in manufacturing sector k in year t is equal to the sum of each services s AVE in year t weighted by its share in manufacturing sector k.

$$\text{AVE}_{kt} = \sum_{s} \text{AVE}_{st} \text{IO}_{sk}. \tag{3}$$

Secondly, I repeat the empirical exercise using a probit analysis instead of the linear probability model. To capture services policy restrictions, both the STRI and the AVE are used as alternative explanatory variables.

Next, a categorical dependent variable GVC *status* is created to account for the different levels of GVC participation, including the absence of GVC participation (GVC *status* = 0) used as a base category. This variable is used in multinomial logit model to check for the impact of services restrictions (STRI and AVE) on the different categories of GVC integration.

Finally, I account for firm heterogeneity by extending the baseline specification to include interaction terms between firm size and the measure of services restrictiveness (weighted STRI and weighted AVE). The interaction of services restrictions and firm size is important, as larger firms are more likely to integrate in GVCS than medium or smaller firms. Hence, the effect of services restrictions is likely stronger for larger firms.

EMPIRICAL RESULTS
Baseline Specification
Summary statistics for the different levels of GVC participation and the explanatory variables are presented in table 3. The results of the baseline specification are depicted in tables 4 and 5. Table 4 presents the results using the STRI as a measure of services restrictiveness.

TABLE 3 Summary Statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
GVC1	7,786	0.111354	0.3145898	0	1
GVC2	7,786	0.075006	0.2634186	0	1
GVC3	7,786	0.021577	0.1453077	0	1
GVC4	7,786	0.016825	0.1286239	0	1
Ln(*Age*)	7,720	7.598776	0.0082966	7.498870	7.610358
Ln(STRI)	5,465	3.030347	0.3872542	2.607272	4.274266
Ln(AVE)	5,465	2.567189	0.4449048	2.009479	3.851206

Overall, the coefficients of the explanatory variables have the expected signs but are not always significant. The coefficient for firm age is only significant for GVC3 (firms that trade and have foreign capital). The longer the firm has been operating, the more likely it is engaged in two-way trade along GVCS and the more likely it benefits from foreign capital. In line with the literature on GVCS, trade and investment are complements and multinationals often seek to invest in foreign affiliates to generate additional revenue. Investors are often encouraged to acquire well-established firms that are productive enough to engage in global trade.

Being a medium-size firm is positively associated with the probability of engaging in GVCS through two-way trade (GVC1) and trade with international certification (GVC2). The coefficient is insignificant for GVC3 and is weakly significant for GVC4 including all measures of GVC participation. This is because medium firms are unlikely owned by foreign investors, as these seek to establish or acquire large size foreign affiliates to serve as a trade platform and to realize revenue gains. Therefore, the results for large firms are found to be positive and strongly significant across all definitions of GVC participation. Being a large firm increases the probability of being integrated into GVCS for all forms of GVC participation. These results are in line with the literature on heterogeneous firms, where large establishments are more productive and perform better in the global market. These firms are not only likely to be exporting and importing but are also more likely to increase their competitiveness

TABLE 4 Impact of STRI on GVC

Variable	GVC1	GVC2	GVC3	GVC4
Ln(Age)	−0.455	−0.231	0.598**	0.312
	(0.479)	(0.426)	(0.264)	(0.233)
Medium	0.0698***	0.0511***	0.00959	0.00872*
	(0.0169)	(0.0152)	(0.00525)	(0.00453)
Large	0.285***	0.247***	0.0771***	0.0667***
	(0.0219)	(0.0149)	(0.00582)	(0.00607)
Ln(STRI)	−0.0337*	−0.0192	−0.0140**	−0.0113*
	(0.0175)	(0.0160)	(0.00593)	(0.00569)
Constant	3.591	1.814	−4.494*	−2.336
	(3.626)	(3.235)	(2.003)	(1.771)
Year dummies	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420
R-squared	0.118	0.124	0.040	0.037

NOTES Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Errors are clustered by sector.

[266]

by being intensively engaged in GVCS by complying with international standards and/or receiving foreign capital.

The coefficient of main explanatory variable of interest, the STRI, has the expected sign and is significant for 3 out of 4 definitions of GVC integration. Indeed, the higher the services restrictions, the lower the probability of firms being engaged in GVCS. This result holds for firms fully integrated in GVCS (GVC4), for firms trading two-way (GVC1) and for firms who trade and benefit from foreign capital simultaneously.

Table 5 shows the results of the baseline specification using the AVE of services as a measure for services trade policy. Overall, the results are similar to those of the STRI. The coefficient of firm age is only positive and significant for GVC3. Firm size is found to have positive and significant impact for medium and large firms across the four definitions of GVC participation. However, for medium firms, the coefficients are smaller and only significant at the 90% level for GVC3 (trade + foreign ownership) and for GVC4 (all measures of GVC participation). In the case of large

TABLE 5 Impact of AVE on GVC

Variable	GVC 1	GVC 2	GVC 3	GVC 4
Ln(*Age*)	−0.487	−0.251	0.584[*]	0.301
	(0.476)	(0.429)	(0.263)	(0.233)
Medium	0.0704[***]	0.0516[***]	0.00989[*]	0.00901[*]
	(0.0169)	(0.0153)	(0.00538)	(0.00466)
Large	0.285[***]	0.248[***]	0.0773[***]	0.0669[***]
	(0.0219)	(0.0149)	(0.00588)	(0.00616)
Ln(AVE)	−0.0269	−0.0181	−0.0121[**]	−0.0106[**]
	(0.0179)	(0.0124)	(0.00459)	(0.00409)
Constant	3.799	1.951	−4.401[*]	−2.255
	(3.600)	(3.257)	(1.995)	(1.773)
Year dummies	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420
R-squared	0.117	0.124	0.040	0.037

NOTES Robust standard errors in parentheses. [***] $p < 0.01$, [**] $p < 0.05$, [*] $p < 0.1$. Errors are clustered by sector.

[267]

firms, the coefficients are greater in value and significant at the 99% level.

As for the effect of services restrictions measured by the AVE on GVC participation, the sign of the coefficient is as expected, but the coefficient is only significant for deeper forms of integration that include foreign ownership (GVC 3 and GVC 4). This is interesting, since deeper forms of GVC integration involving foreign ownership require an open and competitive services sector that allows for a smooth operation of foreign affiliates along GVCS. This result does not necessarily hold for firms trading two ways, and for those trading two ways and being internationally certified, where the coefficients are negative but insignificant. The results suggest that services liberalization matters for more complex forms of GVC participation that include foreign direct investment.

To check for the robustness of the baseline specification, the impact of the STRI and the AVE on GVC participation is estimated using probit analysis. Overall, the probit estimation produces similar outcomes as the baseline specification. For both estimations us-

TABLE 6 Impact of STRI on GVC Using Probit Analysis

Variable	GVC1	GVC2	GVC3	GVC4
Ln(*Age*)	−2.585	−1.999	13.91**	8.288
	(2.483)	(2.973)	(5.494)	(5.909)
	[−0.494]	[−0.293]	[0.761]**	[0.369]
Medium	0.499***	0.583***	0.403***	0.574***
	(0.0885)	(0.126)	(0.157)	(0.192)
	[0.070[***	[0.052]***	[0.010]***	[0.009]***
Large	1.255***	1.415***	1.222***	1.400***
	(0.0862)	(0.0725)	(0.0720)	(0.106)
	[0.283]***	[0.245]***	[0.080]***	[0.068]***
Ln(STRI)	−0.147*	−0.0955	−0.248**	−0.242*
	(0.0836)	(0.0962)	(0.115)	(0.132)
	[−0.028]*	[−0.014]	[−0.014]**	[−0.011]*
Constant	18.34	13.30	−107.5***	−65.12
	(18.80)	(22.56)	(41.68)	(44.83)
Year dummies	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420
Pseudo *R*-squared	0.1352	0.1730	0.1418	0.1603

NOTES Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Errors are clustered by sector.

ing the STRI and the AVE, control variables have the expected signs but are not always significant. For example, firm age is only significant for GVC3, suggesting that the longer the firm has been established, the more likely it can benefit from foreign capital as a form of GVC integration. Firm size is found to be positive and significant across the four definitions of GVC participation. For example, being a medium size firm increases the likelihood of the firm to be integrated into GVCS through two-way trade (GVC1) by 0.07%, compared to small firms. Large firms are 0.28% and 0.24% more likely than small firms to export and import (GVC1) and to trade and acquire international certification (GVC2), respectively. The marginal effects are small and continue to decrease as the definition of GVC integration is deeper. For example, larger firms are only 0.08% more likely than smaller firms to trade and attract foreign capital, and

TABLE 7   Impact of AVE on GVC using probit analysis

Variable	GVC 1	GVC 2	GVC 3	GVC 4
Ln(Age)	−2.676	−2.033	13.88**	8.335
	(2.477)	(2.986)	(5.460)	(5.886)
	[−0.512]	[−0.298]	[0.759]**	[0.370]
Medium	0.502***	0.586***	0.410**	0.583***
	(0.0890)	(0.127)	(0.160)	(0.196)
	[0.071]***	[0.053]***	[0.010]**	[0.009]***
Large	1.257***	1.418***	1.229***	1.411***
	(0.0860)	(0.0736)	(0.0759)	(0.112)
	[0.283]***	[0.245]***	[0.080]***	[0.068]***
Ln(AVE)	−0.122	−0.101	−0.227***	−0.246**
	(0.0867)	(0.0773)	(0.0860)	(0.0959)
	[−0.023]	[−0.015]	[−0.012]***	[−0.011]**
Constant	18.90	13.53	−107.5***	−65.59
	(18.75)	(22.64)	(41.44)	(44.68)
Year dummies	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420
Pseudo R-squared	0.1350	0.1732	0.1421	0.1614

[269]

NOTES   Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Errors are clustered by sector.

0.06% more likely to be fully integrated in GVCS (GVC4) (tables 6 and 7).

Findings from the estimation using the STRI (table 6) suggest that the higher the restrictions, the less likely a firm takes part in a GVC across all definitions, except for GVC2 (two-way trade and foreign certification). Indeed, higher trade policy restrictions affect firms' likelihood to export and import, and to benefit from foreign capital as a deeper form of GVC integration (GVC3 and GVC4) but appear to be insignificant for trading firms seeking to acquire foreign certification. This is expected, given that the quality of infrastructure services and service inputs in manufacturing matters for the sector's attractiveness to FDI, while do not necessarily affect firms opting for international standards. As for the AVE of services (table 7), it is found to matter only for deeper forms of GVC inte-

gration that include FDI (GVC3 and GVC4), while its impact on trade and foreign certification is found to be insignificant. Finally, it is worth noting that the marginal effects of services trade restrictions (STRI) as well as their AVE are found to be extremely small across all forms of GVC integration. This may be due to the small number of Egyptian firms integrated in GVCS across all firm sizes and all forms of GVC participation.

Extensions

In this section, the analysis is extended in two ways. First, the categorical variable GVC *status* is used in a multinomial logit analysis to investigate the impact of services restrictions on the different modes of GVC participation. Results are depicted in tables 8 and 9. In line with previous findings, firm age is likely to increase the likelihood that a firm joins a GVC in the form of two-way trade and foreign ownership (GVC3). Surprisingly firm age is found to reduce the likelihood of GVC participation through two-way trade only (GVC1). A possible justification could be that firms with a successful international trade profile tend be acquired by foreign investors at a certain point and that older firms are less likely to be exporting only. Another possible explanation is that older firms operating only domestically may be unable to reach the productivity level required to compete internationally. In line with findings from the baseline specification, firm size is found to increase the likelihood of GVC integration for medium firms except for GVC mode 3. This reflects the difficulties medium-size enterprises encounter to attract foreign investment. Being a large firm, however, increases the likelihood of GVC integration across the four definitions. As for the main explanatory variable, the STRI (table 8), the coefficient has the expected sign and is significant for 3 levels of GVC integration (GVC1, GVC3, GVC4). As discussed previously, an increase in services policy restrictions does not appear to affect the decision of a firm to acquire foreign certification.

Similar conclusions can be drawn from the multinomial logit analysis, including the AVE as the main explanatory variable (table 9). The control variables produce the same results as in the case of

TABLE 8   Impact of STRI on GVC Using Multinomial Logit Analysis

Variable	GVC1	GVC2	GVC3	GVC4
Ln(*Age*)	–	−15.01**	−6.823	81.28***	15.97
		(7.190)	(6.040)	(15.92)	(13.66)
Medium	–	0.698***	1.270***	0.349	1.727***
		(0.237)	(0.290)	(0.377)	(0.543)
Large	–	1.196***	2.710***	2.015***	3.876***
		(0.340)	(0.180)	(0.321)	(0.295)
Ln(STRI)	–	−0.483**	−0.152	−0.589**	−0.590*
		(0.202)	(0.162)	(0.280)	(0.322)
Constant	–	111.8**	48.04	−621.7***	−125.7
		(54.80)	(45.83)	(121.3)	(103.6)
Year dummies	–	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420	5,420

[271]

NOTES   Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Errors are clustered by sector.

TABLE 9   Impact of AVE on GVC Using Multinomial Logit Analysis

Variable	GVC1	GVC2	GVC3	GVC4
Ln(*Age*)	–	−15.18**	−6.871	81.11***	16.01
		(7.219)	(6.060)	(15.97)	(13.57)
Medium	–	0.703***	1.275***	0.355	1.751***
		(0.231)	(0.291)	(0.383)	(0.553)
Large	–	1.190***	2.715***	2.009***	3.901***
	–	(0.338)	(0.182)	(0.318)	(0.304)
Ln(AVE)		−0.284	−0.149	−0.343	−0.592**
		(0.274)	(0.145)	(0.386)	(0.234)
Constant	–	112.4**	48.32	−621.3***	−126.3
		(55.09)	(45.93)	(121.7)	(102.9)
Year dummies	–	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420	5,420

NOTES   Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Errors are clustered by sector.

the STRI. Services policy restrictions measured by the AVE only matter for the deepest form of GVC integration (GVC4) includ-

TABLE 10   STRI and Size Interaction

Variable	GVC1	GVC2	GVC3	GVC4
Ln(*Age*)	−0.433	−0.213	0.606**	0.319
	(0.486)	(0.419)	(0.256)	(0.226)
Medium	0.151	0.133	0.0320	0.0349
	(0.117)	(0.109)	(0.0451)	(0.0357)
Large	0.535***	0.425***	0.176***	0.149***
	(0.156)	(0.0957)	(0.0299)	(0.0337)
Ln(STRI)	0.000727	0.00763	−0.00138	$2.57e^{-5}$
	(0.0107)	(0.00509)	(0.00317)	(0.00242)
Ln(STRI)*Medium	−0.0271	−0.0272	−0.00748	−0.00873
	(0.0347)	(0.0325)	(0.0145)	(0.0111)
Ln(STRI)*Large	−0.0817	−0.0580*	−0.0321***	−0.0270**
	(0.0505)	(0.0295)	(0.00883)	(0.00971)
Constant	3.320	1.596	−4.591**	−2.425
	(3.691)	(3.194)	(1.946)	(1.721)
Year dummies	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420
R-squared	0.119	0.124	0.041	0.038

NOTES   Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Errors are clustered by sector.

ing exports, imports, foreign certification, and foreign ownership.

The second extension is to account for firm heterogeneity by introducing an interaction term including services restrictions and firm size. Table 10 shows the results for the extended regression including an interaction of the STRI with firm size. Similar to the results of the baseline regression, the coefficient of firm age is only positive and significant for GVC3 including two-way trade and foreign ownership. The coefficients of firm size are positive and strongly significant for large firms across all definitions of GVC participation, while there appears to be no significant relation between being a medium firm and being integrated in a GVC. This implies that firm size matters for all dimensions of GVC integration.

While the coefficients of the STRI are all insignificant, the interaction of the STRI with firm size produces interesting results. First,

TABLE 11 AVE and Size Interaction

Variable	GVC1	GVC2	GVC3	GVC4
Ln(*Age*)	−0.430	−0.204	0.607**	0.321
	(0.483)	(0.421)	(0.256)	(0.227)
Medium	0.160	0.137	0.0392	0.0380
	(0.0965)	(0.0898)	(0.0377)	(0.0292)
Large	0.466***	0.385***	0.157***	0.135***
	(0.134)	(0.0820)	(0.0250)	(0.0251)
Ln(AVE)	0.00284	0.00646	−0.000176	$7.38e^{-5}$
	(0.00838)	(0.00504)	(0.00257)	(0.00191)
Ln(AVE)*Medium	−0.0351	−0.0337	−0.0116	−0.0115
	(0.0328)	(0.0306)	(0.0143)	(0.0107)
Ln(AVE)*Large	−0.0696	−0.0529	−0.0305***	−0.0262**
	(0.0509)	(0.0292)	(0.00859)	(0.00821)
Constant	3.291	1.536	−4.608**	−2.439
	(3.673)	(3.210)	(1.948)	(1.729)
Year dummies	Yes	Yes	Yes	Yes
Observations	5,420	5,420	5,420	5,420
R-squared	0.119	0.125	0.041	0.039

NOTES Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Errors are clustered by sector.

[273]

the coefficients of the interaction term involving medium-size firms have the expected sign but are all insignificant. A possible explanation is that exporting firms and those engaged in deeper forms of GVCS are usually larger firms. Therefore, the coefficients of the interaction term involving large firms are negative and significant for 'deeper' GVC participation indicators involving international certification and/or foreign ownership. In line with the literature on heterogeneous firms, larger firms are more likely to trade and to increase their competitiveness by attracting FDI and by opting for international certification to integrate in vertical fragmentation along value chains. Therefore, the presence of restrictive services regulations that discriminate against services imports or foreign services suppliers hinders large firms from engaging further in GVCS.

Table 11 shows the results of the interaction of the AVE of ser-

vices with firm size. The explanatory variables show the same results as the previous regression. Again, firm size matters for GVC integration across all definitions. The coefficients of the AVE of services are insignificant across all definitions of GVC participation.

[274]   As for the interaction term, services restrictions do not seem to matter for medium-size firms, as these are generally less integrated in the global market. The presence of high AVE of services matters for large firms only when foreign ownership is included in the definition of GVC participation (GVC3 and GVC4). The likelihood that a firm benefits from foreign capital as a more advanced form of GVC integration appears to depend on the firm's ability to overcome the costs of inputs, including those of upstream services. In the case of restrictive services policies, the probability of engaging in the global market is lower as the cost of services inputs is significant. The decision to enter the global market also requires a minimum productivity threshold. Therefore, smaller firms are excluded.

CONCLUSION

The objective of this paper is to assess the impact of restrictive services policies on the likelihood of Egyptian manufacturing firms to participate in GVCS. This paper adopts the novel approach introduced by Dovis and Zaki (2020) to measure GVC participation using several indicators involving two-way trade, foreign certification, and/or foreign ownership. To the author's knowledge, this paper is the first attempt to use this integral approach to understand the link between restrictive policies in services inputs and performance in manufacturing activities. This paper also contributes to the small yet growing literature on services policies and GVC participation.

The findings from the empirical estimation are interesting for three reasons. First, services restrictions (measured by the STRI or the AVE of services) matter for GVC integration. Second, these restrictions matter for higher levels of GVC integration, especially those involving foreign ownership. Third, services policies matter for large firms. In line with the literature on heterogeneous firms, inefficient and expensive services are a fixed cost affecting firms' decisions to enter the exports market, and to potentially integrate

deeper into GVCS by receiving foreign capital. To be able to take part in the growing trend of global fragmentation, a minimum productivity threshold is required. This excludes medium firms and less productive firms.

These findings emphasize the importance of opening the services sector for foreign competition. For developing countries like Egypt, services liberalization may help overcome the absence or lack of variety in specific services and is likely to generate better price-quality combinations in these services. Efficient services are not only important as inputs in manufacturing, but also as the 'glue' that holds together international fragmentation and that allows for a smooth functioning of GVCS. For developing countries, efficient and high-quality services inputs increase firms' competitiveness and provide better connection within GVCS. Competitive services policies also attract FDI in the manufacturing sector. In the context of increasing servicification, manufacturing firms can also improve their competitiveness by offering differentiated bundles of goods and services.

Overall, Egypt's services trade policy (measured by the STRI) is considered more restrictive than other regional groups of developing and emerging economies. Except for telecommunications, services regulations in Egypt are generally more discriminatory against foreign providers than the MENA region. Considering recent global events, patterns in GVCS are changing, where investments are re-shored or 'near-shored' to bring the production of manufacturing goods closer to consumer markets. This may be an opportunity for Egypt to attract foreign investments as a geographically closer market (to Europe, for example) with relatively abundant and cheap labor. However, this depends on the overall business environment, including trade policy, investment regulations, and the quality of infrastructure and services.

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